Arts-Integrated Learning in Science: Experiences of Fine Arts High School Graduates

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ABSTRACT

This qualitative study employed a narrative approach to collect stories and explore the meaning created by six fine arts school graduates who engaged in arts-integrated learning (AIL) in their science classes. The goal of this study was to interview former AIL students and analyze their experiences as they described them. The arts school graduates in this study described overall improvements in their engagement, learning, and creativity in their AIL science classes. Science classes using the arts for engagement made learning enjoyable for five of the six participants and increased their interest in science. Most AIL participants reported learning and retaining the science information longer than they did in their traditional science classes. Interestingly, four participants reported that AIL lessons made them nervous when performing in front of their classmates, and that their groups got distracted and learned less effectively when not properly monitored by the teacher. While three participants learned adequately in traditional instruction, five of the participants believed learning through AIL in high school was essential to learning the science material deeply enough to be successful in traditional college science classes. Four of these fine arts school graduates also reported caring more for their learning than in traditional classes because their AIL science teachers cared enough to build engaging AIL lessons for them.

Keywords: Arts Integration, Arts Enhancement, Arts Infused, Art, Science, Learning, Creativity, Engagement, Knowledge Retention, Stress, Science Interest, Teamwork, Critical Thinking, Traditional Instruction

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Dedication

This study is dedicated to the creative students in school who see the world in different ways and want a science education that embraces their interests and talents.

Chapter I

INTRODUCTION

In the past, scientists like Leonardo DaVinci and John James Audubon used the arts to improve their understanding of the world and communicate that scientific understanding to others. In the mostly positivistic world of American education, policymakers often demand students master science and art as distinct, separate content areas that can be easily assessed rather than transdisciplinary skills that encourage a complete understanding of the world (Eisner, 2004; Smith, 1999). In recent decades, some educators began teaching art standards and core content standards, like science, together rather than teaching them in isolation (Mark et al., 2020; Xu et al., 2012). This process of teaching both art and core content simultaneously to improve the learning of both is called *arts integration* (Carpenter & Gandara, 2018). In this chapter, I define arts integration and provide a working definition for the study. Then, I present the background of the study and compare arts integration to traditional instruction for context. After relaying the background, I explain the purpose and significance of the study as well as the research goals and research questions used to guide the study. My dissertation focuses on participant experiences in science classes using arts integration and the meaning created from those experiences. Defining arts integration requires experts, like Duma and Silverstein (2018), who are experienced in the field.

Duma, the Director of the Kennedy Center, and Silverstein, an education consultant, developed a description of arts integration in the modern classroom:

> Arts integration is not simply an activity; rather it is an approach to teaching that teachers can use every day. Teachers plan for arts integration connections across the year. For example, the creative process for composing song lyrics includes understanding of syllabication, rhyme, alliteration, main idea, and supporting details. Students can apply the lyric-writing process to demonstrate their understanding of a range of topics they are studying. (Duma & Silverstein, 2018, p. 57)

Science teachers using arts integration incorporate different art standards into their lesson plans from dancing and clay modeling to poetry and photography to teach their students certain abstract science concepts. The key to arts integration is that there is a mixture of science and art instruction and assessment to engage students in the lesson (Marshall, 2014).

When I reviewed the literature to define arts integration, a challenge arose because there were various levels of arts integration reported in the literature. For example, the Kennedy Center definition required the science and the art standards to be taught and assessed in equal measure (Carpenter & Gandara, 2018). However, Marshall (2014), of San Fransisco State University, clarified that arts integration as a practice expanded over time from solely arts-infused models focused on academic content like science to arts-as-curriculum focused almost entirely on the arts. In most forms of arts integration, academic and art standards were taught equally, while some in others, the academics were the focus of the lesson with the art standards infused. Science teachers at the fine arts school in question used a variety of these methods. So, the term *arts-integrated learning* (AIL) will be used in this study to cover the continuum of arts

integration that the science teachers at the fine arts high school in question used. I was one of those science teachers, and we primarily used arts-integration models and arts-infused models for our instruction. Appendix A was used to clearly define the various types of arts integration that I am calling AIL. When using AIL, we would teach the art as well as the science, before assessing and providing feedback on both the art and the science. AIL was chosen for the students at the fine arts school, because it has been shown to help students in a variety of ways.

Researchers studying AIL found that teachers who chose to implement arts into their classroom content significantly increased the content learning of their students (Breznovik, 2017; Ramey et al., 2020; Rosen-O'Leary & Thompson, 2019). Moss et al.'s (2018) meta-analysis of nine quantitative studies of over 2,000 Californian students and teachers showed significant benefits to student test scores when students were engaged in AIL. Interestingly, despite the improvements in test scores, Moss et al. did not attribute student success to improvements in content knowledge, but in improvements in students' cognitive abilities and executive functions, because of the different modalities that AIL provided students. In an observational study of 90 fifth and sixth grade students engaged in AIL, Ramey et al. (2020) proposed that AIL in science showed benefits beyond science content learning for participants. Students showed improvements in empathy, collaboration, and creativity. Catterall (1998) and Eisner's (1999) early AIL research helped spark the creation of AIL programs like Harvard's "Project Zero" and Michelle Obama's "Turnaround Arts" program where teachers were educated on how to implement AIL in their classrooms. Some teachers have been using AIL in the classroom

for years, but Wan et al. (2020) still called for more research to support science AIL implementation for specific groups of students and specific educational outcomes.

Through this study, I attempted to contribute to Wan et al.'s (2020) request for additional AIL research by collecting stories from fine arts high school graduates about their experiences with AIL science curriculum and adding their subsequent perspectives to the literature. Researchers Inwood (2013) and Ramey et al. (2020) noted the predominant mechanism of AIL research has been interviewing teachers, but not students. Inwood (2013) studied four educators who taught over 50 arts-integration lessons on environmental science topics. After analysis of the teacher post-lesson surveys, Inwood decided that more information was needed on student experiences from the student perspective. To that end, the participants in this study were interviewed about their personal experiences and the meaning they made from them to broaden the understanding of AIL in science. AIL in science can come in many forms, but in this study, the AIL science teachers either integrated the arts or infused the arts into their science lessons on a daily basis through arts like theatre, dance, visual arts, music, and creative writing as opposed to using only traditional notes, textbooks, and lectures.

Additionally, in a recent study where art was integrated using poetry, visual art, and song, Mark et al. (2020) interviewed 20 Black female middle school students engaged in art/science integration and found it increased their interest in science. Mark et al. (2020) suggested future research describing students' experiences in science class in the years after middle school. This request echoed the suggestions of researchers Inwood (2013) and Ramey et al. (2020) who have called for more student perspective on AIL as

well. This study was designed to fill this gap in the literature by interviewing former AIL students.

By specifically enlisting recent fine arts high school graduates for this study, the graduates could reflect on how those AIL experiences shaped their learning and interest in science and art, and I worked with them to explore the meaning of their experiences through open-ended techniques. The methods employed in the study are discussed in Chapter 3 and the conceptual framework in Chapter 2. The rest of this introductory chapter is dedicated to explaining the background of the study, which includes AIL vs. traditional instruction, my personal connection to the topic, and the related problems in the field. Also, the significance of the study, research questions, and goals of the study will be established.

Background of Study

AIL and traditional instruction were often set up as foils in the literature, and they are major aspects of this study. Therefore, defining these terms, discussing how they compare to each other, and unpacking the AIL vs. traditional instruction dilemma will be addressed, before getting to how I developed the idea for this study and why it matters to education with the problem statement and significance. Following this background information, the research questions and goals that guided the exploration into how fine arts school graduates made sense of their AIL experiences and learning are presented. AIL combined with traditional instruction made up the predominant classroom experiences of the participants in this study, and they both influenced participant interest in science.

Arts-Integrated Learning vs Traditional Instruction

The Kennedy Center defined arts integration as "an approach to teaching in which students construct and demonstrate understanding through an art form. Students can engage in a creative process, which connects an art form and another subject area and meets evolving objectives in both" (Carpenter & Gandara, 2018, p. 8). According to this definition, using arts integration in the classroom requires that science and art standards be taught equally and assessed equally in the science class. The teacher must teach and assess at least one art and one science standard in each arts-integrated lesson. This rigid definition was not the only one used in the literature, nor was it the only way the participants in the study experienced it. Straksiene et al. (2022) claimed that arts integration was a complex term that had many varied definitions and meanings, which helps explain the need for defining the term in this study. Marshall (2014), a long-time arts integration researcher from the University of San Francisco, drew a similar conclusion and indicated that arts integration came in multiple forms from strictly equal to a focus on either the science or art. In this study, AIL can be thought of as falling somewhere on a continuum between having a perfectly equal split between art and science (arts integration) and a focus mainly on science (arts infusion). I created a glossary of terms for various AIL modes of instruction on this continuum for this study, which can be found in Appendix A. The participants in this study experienced AIL at different points all along this continuum in their time at the fine arts school.

All teachers can implement AIL, but this study will focus on the implementation by science teachers. The science teachers in Valls et al. (2019) inspired elementary school children to learn by integrating both dance and science in their classes. Students

were asked to choreograph dances to represent their learning of the states of matter, and the dance teachers evaluated how the students met the dance and content standards to determine their grades for the class. In Dhanapal et al. (2014), science teachers instructed 31 third grade students in visual arts techniques, like drawing and modeling. The students then used these new skills to help model different science phenomena. Not only did the students gain science content knowledge through the process, but they also gained visual art skills that they could use in all their future classes from the instruction and assessment using art standards. The teachers in Dhanapal et al.'s study chose to incorporate visual arts, but they could have chosen arts like puppetry, music, theatre, photography, videography, or any number of artistic processes to help the students to learn the material in class.

As discussed earlier, there are many incarnations of AIL in the literature (Marshall, 2014), and all of them involved teaching art and science at various places on the continuum from pure art to pure science. In arts enhancement, students used the arts to construct scientific ideas, but the art was considered secondary to the science standards (Jaffe, 2013). The focus for each lesson in arts enhancement was to learn the science content, and the art was merely a means to that end. Science, technology, engineering, art, and mathematics (STEAM) was similar in many ways to AIL, and it involved teaching any two of the five parts of STEAM and assessing them in the lesson. Science, technology, engineering, and mathematics (STEM) was upgraded to STEAM when President Obama signed the Every Student Succeeds Act of 2015 so that students could focus on creativity and design elements in their engineering (Wilson, 2018). However, in STEAM, the arts were not taught in equal measure to the science as is the case in other

AIL (Ramey et al. 2020). Teaching artistic behavior (TAB) was the converse of arts enhancement and STEAM. In TAB, the arts were the focus of the learning in the classroom, and science practices were taught secondarily. TAB students were considered artists who were exploring the world through their art while problem-solving and asking questions like scientists. No matter the level of AIL, students were taught both science and the arts in their classrooms, and research showed that there were benefits to STEAM (Ramey et al., 2020), STEM (Wilson, 2018), and TAB (Van Plew-Cid, 2018).

The benefits of AIL cannot be discussed fully without comparison to a traditional science classroom. In trying to clearly define these two approaches for this study, I came across a book by Hanuscin and van Garderen (2020), in which the authors tried to show the differences between Universal Design for Learning (UDL) and traditional instruction. They designed a table that clearly marked the differences between the two approaches and made the distinctions clear between the two. I decided to use this approach from their study as well as their example of a generic traditional science lesson to help differentiate between AIL and traditional instruction in this study. The AIL lesson in Table 1 was taken from the Kennedy Center (2022a), and the traditional lesson example was based on a lesson that I taught years ago about the human body. The breakdown of a traditional lesson in comparison to an arts-integrated lesson is in Table 1.

In the table, there was a lot more work required of both the teacher and the students in the AIL lesson (Kennedy Center, 2022a). Both lessons teach about the human body, but looking closely at the AIL activities, there was more cognition required for students when engaged in their activities. The students were active participants, mirroring each other's motions and choreographing dances for each concept.

Table 1

AIL Science Lesson Plan (Kennedy Center, 2022a) vs Traditional Lesson Plan

	Arts-Integrated Learning		Traditional Instruction	
	Activities of the Teacher	Activities of the Students	Activities of the Teacher	Activities of the Students
Engage	• Lead students in dramatic actions of body functions. • Have a follow-up discussion with students.	• Dramatically act out body functions: breathing, heart thumping, flexing muscles, etc. • Have students explore the Human Body Interactive.	• Provide students with background information and vocabulary in a presentation or have them read from a book that covers body functions.	• Listen carefully to new information that is presented or read the material. Ask questions when necessary.
Build	• Watch the Teaching Artists Present video, Art in Motion with Kylie Murray (Kennedy Center, 2022a). • Divide students into small groups and designate the group a major system of the body: circulatory, respiratory, nervous, muscular, skeletal, and digestive organs. • Brainstorm movements related to the functions of a system.	• Have students perform mirror actions in pairs. Have partners face one another, with one as leader and one as follower. Give them one action word at a time. The leader does the action while the follower attempts to be a mirror image. • Have students perform complementary actions in pairs while partners are facing each other. Example: the leader "chews" at a high level, and the responder does a similar action.	• Clarify and further explain the concepts to students with an additional, real-world example. Lead children in a pulse-taking exercise where children stand up and jump around or run in place for one minute. Take their pulse before and after the activity. Lead a discussion where students must discuss the body processes involved.	• Comprehend the explanation by transferring learning from first example to the second provided by the teacher or text. Students will jump around and run in place and take their pulse, and afterwards they will answer the teacher's questions.
Apply	• Give students ground rules for working on choreography within their groups.	• Choreograph a simple dance that expresses information about how an organ or a major system functions.	• Provide activities to reinforce the concepts: labs, worksheets, textbook pages with a chapter review.	• Students must use the information to answer questions or conduct experiments.
Reflect	• Have each group perform for the class or an audience. Ask the audience to interpret the movements.	• Interpret the movements or guess the system or functions of the body.	• If time is left, provide enrichment or extension activities to do at home.	• Students are asked to go home and find or perform examples of what they learned in school.
Evaluate	• Using a rubric, the teacher will evaluate students' representation of the science and the art principles used.	• Students will show their knowledge in different forms of expression that make the most sense to them personally.	• Evaluate students (e.g., test).	• Students answer a series of multiple choice questions and maybe a short answer question.

The traditional lesson was very teacher-centered where the students had to sit passively while the teacher shares or presents knowledge. Students got a chance to run and record their own pulse, which can be fun. However, based on my personal experiences, the amount of thinking required from students in the traditional process was minimal.

I taught very traditionally in my first year of teaching just like the example in Table 1. My traditional science classes began like the lesson from Table 1 with the teacher introducing a new subject and the students taking notes straight from the presentation on the board. There was very little engagement, and the information was dumped straight into the children's notebooks. There may have been a video or two that summarized what was supposed to be learned in the note-taking session. Students would then complete a worksheet or a lab using their notes to guide them to show what they learned. Students did very little thinking during my traditional instruction.

Even the labs that were used were called "cookie-cutter" labs and required very little thinking from the students. They just had to follow the instructions and answer the questions. That means the students would not spend any time in class designing their own experiment and were given no autonomy and did very little actual thinking. Instead, they would follow a recipe list of instructions that the teacher created. Braund and Reiss's study supported this analysis of student thinking (2019). The researchers discussed how teacher-centered style of learning does not engage students as there was no critical thinking or design required for the students to find success. Traditional students were given no choice but to show their understanding of the material in the one way requested by the teacher: worksheet or lab report, which requires minimal effort and did not engage all students. Repetitive task completion would dishearten students, negatively impact

their learning (Breznovik, 2017). I witnessed students grow tired of the repetition and lack of creativity or control in my traditional classes, and many began to act out or misbehave because they struggled to learn the content. My struggles led me to implement AIL in my classroom and inspired me to conduct this study at the secondary level.

Problem Statement

As a teacher, I have heard, read, and experienced many of the problems facing science educators at both the state and national levels. Many students, including art students, struggle to engage in class when traditional teaching methods are the dominant form of instruction. National and state testing data show serious deficits in student achievement on final exams (NAEP Report Card: Science, n.d.). I have seen AIL be a solution to engaging students and for preparing them with collaboration skills needed in the future, but more research is needed to understand the process better. According to Inwood (2013), not enough was known about the AIL process specifically from the students' perspective. A more complete understanding of AIL could add value by helping educators engage students.

Students who have negative interactions with traditional learning in school lose interest in the subject matter (Hanson, 2002). As a former student who learned through traditional learning approaches, I had lots of experience struggling to maintain my interest in class. My love for math was negatively impacted by the "drill and kill" practices of my high school days where we completed worksheet after worksheet in an attempt to learn the material – never applying our math in any medium relevant to us as students. In Hanson's (2002) study, he observed that students in public school were struggling to find motivation in math and science classes, and he noted art students tend

to struggle. Test scores for math and science were low in public schools. Hanson described how students who were excellent artists with incredible work ethics in their arts were forced to drop out of school because they were unsuccessful learning from traditional instruction. The students struggled to connect and find motivation in those core classes. I teach at a fine arts school with many extremely talented artists, and I have seen many of them give up in their traditionally taught content classes. After struggling to meet proficiency in their core content classes, the artists are then forced to withdraw from the magnet school if they could not maintain their grades at the necessary level. Many students across this state struggle in their science classes.

According to the National Assessment of Educational Progress (NAEP) in 2015, this state was ranked in the lower half of the country in terms of science proficiency (NAEP Report Card: Science, n.d). Science proficiency was a student success measurement on state testing, and proficiency was the expected level of science content mastery. Since 2015, there has been no update to the NAEP science assessment data for this state. However, nationally, lower-performing science students showed a decrease in achievement from the year 2015 to 2019 (NAEP Report Card: Science, n.d.). Beyond lower achieving students struggling with science proficiency, Xu et al. (2012) noted the wide gaps in achievement between Black and White students nationally, and as Mark et al. (2020) discussed, there were significant gaps in achievement between genders as well. Students of all types are struggling to engage with traditional science instruction, and scientific understanding is so important to any nation. Braund and Reiss (2019) conducted a meta-analysis of science and art-integration studies to evaluate AIL's

effectiveness, and they concluded that traditional science instruction was failing to inspire students.

Braund and Reiss (2019) elaborated on this point writing that traditional instruction also fails to adequately prepare students for a modern, 21st century workplace that required creativity and collaboration and innovation. This failure to build 21st century skills went beyond the United States, as Dhanapal et al. (2014) came to similar conclusions writing that students in Malaysia needed instruction in collaboration and creativity to be able to compete in the modern workforce. Dhanapal et al. found that AIL can be key to motivating non-science focused students like students such as those at fine arts high schools, while giving all students the 21st century skills they need to be successful in their jobs. Wan et al.'s (2020) meta-analysis of AIL studies found there to be a significant impact on both student achievement and workplace skills when arts and science were integrated. Wan et al. called for more research into AIL to better support educational leaders making policy decisions. Researchers like Grant and Patterson (2016) and Ramey et al. (2020) argued that, despite the evidence of success, more knowledge is required about how the learning experience happens, and Inwood (2013) specifically asked for the students' detailed perspectives and their experiences in the process to learn more about AIL.

In an example that included data collected from students, Dhanapal et al. (2014) did an investigation of students and their experiences in AIL qualitatively. However, the researchers only performed simple surveys, which would not allow for a deeper exploration of the learning process. Former art students in this study narrating their experiences and giving meaning to those experiences can provide researchers and

educators with important knowledge about what skills or understanding they gain from arts-integrated instruction (Moss et al., 2018). The series of narratives from this study's participants who have been through the AIL process could provide educators and administrators with another means of understanding AIL instruction with the hope that they can use it to help solve the problem of poor student science achievement.

Significance

This study is significant because it increased our understanding of the impact that AIL can have on student learning and student interest in science. The research I have reviewed for this study showed benefits to students according to teachers implementing AIL (Duma & Silverstein, 2018; Graham & Brouillette, 2016; Valls et al., 2019). However, students have not been interviewed enough to confirm these benefits or to share any issues they may have experienced when integrating art and science. Moss et al. (2018) stated that there may be further benefits or drawbacks to arts-integration students beyond the ones that are currently understood. Therefore, exploring student experiences in AIL is important, as research has mainly been from the teacher's perspective and there may be more to learn from the former students specifically. This knowledge could make a difference as researchers Braund and Reiss (2019) and Xu et al. (2012) found that AIL was a tremendous motivator for students in science class for low achieving students and Black students.

Many teachers implement traditional science instruction. It was how they were taught in the past, and it is a straightforward way to communicate the information. A detailed student perspective could help break up the entrenched misconception among some science teachers that art has no place in science class, despite research saying

otherwise (Braund & Reiss, 2019). Secondary teachers who hold this misconception continue to teach traditionally using lecture and labs, which fails to engage many of their students who are not interested in a science career (Poldberg et al., 2013). The more students can be engaged in science through AIL, especially in middle school, the more likely they are to pursue science in their future career and be more scientifically literate (Xu et al., 2012). Simply reviewing this research will not convert any traditional teachers immediately. However, by adding to the literature and providing more context and stories of student experience for educators to learn from, some traditional teachers may become more open to trying AIL opportunities. It is possible because I was a traditional teacher once too, and I changed my instruction after hearing negative stories about taking my class from former students. Stories can make a difference, and AIL can inspire students who might otherwise turn away from science (Braund & Reiss, 2019).

Braund and Reiss (2019) noted in their research that enthusiasm for science was waning. Their conclusions match those found by Xu et al. (2012). Students often lost interest in science after elementary school, because secondary science classes can become a series of rote experiments and memorization lacking creativity and collaboration. The researchers agreed that students who lack an interest in science class can be engaged in learning through the arts instead (Braund & Reiss, 2019; Xu et al., 2012).

According to Hancock and Wright (2017), who interviewed teachers working in low-income environments, by incorporating the arts into traditional science instruction, science teachers engaged and connected more diverse student groups to the science content. Researchers working with dozens of elementary school students in math (Breznovik, 2017) and science (Rosen-O'Leary & Thompson, 2019) showed that AIL

had a significant, positive quantitative impact on student comprehension making it a valuable instructional practice. Looking for more insight into the process, researchers have also conducted teacher observations and interviews. (Inwood, 2013, Ramey et al., 2020). However, both Inwood (2013) and Ramey et al. (2020) requested more information from the students themselves for a more complete understanding of the learning process and the sense that students make of it. This research study is needed for a more complete understanding of the student learning experience.

If high school graduates are asked to share their arts-integration experiences, educators can learn more about how to generate interest in science from their students (Braund & Reiss, 2019). Mark et al. (2020) demonstrated this when they conducted interviews with middle school students and found support for incorporating more arts at the middle school level. However, even Mark et al. (2020) called for gathering more data from students at the high school level, which this study will hopefully contribute. Using Seidman's (2019) three-interview series for this study, students shared their backgrounds, detailed narratives about their experiences in AIL, and reflections on those same experiences. Narrative inquiry can bring a better understanding of student experience, according to Kim (2016), which was why it was used for this study.

Interviewing high school graduates instead of current students was immensely helpful as these students had time to reflect on their experiences and make sense of them in the time after their AIL classes. Gurnon et al. (2013) suggested studying students in the years after AIL to observe how student lives are affected in the future. Interviewing high school graduates, I gained student perspectives on the benefits of arts-integration. Educational researchers can use the narratives provided to help inform science

curriculum specialists about the process making them more comfortable implementing arts-integration in their classrooms (Steele & Ashworth, 2013), while also filling gaps in the literature (Inwood, 2013; Ramey et al., 2020).

This narrative research was valuable because it produced findings that further support the use of AIL in the classroom, while pointing out ways that AIL can improve in certain classes. These narratives were storied in a way to help teachers understand the importance more clearly (Kim, 2016). Students who enjoy their experiences in science class in middle school were three times more likely to enter a science profession in the future than students who do not enjoy their time in science class (Xu et al., 2012). Science teachers integrating the arts could increase student engagement in class if they have a better understanding about their students' thinking from this study.

The participants in this study came from a very specific location: a fine arts high school the southeastern U.S. However, this location was the only one where students could provide narratives that specifically address the research questions in the following section. All participants took at least two AIL science classes at some point in their time at the school. The purpose of this study was not to generalize but to share the meaning that students create reflecting on their experiences in arts-integrated science classes. To that end, the following research questions were used to guide the inquiry.

Research Questions

1. What stories do six recent high school graduates from a fine arts school share about their experiences before, during, and after engaging in AIL in their high school science classes, and what meanings do these participants create from their lived experiences?

The primary focus of this study was to give participants who graduated from the fine arts school in the past three years a platform to share their stories from their time in AIL and reflect on those experiences. The participants had experiences from their time in AIL upon which they had yet to reflect, and I wanted them to generate meaning from those experiences. As Patton (2015) suggested, during a social constructionist study, the participants build the reality through their stories and the meaning created from those stories. So, in this study, the participants described their experiences and reflected on them. It was up to me to represent those experiences in the vignettes as the participants intended.

2. How did six recent high school graduates from a fine arts high school compare their learning in science classes with AIL and in science classes without it?

Research from the teacher's perspective showed students make lots of growth in engagement and creativity and learning (Inwood, 2013). However, students were almost never asked for their perception of these events. I wanted to use this study to learn more about how students learn during AIL and if the participants prefer this method of learning to more traditional instruction.

3. How did six recent high school graduates from a fine arts school describe their engagement with science after having taken at least two AIL science classes?

Proper instruction in high school helps students maintain a lifelong interest in science (Xu et al., 2012). Learning more about how students perceive science during and after high school could tell researchers more about the impact of AIL on students. I wanted to work with high school graduates for this very reason. Students had time to process their experiences from their science classes and how they believe those arts-integrated

experiences have shaped their future. These questions helped me achieve my specific research goals discussed in the next section. I was also curious as to their motivation for joining an art school rather than a traditional school, as art students may have preconceived notions about science.

Research Goals

In the following paragraphs, the research goals were presented as three types following Maxwell (2013) suggestion: personal, practical, and intellectual. Maxwell wrote that personal goals are what motivate the researcher to do the study, and it was very important to declare these personal connections with the study because they influence so much of the researcher's design and analysis (2013). Maxwell did not believe that personal goals were a bad thing or something to be hidden, just that they were something that needed to be discussed, because they influenced studies so much. For my personal goals, I wanted more teachers to include the arts in their science classes. I saw teachers using traditional, note-based science instruction in secondary school every year, and I saw their unmotivated students losing interest in science, which all students should need to be well-informed citizens. Many science teachers disliked non-traditional science instruction (Xu et al., 2012), and so teachers should be shown that arts-integrated instruction is valuable in the science classroom. I wanted to ask students if this form of instruction has made a difference in their lives. I wanted to know if it meant something to them. I wanted to use the data that I get from students to help convince other teachers that this transdisciplinary practice has lasting and impactful results. Then, I might help other students gain a love of science beyond my classroom, and I can contribute to a more

scientifically literate population. Practical goals, however, are different from personal goals.

According to Maxwell (2013), practical goals are about "accomplishing something – meeting some need, changing some situation, or achieving some objective" (p. 28), and I want science students to be successful in class and on their high stakes standardized science tests, and I want other science teachers to start implementing AIL in their classrooms, too. When students find success on these assessments, they can be inspired to engage more in the content on which they scored highly. Students see success as confirmation of their understanding and skill in the subject. High-stakes testing can negatively impact the learning experience for students, but in the reality of our educational system, good test scores can help them find the success they are looking for in science. The meaning students derive from our arts-integrated lessons may help them succeed at school in the future. I wanted students to develop a love for science that lasts as well. Inspiring other science teachers to use arts-integration in their classes was a further practical goal of this study. I conduct professional development on AIL for my district, and if I have more detailed student interview data from this study to share with these teachers in professional development, then more teachers may join in arts-integrated instruction. To that end, I need to understand AIL better, and that is one of my intellectual goals.

Maxwell (2013) described intellectual goals as the things that a researcher wants to understand or that are not known in a particular field. I wanted to discover what kinds of meaning my students derived from this type of education. I was curious about what a more engaging and inclusive science experience means for students as they move through

the remainder of their educational careers. I knew that the data was there – that this instruction helped students be successful, but I was curious about what they experienced and how they made sense of that experience. What was it specifically about the arts-integration method that helped students understand scientific concepts or engages them in their instruction, and how did it impact their interest in science in their future? I believe this information could help teachers and administrators see past the statistical side to how much learning through AIL means to the students and can impact their future.

Summary

In summary, researchers have shown that AIL significantly increased student success in content area classes. I saw this success myself in my classroom. However, I wanted to discover what meaning students create from this art/science integration. There was very little research on the topic from the student perspective, and I was very curious about how students are affected by the process. The more teachers that see the impact art integration had in science class; the more likely teachers will start utilizing a helpful teaching strategy to support their students. Research has shown that AIL significantly impacts student motivation in science class, and the goal was to allow students to speak for themselves as to their perceived benefits. Once students' voices are better included in the research, teachers will have a better understanding of arts-integration benefits, and it was hoped that more teachers could start using the practice to improve upon their traditional instruction. Simply, I believed this study could help science teachers in the classroom connect with their students who are interested in the arts. In the next section, I will present my conceptual framework that details the understanding and assumptions of AIL research that were used as the basis for this study.

Chapter II

CONCEPTUAL FRAMEWORK

Maxwell (2013) broadly defined a conceptual framework as "the ideas or beliefs that you hold about the phenomena being studied" (p. 39). In this section, I present my ideas and beliefs about AIL in science education, but I also organize my thoughts in this framework to inform my study, as recommended by Riggan and Ravitch (2016). I start by explaining my personal experience with AIL and then reviewing the literature about arts-integrated instruction to reinforce this framework. Later, I will also share the pilot research I have engaged in, prior to this study as Maxwell (2013) encouraged. Riggan and Ravitch (2016) wrote that the conceptual framework "ensures a close alignment between topic, questions, and methods; and provides a mechanism for integrating new data, findings, questions, and literatures as a study evolves" (p. 193). I used this framework to present the alignment of my ideas for this study. However, as Maxwell (2013) wrote, a qualitative study must evolve as data is collected. So, I used this conceptual framework as a solid foundation for my study, so that as the study is influenced by the incoming data, the study would be grounded and remain guided, as data is collected (Riggan & Ravitch, 2016).

Riggan and Ravitch (2016) wrote that a conceptual framework was a complex arrangement of factors that can often be viewed differently between different researchers. As I discuss later in the literature review, there was a paucity of research surrounding the student experience in arts-integrated instruction (Inwood, 2013). Inwood wrote that

students are a key arbiter of the arts-integration reality. However, there was very little research presenting the students experiences while there was a preponderance of information of teachers' perceptions of the student experience (Ramey et al., 2020). To gain a better understanding of the reality of students engaged in arts-integrated instruction, students were the focus of this study. I interviewed six students of various backgrounds and allowed them to construct a narrative of their experiences engaging in arts-integrated instruction. As Patton (2015) wrote, social constructivism was used to allow participants to make sense of their own experiences. I want to collect these individually-created experiential understandings of AIL and search them for themes and connecting ideas.

Theoretical Framework

For this study, I wanted to construct socially the "essence" of the student art/science integration experience (Creswell, 2014). I wanted this study's focus to be on collecting different students' experiences and the meaning they created from them, analyzing their words, and presenting them in such a way as to give shape to the collective reality of art/science integration from the student perspective. As Patton (2015) discussed, in social constructionism there was no singular truth or essence to any experience. However, there is a collective and socially-constructed reality into which we all share, experience, and contribute.

The participants constructed the reality for themselves through the interview process. However, to give a better understanding of context of the student's experience, I needed to create vignettes of the participants. I therefore used Siedman's (2019) three-interview series to collect pertinent context about the participants' lives, their experiences

in arts-integration, and the sense that they make from those experiences. With the context for their experiences, I hoped I was able to increase the understanding of each narrative for the reader and present a stronger picture of the constructed reality (Patton, 2015).

As I analyzed the interviews, I coded for themes to try to find the shared understanding and constructed reality of arts-integration at the chosen school (Creswell, 2014). I also created a vignette (Seidman, 2019) of each participant from their interview data to give more context about their experiences and hear their voice. Lastly, I provided a summary to preserve the overall narrative from each student. Breaking down narratives into pieces for themes through coding, a researcher can lose the overall context of each narrative, and Maxwell and Miller (2008) suggested that vignettes and summaries can preserve the overall context from each narrative while still allowing the researcher to analyze the participants interview data. I hoped that this constructed reality shared from each participant can help shed light on a major gap in the literature allowing researchers to understand more about the student experience in arts-integrated science instruction.

I have designed the concept map in Figure 1 to show the current understanding of arts-integration and its benefits while also highlighting the lack of student perspective in the literature. AIL has been shown to engage students significantly more than traditional instruction (Breznovik, 2017; Ramey et al., 2020; Rosen-O'Leary & Thompson, 2019). AIL also showed benefits in motivation (Ajayi, 2019; Braund & Reiss, 2019), empathy (Bradshaw, 2016; Brown et al., 2018), creativity (Bradshaw, 2016; Wynn & Harris, 2012), content knowledge (Baker, 2013; Duma & Silverstein, 2018), and interest in science (Xu et al., 2012) for students. However, studies like Inwood (2013) and Ramey et

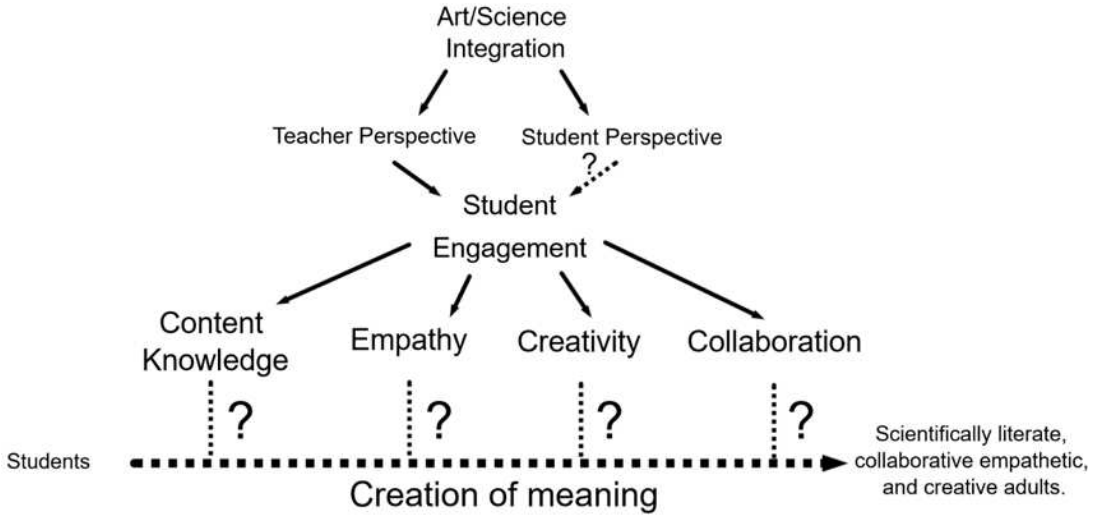
al. (2020) drew attention to the preponderance of teacher input and the lack of student perspective on the benefits of integration.

Students have a perspective that needs to be researched qualitatively (Inwood, 2013). In this study, participants shared what, if any, benefits they saw in the process, and students will share what sense they make from the arts-integration process. Researchers have shown that engagement in AIL motivated students and grew an interest in science because of this unique style of instruction that allows students to learn in non-traditional ways (Xu et al., 2012). In Figure 1, I include a concept map that models the theoretical framework of this study. Teachers, and not students, have been the focal point for all research into art/science integration. Students have rarely been asked to share their experiences or about the meaning that they create from the process. I enjoyed hearing from students about their experiences in AIL to seek confirmation of the benefits that teachers described or if there was new knowledge to be gained about the process.

Figure 1 was used to detail the conceptual framework for this study.

Figure 1

Concept Map of Conceptual Framework



In the qualitative research found in the literature, there were two perspectives that were needed for understanding AIL, the teacher and the students. As the figure showed with the question marks, there was not enough knowledge about the student's perspective on engagement as students pursue in the AIL process. In the literature, teachers reported student gains in content knowledge, empathy, creativity, and collaboration as shown in Figure 1 on their way to becoming self-sufficient adults (Hancock & Wright, 2017). However, the student perception of those same activities has not been adequately researched (Inwood, 2013). Figure 1 was used to show that there was still uncertainty in the literature from the students' viewpoint that required more research (Ramey, 2020). This study was designed to investigate students and the meaning that they created for themselves when engaged in AIL.

Students, not teachers, presented detailed interview perspectives on AIL as Inwood (2013) and Ramey et al. (2020) requested for the literature. Former AIL students were interviewed and in-depth interviews were conducted to allow students to adequately reflect on and share their experiences to add to the literature. According to Maxwell (2013), it is important that I take the time to explain my experiences with AIL and how those shape this study because in qualitative the researcher is the instrument. So, understanding my motivations and history with AIL is essential to presenting this study.

Experiential Knowledge

Maxwell (2013) wrote that it was often assumed that the more personal background a researcher has with a topic, the more that researcher was considered biased. Maxwell disagreed with that premise. He sided with Peshkin (1988) writing that all that experience with the topic was helpful because it gives the researcher a lot of insight into

the topic that a researcher who is unfamiliar with it might be lacking. Peshkin (1988) believed that trying to remove our bias from the research could possibly diminish our insights and analysis. Maxwell (2013) elaborated saying that this subjectivity was important and that researchers should not hide their bias but acknowledge it and bring it to the forefront of the study for evaluation, while being careful not to let it take over the study. He wrote that "any view is from some perspective" (Maxwell, 2013, p.46). So, I unpack and share my perspective and experience with AIL in this section so that I can keep an eye on my own subjectivity and so the reader will understand how I reached my conclusions.

I have been teaching math and science at Title I schools in the southeastern U.S. for 12 years. I currently teach at a fine arts magnet high school in the southeastern U.S. As a White male raised in private schools, I struggled in my first years as an educator to reach my Black students who grew up in poverty. I taught very traditionally. I had lots of PowerPoint slides that I went over in class. Students were asked to take copious notes, which they did not enjoy. We did some coloring activities for cell parts, and students did the occasional lab. It was a repetitive process that would slowly drain my students' enthusiasm for learning, and I had to continually punish my students just to keep their attention. I was teaching in the fashion I was trained: show, tell, and assess. I remember that part of my training as a first-year teacher I was told by a veteran, "Don't smile 'till Christmas." There were just so many traditional teachers at my school who were considered successful that I felt compelled to imitate them as a new teacher. I reasoned that since I learned in this traditional fashion once as a student and I turned out all right, so would they. Despite being passionate about my career, initially, I was ready to quit at

the end of the first year because most of my time and effort in the classroom went into disciplinary actions to keep students' attention. I was sad as I walked out the door on the last day of the school year, but a veteran teacher saw my pain and convinced me to try it for one more year. However, she advised me to talk to my students more and then to find connections with them through their interests.

Over the next year, I took that advice and learned how to build relationships with my students. I even found new ways to engage my students in their learning by attending a teacher development program at the Ron Clark Academy. Ron Clark is a former national teacher of the year who built a school in downtown Atlanta to bring some of his unique teaching methods to students who needed more engaging instruction. The academy operates as a teacher-training school where teachers from around the country can observe the teachers at the school and learn from their practices. I saw so many incredible and awe-inspiring lessons in my time at the school, but what stunned me was how incredibly passionate these students were about their learning. When the teachers were fiery and passionate, the students were matching their energy level. I saw students in their science classes singing and dancing and moving around and just having fun while learning eagerly. The activities were all game-based and challenging, fun but educational. Talking to the students, I found that they understood the material so well that they could explain their learning at a level that my students could not. I had to bring this to my classroom. My kids deserved the chance to learn in an engaging classroom like those at the Ron Clark Academy.

One of the methods that I implemented from Ron Clark was AIL. I started using art projects and art activities to help my students engage in the science. For example,

students would create interpretive dances showing the particle theory of matter. They had to physically represent the particles and how they would behave at different levels of energy without talking – focusing only on their movements. Students had to think more in their science class, and they were up and moving around, which most students are desperate to do. Just trying a lesson like this one, I was amazed at how my students were later able to show their understanding of the material. They really understood the content while having fun. There were no punishments involved, and they paid attention. I was hooked, and I had to do more. Over the years, my students have created dramatizations of the cell being invaded by viruses to learn about cell organelles, written poetry on photosynthesis, and rapped about evolution. Students sang songs about nuclear physics (fusion and fission) and genetics. I have used many different art forms to push my students to think in different ways about the information they were learning, and I immediately saw increased engagement from almost every student.

Students who once preferred to disrupt class or ignore what we were doing were now leaders who took control of the performances – often delivering the best ones. Duma and Silverstein (2018) wrote that AIL allows students to construct knowledge of content using an art form in a way that helps students learn about both the art and the content. As my interest and curiosity about using AIL in science class increased, I discovered a wonderful arts-integration resource in our school district, the local theatre. There is a program running at the theatre, which provides AIL professional development to teachers. The instructors from the program came into my classroom to design an arts-integrated lesson with me, in which students acted out and modeled electron movement in metals and nonmetals. They demonstrated to me and a colleague how to teach specific art

standards along with my science content standards, and they even observed and helped lead the lessons that we used in class. The program invites teachers from across the district to professional developments to promote more AIL within our schools to support student learning. This facility trained me and another teacher in AIL techniques to help us reach our fine arts school students, and I have only seen improvements in my students' engagement and understanding in my AIL classes over the years.

I chose to study students from a fine arts school as I am a teacher at a fine arts school, and art students can be very reticent about engaging in their science classes due to lack of interest and negative past experiences in traditional science classrooms. In the next section, I will address in more detail what the literature revealed about AIL's development as a form of instruction, its benefits, and the identified gap in the literature, which will help support the conceptual framework for this study.

Literature Review

In this review, I discuss the development of AIL in the American education system and its benefits or issues as an educational practice. I also explain the current state of arts-integration research, highlighting the gap in the literature that I targeted in this study and concluded with the challenges presented to AIL teachers. Science students who were instructed using AIL showed tremendous growth in many dimensions (Braund & Reiss, 2019), and I hope to clarify those benefits and show how they increase student interest in science (Xu et al., 2012). Braund and Reiss (2019) asked, "what might the arts provide that the sciences do not, and how can we improve science instruction to include more young people" (p. 225)? A more defined student perspective on AIL is key to improving the practice of AIL.

Arts-integrated learning: A Brief History

Educators' views on AIL as an instructional practice have changed over time. For example, American researchers have been promoting the use of art in education as far back as John Dewey (Eisner, 2004). In the 1930s, progressive educators like Dewey competed with rival theorists like Thorndike to decide the future of education (Eisner, 2004; Smith, 1999). Eisner (2004) and Smith (1999) write that Dewey saw that teachers using the arts helped students reflect on their experiences, which is the heart of learning. Thorndike and others wanted a more industrial scientific approach to education based on positivist ideas focused on achievement and assessment rather than process and social change (Eisner, 2004; Smith, 1999). Eisner (2004) wrote that Dewey lost that competition to Thorndike, and Braund and Reiss (2019) discussed how after that loss, educational researchers pushed education towards discrete subject area competencies instead of interconnected, transdisciplinary subject areas.

Eventually, researchers like Eisner and Broudy helped shift education away from a traditional educational approach towards more AIL (Smith, 1999). Smith (1999) wrote that while contemporaries Dewey and Broudy were not always in agreement, they shared the idea that students have so much to gain socially when the arts are incorporated into their learning. Broudy suggested that students could use the arts to uncover truths in the world and find school more significant with the arts included in their education (Smith, 1999). When teachers fail to integrate the student learning experience, important context is lost, and students find little value in discipline learning (Smith, 1999). Eisner (2009) agreed with Broudy on the natural interconnectedness of science and art, and that, without art, students are at a disadvantage in their future occupations. Through their

research, Eisner (2009) and Xu et al. (2012) wrote that participating students learning through AIL used the arts to express themselves better, and the students taught with AIL show a greater ability to work on open-ended projects. Fuller (2007) citing interviews from top business executives wrote that these businesspeople want to hire students with experience thinking creatively and solving open-ended problems. Other researchers began to see the benefits in the arts and student learning as AIL became more prevalent in core classes through necessity.

As a discipline, AIL became more widespread in the past 25 years because ELA, math, science, and social studies teachers were forced to integrate the arts more into their content classes when policies like No Child Left Behind were enacted (Fuller, 2007). Arts programs and instruction around the country were being cut from school budgets in response to the increasing academic focus on Math and Language Arts testing scores (Tamer, 2009). So, many teachers began to offer arts education in their academic classes so that students did not miss out on too much arts instruction. In one of the first major studies on the importance teaching art in schools, Catterall (1998) conducted a meta-analysis of Department of Education and Department of Labor data from national longitudinal studies of students from low socio-economic areas and the impact the arts had on their future. In his study, Catterall (1998) found that low-socioeconomic students (LSES) who engaged in the arts more often while in school did better in school by almost every metric from test scores to extracurricular participation.

In fact, the number of arts that students experience matters as LSES with high art engagement included in their curriculum performed significantly better than those with fewer (Catterall, 1998). Despite the growing body work showing the positive impact of

arts in education, creators of No Child Left Behind and Common Core Standards did not include any art standards in their curriculum (The College Board, 2012). The arts clearly were improving student outcomes, yet decision-makers continued to cut the arts programs in lieu of more math and language arts remediation to artificially increase student achievement on state tests. Some core classes began to incorporate arts into their curriculum using AIL because they saw a need. Researchers studying AIL use in the classroom like Breznovik (2017) and Rosen-O'Leary and Thompson (2019) found positive effects in learning and engagement for students from arts-integrated science instruction. Moss et al. (2018) performed a meta-analysis of nine quantitative arts-integration studies of over 2000 K-12 students, and they agreed that there are significant benefits to AIL in schools.

Further, researchers like Fuller (2007) and Dhanapal et al. (2014) suggested in their studies that educational policymakers reconsider No Child Left Behind's focus on math and ELA and, instead, focus more on art integration because arts-integration students were learning more and even showing growth in 21st century collaborative working skills. Business leaders want workers to improve these 21st century skills in school, and students can improve these skills when engaged in AIL. Inwood (2013) and Ramey et al. (2020) asked for more research into AIL because, as Fuller (2007) and Dhanapal et al. (2014) claimed in their research, student voice is still needed to solidify the benefits in the minds of educational policymakers.

Arts-integrated Learning Benefits

Researchers have recorded many benefits for teachers that implement AIL instruction. Here, I discuss what research has been found surrounding AIL benefits, but I

also want to frame these benefits within the gaps in the literature that need resolving. Any benefits and any issues with AIL need to be discussed in this literature review so that when the participants narrate their experiences, there will be some background understanding of what the students may share in their stories. This section of the literature review may also help shed some light on the themes generated from the interviews of former AIL students in this study.

According to Catterall's (1998) and Fuller's (2007) research, policymakers were not valuing the importance of art in a student's education in those days, and according to Varelas et al. (2022) there was still a major disconnect when teachers and students view science and art integration: "The arts continue to be positioned by teachers and students as distinctly different from the sciences, especially the performing arts where ideas are acted out or dramatized and attention is placed on embodied experiences" (p. 495). Art and science were still believed to be unrelated and integrating them was rarely considered. Primary and secondary school teachers who used AIL showed a significant quantitative impact on their students' learning (Breznovik, 2017; Catterall, 1998; Ramey et al., 2020; Rosen-O'Leary & Thompson, 2019). However, few researchers were qualitatively investigating students and the sense that they made of this process. How do students make sense of and understand what they are learning when engaging in AIL? Inwood (2013) and Ramey et al. (2020) sought to answer this question with two very different sets of methods.

Inwood (2013) interviewed teachers engaged in eco-art designed to integrate the arts into environmental education. The teachers reported that students connected more with their learning and that the students were more engaged with the process (Inwood,

2013). However, those gains were entirely from the teachers' perspective, which paralleled Ramey et al.'s (2020) concerns from a separate investigation. Ramey et al. (2020) investigated student spatial reasoning skills from the educational psychology perspective. The researchers focused on a group of 90 students from which they collected student work while observing the students who were performing arts activities (Ramey et al., 2020). Similar to Inwood (2013), Ramey et al. (2020) realized that to understand how the learning was occurring, they needed to conduct in-depth interviews. Both Inwood (2013) and Ramey et al. (2020) wanted to know what students derive from this integration process because most researchers were still inquiring into the teacher's perspective.

Mark et al. (2020) conducted a recent student-focused investigation into six sixth Grade Black female students and their interest in science. Conducting multiple in-depth interviews, Mark et al. (2020) found that the students confirmed a growing interest in science during AIL. Mark did not interview these students in the years afterwards to evaluate how their interests have changed over time as this study will, and his study was focused on Black middle school females instead of art school students. Xu et al. (2012) and Braund and Reiss (2019) showed similar results in their studies, i.e., that more engagement means more student interest in science.

Even if students do not gain any interest in science from their time in AIL, students can gain 21st century skills (creativity, collaboration skills, communication, and critical thinking) that they will need for the modern workforce (Corbisieros-Drakos et al., 2021). Educational researchers from Boston University, Corbisieros-Drakos et al. (2021), conducted a large, controlled study that interviewed teachers and asked fourth and fifth

grade students to reflect on their experiences with AIL and its impact on their creativity, collaboration skills, communication, and critical thinking. Unfortunately, these were very young kids who took part in the study self-reporting growth in all those areas. Their age may limit their understanding of those 21st century skills enough to properly analyze their experiences. To solve this issue with my study, detailed interviews of older, college-age students were performed, and they shared their stories and meaning from a more experienced and wiser position than the fourth and fifth graders in the Corbisieros-Drakos et al. (2021) study. I look at the graduated student perspective in the years after AIL to see what participants believed they gained or struggled with during their time in AIL and if students maintain or develop an interest in science. In the following sections of this review, I share what has been learned from the limited, teacher-focused perspective prevalent in the literature and discuss the value confirming these benefits from the students' perspective (Inwood, 2013; Ramey et al., 2020).

Valls et al. (2019) claimed that, according to their teachers, dance students excel with arts-integrated instruction because it incorporates their interests, inspiring and motivating them to learn the content. Marshall (2014) made similar points writing that students from her study used the arts to construct an understanding of the new science material themselves for a deeper understanding of the content. In the Valls et al. (2019) study, researchers performed a qualitative study sampling 600 elementary school students engaged in AIL. Every year over the five-year study, researchers interviewed the 12 instructors who participated. The study was designed to gain the teacher perspective on AIL only (Valls et al., 2019). A student's perspective would make this study more credible as the student could explain the knowledge construct process in their own words.

Marshall (2014) and Bradshaw (2016) both wrote that AIL helped many students in their studies construct their knowledge in a deep and lasting fashion. Marshall (2014), a San Francisco State University professor, studied a visual arts International Baccalaureate (IB) student and her arts-integrated science learning products. Marshall (2014) found process thinking, metacognition, and problem solving in the student's work -- which are key tenets of the new Next Generation Science Standards (NGSS). In these new NGSS standards, students must think through a series of steps to accomplish their goals rather than memorize information (Graham & Brouilette, 2016; Marshall, 2014). The IB student in Marshall's (2014) study exercised autonomy and explored the subject in detail and in-depth using the visual arts – characteristics of constructivism and tenets of the NGSS. This construction of knowledge helped the student create deep and contextual understanding of the material (Marshall, 2014). However, these are researcher observations of the students work, which add important non-verbal perspectives to research (Xu et al., 2012) but leave out student voice, which Inwood (2013) and Ramey et al. (2020) recommended for a more comprehensive understanding of students learning in arts-integrated lessons.

In another qualitative study focused on teachers, Varelas et al. (2022) performed a case study of three classes of elementary and middle school students engaged in AIL. They watched recordings of classes where students were asked to dramatize certain scientific concepts that are hard to replicate in a classroom, and they had brief group interviews with the teachers after each lesson. Varelas et al. postulated that when students were asked to share their learning in written and oral modes that many students struggled as those modes were not their preferred means of communication. According to the

teachers interviewed, students who engaged in dramatizations of their learning former stronger memories, built closer bonds with their classmates, and showed improvements in creativity as well. This study was useful in bringing together and showing all the various the benefits of AIL. Students were able to express themselves and learn in different and engaging ways that they had never considered before. Again, the researchers only focused on the teachers' points of view without asking for input from the very students engaged in the practice, and it is the students who are asked to confront challenging new information and ideas.

For example, abstract ideas are some of the most challenging concepts to teach students in a classroom, and arts-integration is one way to help students learn these abstractions (Baker, 2013; Graham & Brouillette, 2016). Graham and Brouillette (2016) studied the upper elementary grades (3 – 5) of 10 randomly chosen Californian Title I schools. Graham and Brouilette (2016) included drawing, dance, drama, and painting creating engagement to help build the students' abstract science concept understanding. AIL was designated the treatment group (n = 2,153), and for comparison the control group (n = 5,683) was taught with traditional instruction. Graham and Brouilette (2016) found significantly higher assessment scores when the students received AIL compared to the control group on the science end of course test (EOCT) at $\alpha = .001$. As AIL has been found to be significantly beneficial, the next step in understanding AIL's impact would be to interview these students to discover how students grasp these abstract ideas better through AIL.

Graham and Brouillette (2016) reported in their study that science students who struggle on EOCTs often do so because they cannot conceptualize the abstractions they

learn in class. Even at the elementary level, Baker (2013) showed through careful observation of science classrooms in her study that students can receive great benefits to their abstract science understanding with AIL. Learning abstract science content can be very disheartening and dispiriting for any student. However, according to Graham and Brouillette (2016), AIL provided "concrete tools for envisioning phenomena that students cannot directly observe" (p. 1). Wilson (2018) agreed and wrote that students need access to higher-level cognitive thinking, and art is the way to accomplish this feat. Imagining the Earth rocketing around the sun in orbit is almost impossible for many students, but it is significantly easier to grasp the concept when the student is acting it out in class (Graham & Brouillette, 2016). Graham and Brouillette (2016) summarized saying that the arts have a "dual role in education" (p. 14). The arts are a curriculum unto themselves, but they also are a crucial tool when learning science abstract concepts. Researchers interviewing students about the abstract learning process could provide valuable insight to educators trying to help their students learn (Inwood, 2013; Ramey et al., 2020).

Varelas et al. (2022) reported huge benefits to students when interviewing teachers for a case study on movement in AIL. The researchers watched tapes of teachers using AIL in the classroom and discussed their experiences afterwards. The teachers reported that students understanding increased with these AIL techniques, yet schools are still not implementing AIL: "In fact, science education remains a domain where dramatizing of any length inside or outside of the classroom is not part of teaching and learning, even with the knowledge that the arts engage the human imagination in particularly deep ways across disciplinary domains, and the arts help the public make

sense of, and engage with, science ideas" (p. 517). The researchers saw the importance of AIL in allowing students to make sense of those abstract ideas and realized that the arts are used to make sense of so much of the human experience. Educators must step up, meet student needs, and engage them in these lessons, now.

Marshall (2014) declared that modern education requiring so much higher-level thinking is the exact reason that teachers need AIL. Like Graham and Brouillette (2016), Marshall saw the new NGSS requirements and student priorities provided the perfect AIL implementation opportunity. Marshall believed that this integration could inspire so many new educational models. For example, Ramey et al. (2020) conducted observations of student 3D computer art to discover how 90 fifth grade students built their spatial reasoning skills, which are essential higher-level math and science skills. Ramey et al. suggested that AIL engaged students meaningfully and enabled more success with abstract thinking. Ramey et al. (2020) concluded their abstract-thinking study asking for detailed student interviews to explore the AIL learning process in more detail. One additional aspect of AIL that I found researchers investigating in the literature was motivation.

Motivation is an essential aspect of learning, and students of any age can be inspired when engaged in AIL (Ajayi, 2019; Carpenter & Ganadara, 2018; Graham & Brouilette, 2016; Gurnon et al., 2013; Hanson, 2002; Moyer et al., 2018; Romanski, 2019; Taylor & Iroha, 2015; Turrka et al., 2017; Valls et al., 2019; Wynn & Harris, 2012). Ajayi (2019) worked with adult education students in Nigeria and found that using song and folklore engaged his adult students and inspired many to remain in the program. Incorporating important cultural art practices provided much needed motivation to

students both young, as in the Valls et al. (2019) study, and old, like the adults from Ajayi's (2019) study. Moyer et al. (2018) employed a similar tactic to Ajayi when studying AIL, sampling 600 Virginian middle school students – half of those students receiving free or reduced lunch. The students were taught computer programming using arts-integrated methods (Moyer et al., 2018). Moyer et al. used the students' love of music to engage them in the programming process. Students wrote computer programs creating their own music – a tactic that the students responded to positively and provided needed learning motivation (Moyer et al., 2018). Students in the Moyer et al. (2018) study experienced the same motivational benefits as the students in the Ajayi (2019) study regardless of background, race, or even age showing that arts-integration benefits a range of students.

According to Xu et al. (2012), non-science students exhibit these benefits to motivation because they can express themselves in formats that make more sense to them. Gurnon et al. (2013) wrote that if students were going to be more scientifically literate, then connecting non-science students to the arts is essential. Braund and Reiss (2019) echo this point in their research. Leysath and Bronowski (2016), for example, made their chemistry class more fun by incorporating art into stoichiometry. The researchers interviewed students with four simple interview questions and got simple responses like "Putting chemistry and art together was a lot more fun for me" (p. 32). Leysath and Bronowski (2016) could have gotten more detail on this motivation from students if they had performed a more in-depth, detailed interview of students as Inwood (2013) recommended rather than a surface-level set of questions. Consequently, I planned

on conducting a detailed interview with this study on AIL to investigate these benefits from the students' perspectives.

Teachers using AIL engaged and motivated students (Ajayi, 2019; Moyer et al., 2018), but researchers have also found in some cases that students were more enabled to be creative and explore new ideas (Breznovik, 2017; Gurnon et al., 2013). Breznovik (2017) researched arts-integration's significance as an instructional strategy for elementary students (n = 105) by separating students into experimental and control groups. The experimental groups received the treatment of arts-integrated instruction. Not only was it effective in motivation and achievement, but the author noted distinct benefits in creativity in the experimental group as compared to the control group. In the Gurnon et al. (2013) study, similar results were obtained from a class of high school biology students designing proteins using art materials. The researchers provided insight into the student thought process with their interviews of the biology students. Gurnon et al. (2013) – much like Xu et al. (2012) – did not want science education to be a simple "checked box" (p. 1) that students must accomplish before graduating, but an engaging process that builds scientifically literate citizens.

Gurnon et al. (2013) stated that scientists who engage more often in the visual arts publish "high impact, and highly cited research" (p. 1). The researcher stated that innovative scientists have a large amount of success thanks to their creativity, which helped show that AIL can be of benefit to all students (Gurnon et al., 2013). The main issue with the Gurnon et al. (2013) study was that the number of students sampled and that the actual investigation methods were not present. There was a lot of valuable student meaning and insight into creativity that could have been uncovered with an in-

depth, well-designed qualitative study on the subject (Inwood, 2013; Ramey et al., 2020). Many of the benefits of AIL have been addressed in this review. However, in the literature there were also studies showing the struggles that students experienced when performing AIL.

Issues with Arts-Integrated Learning

Narratives highlighting the challenges of AIL could help teachers understand some of the problems they are experiencing in their classrooms when using AIL. According to *Educational Leadership* (2018), researchers performed a meta-analysis of 135 separate arts-integration studies found that there are many issues that teachers must overcome to be successful in AIL: supportive administration, proper training, and teamwork. Success in AIL required lots of instructional time for teachers to work through the lessons with students (Taylor & Iroha, 2015; Valls et al., 2019). It was very hard to perform all these unique learning experiences in a reasonable amount of time. According to *Educational Leadership* (2018) and Steele and Ashworth (2013), teachers should be well-trained and given all needed planning support to be successful.

On top of proper training, AIL teachers needed to be very engaged in the creation and integration process with their students. Hannigan et al. (2022) conducted an 8-week study on students and teachers to evaluate the impact that the teacher had on the effort that students put into their work in AIL. Students made trash puppets of endangered species to learn about the challenges that endangered species face. The researchers read over transcripts and focused on students' reactions to teacher feedback. They found that the teacher set the tone of the class with their expectation of quality of their art and their science knowledge. The students would rise to the challenge if the teacher asked them to.

However, the teacher needed to effectively model the expectations for the group. Lastly, AIL was only as successful as the teacher's imagination and content knowledge, and only proper professional development helped teachers be more successful (Steele & Ashworth, 2013). The participants in this study will be in the position to comment on these issues brought up by Hannigan et al. (2022) and Steele and Ashworth (2013). What I know about AIL came from my own experiences and action research within my own classroom, and I even conducted my own pilot research to explore the main ideas from this study.

Pilot and Exploratory Research

Maxwell (2013) encouraged the use of pilot research as a means of testing theories and practices that the researcher planned on using in their study. I was able to conduct a pilot study that helped solidify, in my mind, how much this study was needed and what participants I should look to secure. In 2021, I gave my seventh-grade students (n = 56) an end of course student survey to improve my arts-integrated instruction. This survey was a form of action research, which is a type of research that teachers conduct in their own classroom to evaluate their own methods. I used the data – both Likert scale ratings and free response questions – to identify strengths and weaknesses in my instruction as the students see it. I used the Likert scales for a snapshot of the students' opinions while I spent more time focusing on the students' free response feedback, in which they provided details on the activities in my class. They answered questions like "What specifically did Mr. Ellis do in class that helped you or things that helped the class?" and students shared their thoughts and feedback in complete detail.

My students thoroughly enjoyed AIL, as shown in Table 2 in the Likert scale ratings from Table 2. For context, this data was collected after a year in which many

students were virtual for some – if not all – of the year. I have found that students who are learning virtually can be more challenging to engage in lessons than face-to-face students. Also, students did not take this survey anonymously. I began conducting these surveys anonymously years ago, but I have found in my decade as teacher that middle school students were more than willing to share their opinions even when their names are on the survey responses. I preferred the names as well for my personal research as I get some context for the student's experiences in my class when I know who is sharing the information. Analyzing the data, two-thirds to three-quarters of the students found the AIL class engaging and educational.

Table 2

Student response percentages by survey question.

	Likert Scale Rating Class Percentages				
Questions	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1. I enjoyed Mr. Ellis' class this year.	71	21	7	0	0
2. I like Science better thanks to Mr. Ellis' class	66	23	7	4	0
3. Mr. Ellis' teaching style made learning the material easier.	75	14	9	2	0
4. I enjoyed how Mr. Ellis used the arts in his lessons.	61	29	11	0	0
5. I would recommend Mr. Ellis' class to my friends.	84	13	4	0	0

Students showed an appreciation of the learning they were doing in class as 84% of them would suggest my class to a friend. I have collected this Likert data for years, and while I appreciated the feedback, I was always more interested in short answer responses.

The short answer responses were helpful when I wanted to know specifically what students enjoyed about my integrated instruction. I got more context for the Likert scale from Table 2 with this mixed-methods approach. The two questions that I used to evaluate AIL and its impacts in my classroom were:

1. What specifically did Mr. Ellis do in class that helped you or things that helped the class? (Specific Lessons or Teaching Style)
2. Was there anything that you learned in this class that surprised you or a life lesson that has stuck with you from this class?

For question 1, about half of the students reported that the arts specifically were what they enjoyed the most about my class. Students enjoyed the songs that we sang and the activities such as writing children's books, poetry, and dance. With AIL, the arts and science were valued equally in class. I knew that I was integrating science and art properly when I coded the responses for science and art activities because the other half of student responses include preferences for more traditional science practices with students reporting they enjoyed the hands-on activities, PowerPoints, and labs. Using the arts and traditional science practices, I reached many of my students and helped generate an interest in science, which was what the literature reported.

Students reinforced the need for this study with their responses to the second question in my survey. When I asked a group of secondary students to discuss what meaning they gained from my classroom, students struggled to share responses. The responses were less considered and thoughtful than the responses to the first question. Students wrote about cool science examples from class, but they did not grasp that I was asking about deeper meanings. This misunderstanding should be expected from

secondary students. They were not at the developmental stage to think metacognitively about their experiences. This pilot research was a major reason why I want to interview high school graduates. These participants have had time to reflect on their experiences in AIL and can share more details about what science/art they learned from the practice and any meaning that they gained from the process.

Summary

Teachers using arts-integrated science instruction with support from their administration help their students generate meaning in many ways (Educational Leadership Staff, 2018). AIL allows students to make achievement gains (Wilson, 2018), and they can learn in multiple modalities, which helps all students (Duma et al., 2018). They can forge deep connections to their learning (Marshall, 2014; Duma et al. 2018; Valls et al., 2019), and students can learn items considered extra-curricular like empathy, motivation, or collaboration (Moyer et. al., 2018). In a meta-analysis on AIL, the Educational Leadership Staff (2018) reported significant increases in learning outcomes such as attitude towards math and critical thinking for students engaged in AIL. However, there remain the issues that Inwood (2013) noted: researchers need more of the student's perspective on the benefits of AIL. I observed this same need for student perspective in my pilot research, and students need the opportunity to sit down and reflect on their experiences and the influence of those experiences on their learning and their lives.

I highlighted a few studies that looked in detail into student meaning construction in AIL, yet there is more information to be garnered from the students' perspectives. Studies like Marshall's (2014) and Gurnon et al. (2013) show the value of interviewing

students and gaining their perspective on the learning process. I wanted to hear how students perceive AIL and how students learn from AIL in the classroom as Inwood (2013) suggested. For a successful analysis, I carefully considered my methods.

Chapter III

METHODS

This qualitative interview-based study was conducted with a narrative approach (Clandinin & Connelly, 2004) to explore student experiences and the meaning they make from those experiences in arts-integrated science classrooms. The following sections detail the methods used for this study, the setting and participants who were involved, the data gathering and analysis, as well as issues related to validity. The chapter concludes with a discussion of my biases and how they affect the validity of the study as well.

In this study, I chose a narrative approach (Clandinin & Connelly, 2004) to help participants reflect deeply on their experiences in arts-integrated science classrooms and to allow them to construct meaning from those experiences. Connelly and Clandinin (1990) wrote that humans are natural "storytellers" who "lead storied lives" (p. 2). So, any analysis of the human experience will require that participants share a story (the phenomenon), and that the researcher uses a narrative approach for analysis (the inquiry). To gain a better understanding of these stories, Clandinin and Connelly (2004) suggested gaining more information about the participant's past. They discussed John Dewey's notion that the knowledge gained from one experience would affect the next experience in someone's life. Basically, the meaning drawn from one experience is directly affected by the previous experiences through "continuity" (p. 2).

So, if I were trying to gain appropriate context for these participants' stories, I would need to collect background information on the participants, because their sense-

making in the interview would be directly affected by their past experiences. To gain this data on their past, Seidman's (2019) three-interview series was used. In Seidman's (2019) series, the first interview asked about the participants' backgrounds, the second explored their experiences, and the third investigated what meaning they made from those experiences. All three interviews built on each other and provided important insights into the participants' experiences to help understand what students go through in AIL.

Initially, I had plans to construct large narratives from the interview data as Clandinin and Connelly (2004) suggested. However, the interview data that I collected did not lend itself to construction of a large narrative that contained many descriptive experiences. The participants were interviewed years after their AIL classes to allow them time and perspective to reflect properly on those experiences. However, that came at a cost, because the participants struggled to recall detailed information on their day-to-day experiences in classes that they had taken years ago at the level necessary for a large, descriptive narrative. To present and story the smaller amount of data that I was able to capture about their AIL experiences, I chose to build Seidman's (2019) vignettes because these smaller storied experiences could help maintain the narrative aspect of the study and answer the research questions discussed later in this chapter. These vignettes are intended to give teachers a better understanding of how students make sense of the AIL lessons they experienced because, as Connelly and Clandinin (1990) wrote, humans are storied creatures, and teachers can gain a better perspective on the students' experiences from reading their stories.

Participants were asked to share and reflect on experiences from early childhood to current times for the vignettes. They explored what may have shaped their learning in

AIL science classes compared to more traditional science instruction. Simply giving students a survey or conducting focus groups would not have maintained the continuity of experience needed for each student as suggested by Clandinin and Connelly (2004). Surveys do not allow for follow up questions and focus groups can have too many competing ideas for the desired depth of reflection for which I was hoping in this study. As Creswell (2014) noted, narrative research can be used to help the researcher learn about the lives of the participants, and that context was helpful in framing how these participants made sense of their experiences in AIL classrooms. Narrative inquiry was used to gain rich experiential information.

Seidman (2019) wrote that knowing the context of the participant's life is essential for understanding the participant's lived experiences, which is the goal of any narrative inquiry. Seidman described Schutz's explanation of lived experiences as participant's reconstruction of experiences they had during the period of interest via the interview process. To help a reader understand those experiences, Clandinin (2018) wrote that narrative inquiry requires "temporality, place and sociality" (p. 51) to gather details on lived experience. The participants in this study shared details of different time periods in their lives, in which they engaged in art and science to establish temporality, and they discussed the locations in which they had these experiences thereby adding place as an important element in their stories. Lastly, participants revealed details of the interactions with classmates and teachers as well as family members, which established the sociality or connections to people of importance in their stories. Narrative inquiry was paired with Seidman's (2019) three-interview series allowing participants to provide as much detail as possible about themselves, the time and place, the AIL process, and what it meant to

them. It was a structure that let me focus on the student experiences pre-classes, during the classes, and post-classes with approval from the Institutional Review Board (IRB).

Valdosta State University's IRB approved this research (Appendix B). All IRB required trainings covering ethical treatment of participants as well as legal rules and regulations for conducting research were reviewed and completed. Throughout the entire process, participant data, including places and names, were protected using pseudonyms (chosen by the participants) while keeping the data secured and password protected. The approved research design and the way it was implemented are detailed in the next section.

Research Design

The aforementioned narrative inquiry approach involved multiple phases of implementation of the design. Decisions on the setting and participant recruitment were foundational to the work and therefore discussed first. Data-gathering, analysis, and presentation follow with issues of validity closing out the section. The goal of these methods is to reveal the stories and experiences of these participants engaged in AIL and the meaning they made from them.

Setting

This study's participants graduated from a fine arts middle/high school in a southern U.S. state. The school is in one of the largest cities in that state, and all the students who attend the school are considered arts-magnet students. In general, students who chose to attend this school were interested in art. They applied to and were accepted by the school to major in a specific art form and get extended educational opportunities in that art. For example, Jane Doe would apply to the school to major in orchestra to learn

the violin. If accepted, Jane Doe would take courses in the core curriculum (math, English, science, and social studies), and she would then take extended orchestra major classes every day to maximize her experience with the instrument. Students can major in orchestra, band, chorus, dance, photography, theatre, 2D and 3D visual art, music production, or creative writing at the school.

The art school was established in the late 2010s for grades 6-12 and was considered a Title I school in 2018. Diversity in the student population (n = 318) was slightly different from that of the county:

Table 3

Demographics of the Fine Art School

Ethnicity	School	District
White	39%	23%
Black	38%	57%
Hispanic	13%	11%
Two or More Races	7%	6%
Asian	3%	3%

Fifty-six percent of students in the local school district are living in poverty, while the school currently has 35% of its students receiving free or reduced lunch. I am a teacher at this school, and I teach science classes for grades 6-12. Teachers at this art school typically practice traditional instruction. AIL was not even a suggested practice at the school for the core curriculum courses. Selected participants all had experience in AIL science classes before they graduated from the fine arts school.

Participant Recruitment

For this study, recent graduates from a southeastern U.S. arts-magnet high school were the population of interest as many of these graduates engaged in art/science integration at some point during their time in this art school. Two of the four science teachers at the school regularly practiced arts-integrated learning (AIL) science instruction, and a third used the practice on occasion. The school had a diverse population socio-economically and ethnically. At the time of this work, the school had a 61% minority population, and approximately half of the minority students were Black. A majority of the student population was female at 73%, and only 27% of the students were male. In terms of commonalities, all students who attended the art school were interested in specializing in one of many different fine-art forms.

When recruiting for this study, recent graduates of the school were the intended focus. Gurnon et al. (2013) suggested that interviewing research participants in the years after their experiences can provide time for proper reflection. By using students who had time to live a little past high school, mature, and reflect on their time in AIL, I hoped they could reflect more deeply than if they had reflected during their time engaging in AIL. Therefore, students who graduated from the fine arts school were the focus of this study. Also, if young participants were interviewed, they may not grasp the complexity of their experiences. Participants were asked to reflect deeply on their experiences and how they affected their future relationship with science and learning.

Graduates were selected from this school as opposed to other schools in the area as there was no reasonable way of discerning the level or quality of AIL that the students at other fine art schools received without personally observing them in action, which was

beyond the purview of this study. However, the science teachers that I had previously observed in this school performed these integrated lessons, while students were taught traditionally in almost all their other classes (math, social studies, and ELA). Therefore, gathering participants for this study from my school's graduate pool ensured that the participants selected had the requisite experience in traditional and arts-integrated learning. Importantly, students at this school could not choose to take arts-integrated lessons instead of traditional lessons. They were assigned science classes based on the schedule that their major art classes allowed, as those had to be assigned first before scheduling their other classes. There were four science teachers in the school, and each of the participants reported spending time in class with at least one AIL science class that was not mine.

In the past 5 years, there were approximately 75 graduates from the school. I reached out to the 75 graduated seniors and gained six volunteers over 18 years of age who were willing to participate in this study for three 90-minute interviews. Patton (2015) and Maxwell (2013) wrote that a researcher should choose a small qualitative interview participant pool when seeking detailed data. Knowing that rich participant data would take time and strong relationships to collect, the six initial volunteers seemed sufficient. In this study, the smaller group of participants allowed for more time to build rapport and collect detailed data, which would not have been possible with a large group of participants. These six participants provided approximately 27 total hours of data via the Seidman (2019) three-interview framework as each participant was interviewed for approximately 270 minutes in total.

Keeping in mind that developing a relationship with participants can help the interview process (Connelly & Clandinin, 1990; Seidman, 2019), it seemed that knowing them from their time in school could be a useful access point for building rapport. Because I taught at the school, the participants already knew me in some capacity, and a relationship of varying degrees existed between us already. I will clarify that relationship in each participant's "meet" section from Chapter 4. So, my task was to shift our relationship from the power dynamic of teacher/student to collaborators. Recognizing their previous role of "subservient" to my previous role as "controller" and realizing how that could influence the interview process, I spent time making the new relationship clear in our email communications and at the beginning of each interview:

> You and I will do three interviews. Each interview will be for about an hour and a half. It goes faster than you think and it's honestly quite fun as I have done a couple practice interviews for my classes. The goal of the interviews is to get a complete picture of you and your experiences with art integration. It is fun just to take a moment and reflect on your time growing up and in school. (Pre-Interview Email to Starfox)

In this email, I tried to shift her perspective from seeing me as a teacher to seeing me as a collaborator sharing her story. I wanted her to see it as something fun, and that we would just be reminiscing about her time in high school science classes.

Once the nature of the interview was made clear, I made sure that the participants understood that I would be taking their words to create a narrative, and their job was to share their story, their experiences, and the meaning they made from those experiences. I wanted them to share their honest feelings with me about their time in AIL:

> In terms of me presenting my biases, I am very much for arts integration. I have been for a while. However, this study is not about me confirming my biases. This is about discovering your true and honest thoughts about these things. So, Starfox tell me about yourself: what's your story? (Starfox, Transcript 1)

I wanted to ensure that they understood I was trying to learn about the AIL process, the good and the bad. I hoped this would make them more willing to share a complete picture of their time in AIL absent any bias. Also, as all participants had already graduated from the school before the interview, I was no longer in any position of authority over them, which helped minimize my influence on the interview. There were still validity issues associated with interviewing former students, but I will address those issues in more detail later in the chapter.

Reaching out to these former graduates in the participant pool was done through Facebook Messenger, by text, and email, as well as through video applications like TikTok and YouTube. If I had their phone number from their time in high school, I sent them a text message, if I had links to them on social media through school Facebook groups, I sent them a message, and if they followed me on YouTube or TikTok, I posted a video there for them to see and message me. This message was shared with any of the graduates I could contact, and part of this message was shared earlier:

> This is Mr. Ellis from Rainey McCullers, and I need your help! I am working on my doctoral dissertation through Valdosta State University. For my dissertation, I am collecting stories from students who attended Rainey about their time engaging in arts-integrated instruction. Basically, I want to know about your experiences learning science through the arts.

> The study is ENTIRELY confidential so no one will know you participated. I would just ask for you to sit down with me or on Zoom for three separate, but very important interviews. We will talk about your background and your experiences during your school years. It's actually quite fun! I have had two such interviews before, and both participants loved the experience. If you are interested in helping me, you would not only help me with my doctoral research, but you would help teachers and students understand more about arts-integrated learning.

I tried to focus the message on the fun aspect of the interview so that it would seem less daunting. I also wanted them to see themselves as helping me and not doing something for me. If I could convince them that the study would be helpful to future students and that they would be working on this with me, then I felt that they would be more amenable to joining and that they would feel more comfortable sharing their thoughts during the interviews.

Initially, one person responded to the YouTube video, one on Facebook Messenger, two responded to the TikTok video, four responded to text message, and four responded to email. Of the 318 possible participants who graduated from the school, 16 graduates responded indicating their interest in completing the study. When they responded to my initial interest message, I sent a second message to thank them, to collect their email addresses, and to have them complete a demographics survey. I also included a brief explanation of the study, advising them of the purpose, their roles/responsibilities if they volunteered, and a statement regarding the importance of their contributions.

After having volunteers read through the details of the interview structure and completed the demographic survey, only six participants were interested enough to complete all the required steps. Volunteers either did not complete the survey or just did not respond to further messages. There was no communication that they lost interest in the study; they just never responded to further emails or messages. I sent a final email confirming their participation. Table 4 provides detail on the number of AIL courses taken as well as the graduation year and mode of contact for the six eventual participants.

Table 4

Information on Participants and Their Recruitment

Name	Grad. Year	Total Science Classes Taken	AIL Science Classes Taken	Mode of Contact
Bob	2022	6	3	Text Message
Bubblegum	2020	4	2	Facebook Messenger
Rhea	2022	4	2	Text Message
Quentin	2022	4	2	YouTube Video
Starfox	2021	5	3	Text Message
Sunshine	2022	6	3	Text Message

Note. The participants chose their own pseudonyms.

Of the respondents, all had taken at least half of their science classes in an AIL format, which means that the six participants have the required experience in both traditional science classes and AIL science classes.

Initially, plans were made to select a diverse group of participants, but since there were only six people who submitted all the information I was seeking, those six people became the study's participants. I am using Table 5 to share information gained from their demographic surveys. There were four participants who identified as Black females, one participant who identified as White female, and one who identified as a White male.

Table 5

Demographics, Majors, and Pseudonyms of Participants

Name	Gender Identity	Race	High School Major	College Major or Profession
Bob	Female	Black	Chorus	Music Education
Bubblegum	Female	Black	Chorus	Social Studies Education
Rhea	Female	Black	Theatre	Political Science
Quentin	Male	White	Guitar	Computer Science
Starfox	Female	White	Visual Arts	Wildlife Science
Sunshine	Female	Black	Dance	Exercise Science

Note. The participants all chose their own pseudonyms.

The fine arts school has a small male population, which we see reflected in the participant pool. Also, there are more Black students than White students in the study even though the school has about the same percentage of each. Among the small groups of Asian or Hispanic students in the school, there were no volunteers for this study. As this study will not be used for generalization, the demographics here serve only to give context for the analysis of the data. Each of the participants was willing and committed to completing all three of their interviews for the study. Once the participant pool was set, I moved with great excitement and anticipation to the data collection process.

Data Collection Procedures

Interviews and my researcher journal were the two main forms of data gathering that were used. Participants were asked to complete three separate 90-minute interviews, either in-person or virtually. The interviews were recorded and later transcribed to solidify the data into a manageable form. The technical details of the interview process as well as the memoing process that was used are explained in the upcoming section. Memoing was very important to maintaining the validity of the study and to allowing me

to keep track of any biases, emotions, or ideas that came to me throughout the data collection and analysis process. Participants were extremely helpful providing over 27 hours of audio recordings, which translates to over 1,000 pages of transcripts. Table 6 shows where, when, and how the interviews were conducted.

Table 6

Meeting Lengths and Locations for Participants for Each Interview

Pseudonym	Interview Number	Meeting Location	Time (min.)	Date
Bob	1	Zoom	97	11/11
	2	Zoom	99	11/17
	3	Zoom	92	11/25
Bubblegum	1	Zoom	90	11/13
	2	Zoom	92	11/18
	3	Zoom	94	11/26
Rhea	1	Zoom	93	11/11
	2	Zoom	93	11/16
	3	Library	98	11/26
Quentin	1	Library	91	11/10
	2	Library	91	11/20
	3	Library	93	12/1
Starfox	1	Library	94	10/28
	2	Library	94	11/22
	3	Library	93	12/16
Sunshine	1	Zoom	92	11/8
	2	Library	98	11/18
	3	Library	97	11/22

The six participants were contacted through email to arrange interviews. A potential time window was shared for each interview as well as options for the structure of the interview: in person or virtual. Participants gave me a time – after 4 pm and before 9 pm when the community library closed, which is where these interviews were conducted, as well as their preference for interview format.

When participants were available for in person meetings, they were interviewed at the local county library. The location was easy to access and free for everyone, and there

were private rooms for meetings that were reserved when needed. To make it easier for participants who were unable to get transportation to library, an online video conference program called “Zoom” was used. This video conferencing was only used for the participants who could not attend an in-person meeting because they were in a distant city at the time, and it was helpful in allowing participants to share their stories in distant cities.

Kobakhidze et al. (2021) studied the effectiveness of digital qualitative research techniques during the Covid-19 pandemic by interviewing three kindergarten teachers from three education centers in Hong Kong. The researchers wrote that Zoom conferences did allow researchers to obtain and easily record stories from their participants. The participants seemed very comfortable with the online interview process. The Zoom program itself doubled as an audio recording device to capture interviews, and a cellphone was used as a backup. Zoom provided recordings and captions for all virtual meetings, which were used to generate transcripts. As shown in the table, about half the participants were able to meet at the library in the evening for interviews. However, others were only able to meet via Zoom. It was important to keep the interviews convenient for the participant as the loss of any participants would greatly reduce the reliability of the study.

The participants did not seem out of character in any way during the interviews. If anything, I was more worried about conducting the interview properly via Zoom:

> I can read body language pretty well in person, and I can draw people into a discussion pretty well that way. I am curious how things might change interviewing someone via Zoom. (Memo 11-8-2022, Sunshine Pre-Interview 1)

Kobakhidze et al. (2021) noted this challenge as well in their research. The researchers believed some of the context for their stories was lost since the researchers could not see the body language of the participants. There was no evident issue in these interviews because whether I was looking thru a screen or sitting with the person at a table in the library, I could only ever see their head and upper torso. Thus, Zoom interviews did not seem in any way inhibited. Teaching and socializing a whole year on Zoom due to the COVID pandemic likely made my participants and me more comfortable behind the screen than if it had been our first exposure to video conferencing. Also, because of the Covid pandemic and the participants' experience in school with virtual learning, all participants were very familiar with Zoom conferences as they used it at the high school and/or college level.

To be clear, Zoom conferencing was used as a last resort as it is not a preferred method of data gathering when in-person interviews are possible (Kobakhidze et al, 2021). For all Zoom interviews, all participants were contacted by text or email with the meeting time and link at least 3 days in advance. There were no issues with connection drops, which was a blessing. Three participants had to meet via Zoom due only to being out of town during the interview window at distant colleges. There was no apparent effect on the Zoom participants' narratives, compared to those who met in person. The participants who joined the study were wonderfully helpful and willingly gave up a significant amount of their time for the interviews.

Interview

Before interviewing, participants were informed of their rights and asked if they understood those rights. Participants were able to make their own decisions on whether

they would answer any questions that were asked through the process, and participants could have stopped the interview whenever they wanted. There was a discussion of my role as the researcher and their role as the participant to make sure that they understood that I was there to record their thoughts and experiences. It is important that the participants felt in control of their interviews and understood their right to share what they chose about their experiences. The questions are compiled in Appendix C.

Patton (2015) suggested using an open-ended questioning format to obtain narratives of participant experiences. For example, this question was asked at the beginning of the third interview: "Reflect back on your experiences [in AIL] What did the [AIL] experience mean to you?" These interviews were focused on getting students to look "inward, outward, backward, and forward" (Clandinin & Connelly, 2004, p. 50). Essentially, the students reflected on their series of experiences before, after, and during AIL turning their attention inwards and outwards creating a three-dimensional narrative space (Clandinin & Connelly, 2004). Kim (2016) did caution against leaving the interviews completely open-ended, which was kept in mind for each of the three interviews.

Following Seidman's (2019) three interview series format, in the first interview, participants are asked to tell stories about their upbringing and experiences with science and art. Seidman discussed the importance of having the participants reconstruct their life history because that history may directly impact the meaning that the participants create from the interview. Then in the second interview, students were asked to narrate and detail their experiences in art/science integration. Seidman (2019) wanted the second

interview to focus on details and not “opinions” (p. 22). The focus was specifically on the students’ actions in the classroom to get rich data about their experiences.

Lastly, in that third interview Seidman (2019) encouraged researchers to ask participants to reflect on the meaning of their experiences in the study. These experiences were often not considered by the participants before this moment in the interview – as shown, here, in Sunshine’s second interview. She is discussing the use of song parodies to teach science information in the classroom:

> I remember when the [final state exam] came I felt a bit more prepared. I wasn't freaking out as much as I would for any other test. Teachers always say, “Don’t worry about the test, you have the information in your head, no matter what,” but with our songs, those are more about looking in front of your head. You can just pull those songs out [whenever you need them.] (Sunshine, Interview 2)

Sunshine would often worry about big final exams, and even though teachers would tell her that she knew the information, it was never easy to retrieve it under all that pressure – until she started using songs in her AIL science classes. Then, the information was more accessible. Next, Sunshine shares the reflection piece in the third interview about learning songs:

> I feel like you remember songs more than you remember anything else because it's a story. I honestly think I remember the science songs more than I remembered the actual songs [that were parodied.] I didn’t want to do songs by myself, but as a group, it made me excited. Now, I think learning songs is fun, when before I was like, “What is this? Why are we doing it?” (Sunshine, Interview 2)

In that first quote, these unreflected-upon, lived experiences that Seidman (2019) discussed are exactly what Sunshine shared in her second interview, and then she would reflect on those experiences in the third interview. Sunshine had not thought about how prepared she felt during her final state exams until this moment, and then she reflected on this fact and said that songs are what she remembers more than anything else because they remind her of stories. This reflective experience of the third interview is a major part of the Seidman (2019) interview series.

So, the participants in this study will attempt to make sense of their experiences in AIL classrooms and how those experiences have influenced them, their learning, and their views on science today. The data from the first two interviews was used to create some additional, targeted, reflection questions in a semi-structured third interview. I memoed about this process from Quentin's second interview in November of 2022:

> We talked about how arts integration might be one way to engage young immature students. I should ask why he took a traditional AP environmental class as a student who was admittedly a young immature student. (Memo 11-20-22, Quentin Post-Interview 2)

Quentin described himself as a student struggling to focus on classes sometimes. I used this information to frame a question that could provide a better understanding of his thinking when he intentionally chose to take a challenging, traditional AP course instead of a course more likely be AIL. It was from this question that I learned he believed in the power of AP open-ended writing prompts to effectively learn or assess learning of the material, which was a pivotal component of his AIL story. I really wanted participants to discuss what they saw as valuable, and by structuring the questions in the third interview,

I could make sure they reflected on those specific interests and experiences they mentioned in the previous interviews.

As an inexperienced interviewer who was trained during the pandemic – where there were not too many opportunities to improve my questioning practices – I did my best to maintain the three-interview structure. However, sometimes my curiosity would take over the interview, and I would ask for reflection at times during the first and second interviews. In the first interview with Bubblegum, I asked: "It seems that the [classes] you like the most are the ones where you have the most freedom to make mistakes. Why does that matter so much to you?" That was an important question to learn more about this participant's views on AIL, but it should have been asked in the third interview so as not to redirect the course of the participant's narrative.

Other times, I made my questions too long and found myself speaking too much during the interviews. I offered words of encouragement during the interview to help the participants get more comfortable before asking my questions, as shown in this Rhea interview where I commented:

> I think you would do an amazing job [as president] because you have such a wonderful perspective from all these different backgrounds. I feel like you'd have a lot to share, but has that always been you from day one? What was growing up like? What did you want to be as you grow up? What is it you where we're thinking for yourself? (Rhea, Interview 1)

A natural habit that I have in my conversations is to ask one question in multiple ways so that the listener might understand my question better, but all the additional questions may have confused a participant or maybe even flustered them. However, the participants did

not seem bothered by that practice, and often, the additional phrasing of the questions was in response to participant confusion or silence when given an open-ended question. Students generally struggle in class to write answers to open-ended questions, and so teachers will often prompt them to redirect them. I struggled to control that part of my teacher training during interviews, which was prevalent in the memos in my researcher journal.

Before and after each interview, memos were written to keep track of my thought process in case these interviews lead to a new line of questioning. I memoed on this issue throughout the interview stage to help improve my technique with each following interview, and there was improvement from interview to interview because of the memoing:

> So, I am about to meet with Bubblegum. I am meeting on Zoom. I was very disappointed with my first performance, and I am hoping that I do better in this go-round. Basically, I used a couple of leading questions and would interrupt her to ask questions, which is a no-no. I can do better about my reactivity. It's like I wanted to be their teacher again and wanted to give sage advice on their troubles rather than just to let them speak. I need to be more patient and let the participants share their story in their time. (Memo 11-10-22, Bubblegum Pre-Interview 2)

The interview process was integral to the study. It was important to document my process and memo, to be sure that the interviews were conducted as effectively as I could. A study is only as strong as its instrument, and the researcher is the instrument in this qualitative study. I was considerate of the moments that I spoke and of my physical cues

as all these parts can influence the participant. I endeavored to remain as neutral as I could unless the participant required some encouragement to get started.

Notes were taken throughout the interview so that the participant could later be asked to clarify any points that were unclear in their narrative without interrupting. The notes were also helpful in taking note of the participants' general demeanor when discussing certain topics. For example, in Bubblegum's first interview: "Looks around while reflecting. Uses hands to reinforce meaning. Leaning into the camera. Laughing about struggling in AP class." These notes recorded during the interview helped me triangulate my analysis as they provided an additional metric to evaluate my conclusions.

Participant names were kept confidential through this process. Participants chose their own pseudonyms. After catching up briefly on how they were doing, the format of the interview was shared, then the waiver and participant rights were shared, and when the participant agreed, the recording was started. The recordings were kept password protected on my personal computer. All transcriptions were uploaded to the qualitative data analysis program called MAXQDA and analyzed using a detailed coding and categorization process to look for patterns and themes in the data. Much of this analysis was reflected upon using the memoing process.

Memoing

Memoing is an important practice for qualitative researchers that allows the researcher to document their thought process and subjectivity improving the validity of methods and conclusions by revealing the thought process throughout (Maxwell, 2013). Many of my memos were from the interview process. Memos were made before and after each interview to document any shift in my thoughts through the interview process as

well as how I may have influenced each interview. The following memos were written before and after the third interview I conducted with my participant named Bob:

> OK, I am SOOOOO NERVOUS that I will not do a good job asking narrative questions. I worry that I am missing out on stories. I was going over some of my notes from Kim (2016), and I feel I understand more what I have to do. I am taking the specific questions I wrote down after going over each interview and trying to make the questions more open. I gotta remember I am trying to tell THEIR stories, not sway them to my way of thinking. Who cares what I think about these topics, I want to know what they think about them and how THEY experienced the moments!
>
> I want them to take me where they will and to let them focus on what they see as important rather than just be an "investigative reporter." I feel underprepared. I always do before the first interview. This is my first third interview, and I know it's the most important! I just hope I get stories and that I use my time wisely! (Memo 11-11-22, Bob Pre-Interview 3)

Next, the post-interview memo:

> I am beat. I think I got it though! I had WAY more questions prepared than I asked, and Bob actually covered a lot of it on her own without me needing to do much prompting! I felt the conversation flowed naturally and I could get her back on track easily. We did get off topic a bit talking about old things from previous interviews rather than explicitly arts-integrated instruction, but it was OK, I think.
>
> I am excited to do the next few. I don't think I am seeing many connections just yet between students in their experiences or interviews, but I am

> looking forward to reviewing each student's interviews and putting together questions. Bob's interview had a lot to do with the difference between middle school/early high school and college level science. Bob really felt like more traditional instruction was needed at certain levels to prepare for the college experience. However, she felt that maintaining an interest would be very beneficial to any student learning a topic. So, I am curious to see if other students feel the same way. (Memo 11-11-22, Bob Post-Interview 3)

These memos were written knowing that the third interview was the crux of the study in which students discuss the meaning they make from their experiences. So, I was very nervous, but I was determined to focus on the participant's narrative. In the post-interview, I felt I had accomplished my goal of letting the participant reflect with a minimal influence on the narrative from my line of questioning. Understanding my influence on the interview process through memoing, I was able to conduct a more effective data analysis as discussed in the next section.

Memos were made throughout the process of the study as well. Documenting my thought process added validity to my later data analysis as I was able to account for any personal bias of my own entering my research (Maxwell, 2013). Next, a memo that I wrote back in February of 2022 concerning my literature review:

> For this study, am I doing enough to convince the reader of the importance of my study and am I analyzing the background research enough? Because I am not convincing them when I cite these studies since I include such little information about the research beyond using it to back up what I am saying with a paraphrase. I need to look at the study again and reread my background research to have a

better grasp on what the background research is actually telling me so I can present a stronger defense. More detail is needed.

Be careful with your attributions. I am simply saying Xu et al. (2012) said truth rather than just their postulations. I have to be careful not to misrepresent their work. Set up your annotated bibliographies as truth vs postulation. AERA review of literatures can provide good sources of meta-analysis.

I used this memoing process as a way to reflect on my methods and improve my study. There was a focus in that memo on conducting the literature review in a way that respects both the reader and the researchers whose work I relied on for my study. Memos helped remind me of important details, and they allowed me to organize and process my thoughts as I collected and analyzed the participant's data.

Data Analysis Procedures

To analyze the participants' data, I chose coding as a categorizing strategy and building vignettes as a connecting strategy (Maxwell & Miller, 2008). Coding was chosen as one of this study's two modes of analysis because it can be used to attribute interpreted meanings to the participant's words, which can then be categorized for patterns and themes (Saldaña, 2015). Connecting strategies were chosen because they are a hallmark of narrative analysis focused on cutting together all the relevant parts of the interview data into a story that communicates the participant's meaning created from the interview (Maxwell & Miller, 2008). Maxwell and Miller (2008) stressed the value of using both categorizing and connecting strategies together as categorizing strategies often lose context in their use and connecting strategies often struggle to evaluate and compare different participant narratives.

For both connecting and categorizing strategies, every researcher will bring his or her own unique perspective to the analysis. So, the codes that were selected for this study may be different than the codes a different researcher may choose because codes represent the researcher's interpreted meaning. In this study's analysis, the narratives were collected and read twice before coding. Saldaña (2015) recommended this repetition to allow the subconscious some time to ruminate on what the participant words meant. The first time that the narratives were read was to transcribe the interviews. Zoom was used to record the interviews, and it automatically generated transcriptions of the interviews.

Coding Strategies: In Vivo and Values Coding

Those transcriptions had many errors, and so the recording was played while the transcripts were edited for accuracy. After a second reading to consider the data, the participant experiences were coded with *in vivo* coding to reveal the students' chosen AIL language. Saldaña (2015) wrote that in vivo coding is focused on using terms that the participants used in the interviews, rather than words that the researcher will choose to reflect the perspectives of the participants more effectively. The researcher should highlight key terms from the participant's transcript that give meaning to the passage. For example, Sunshine described her experiences when she was moved up to a higher level at her dance company in a way that provided four in vivo codes as shown in Table 7. Sunshine shared her excitement at being able to push herself as a dancer because the new course was more challenging and asking her to master different skills. The in vivo codes were chosen to highlight the meaning of the passage, and those codes were then grouped and categorized to look for patterns and themes in the interviews.

Table 7

In Vivo Coding Example from Sunshine's First Interview

Passage	Codes
I know that [the classes] were *different*, and the difficulty was *harder*. At the end of the day, eventually, I thought this was *more fun*. I'm not just doing the same [basic dances] all the time. There's actually a *challenge*.	"different" "harder" "more fun" "challenge"

Saldaña wrote that the coding method of choice should match up with the conceptual framework of the study (2015). For this study, I wanted to understand how participants make sense of their experiences in arts-integrated classrooms, and as shown in Table 7, in vivo coding was used to focus the analysis on the participants' specific word choices to best communicate their experience. Therefore, in vivo coding was a valuable tool in the analysis process.

For the analysis, the narratives were coded using MAXQDA software. MAXQDA is a computer software program designed to assist with qualitative research. It stored all transcripts, and I was able to code using the program and track all the codes used over each interview. Codes were later collated, grouped, and categorized using Microsoft Excel because I was more familiar with Excel from my experiences as a teacher. Also, I was not familiar with MAXQDA at all. In fact, my inexperience caused me to create so many codes that MAXQDA did not operate properly in some cases and the program would crash. This over-coding is a practice that Saldaña (2015) called splitting, in which the researcher coded too much of the interview data, often coding items without significance. I understand that there are consequences to coding too much data as it may dilute the quality of codes, but I tried to capture meaning with every code that I chose.

So, I am confident in the codes that were chosen, even if there was a lot of them to analyze.

So, using Excel, I compared and categorized groups of codes from the participants' narratives analyzing the data for themes.

Table 8

In Vivo Codes and Their Categories

Codes	Categories

compete
COVID
didn't bother me that much
didn't care as much
doing whatever we had to do
get nervous
getting a little harder
hard
I was struggling
little nervous
long hours
long term
nerve wracking
nervous
nervous about everything
never, like done something like that before
not like you're actually doing something
remember stressing out
scares me
strengths and weaknesses
struggle
struggling
try to remember it
try to do my best
trying
tune out.
wasn't necessarily fun
we want to leave.
wouldn't be as fun.
	• Effort
	  ○ doing whatever we had to do, I was struggling, long hours, long term, not like you're actually doing something, struggle, struggling
	• Nerves
	  ○ get nervous, little nervous, nerve-wracking, nervous, nervous about everything, remember stressing out
	• Enjoyment
	  ○ didn't care as much, scares me, tune out, wasn't necessarily fun, we want to leave, wouldn't be as fun
	• Challenge
	  ○ compete, COVID, didn't bother me that much, getting a little harder, hard, never done something like that before, strengths and weaknesses, try to remember it, try to do my best, trying

Saldaña gave a seminar on YouTube with suggestions for categorizing and generating themes, and he described the coding process of grouping codes into categories by

similarity of topic or meaning (UMN_MCH, 2022). In that seminar, Saldaña suggested alphabetizing the codes to help discover categories for codes. Alphabetizing made the process of categorizing much simpler and helped find unique categories that I might have missed if I had not alphabetized. The categories chosen and shown in Table 8 were created by looking at the data inductively as I began to read over the codes. There may have been other ways to group these codes, but these categories made sense to me. Throughout the process, analytic memos were written discussing my thought process as I created categories (Maxwell, 2013).

Figure 2 is an example of how the in vivo coding process in MAXQDA was used to highlight the participants' words. In this interview from the participant "Rhea," the blue coded segments represent in vivo codes.

Figure 2

Image of In Vivo Coding from the MAXQDA Coding Software

38 And then, 2020 came and all the *black lives matter* stuff started coming up. I started realizing how much about the world I really *didn't know.* I saw so many different things in the world that I really *wanted to change.* In that moment I *didn't have the power to change* it, but through the life I've led so far I could eventually have the power to change it.

The student was describing her experiences growing up in this state in 2020 after George Floyd's death. The codes chosen were used to encapsulate something about which she was passionate – Black Lives Matter – and how little she understood about the world because of her time in private schools. She knew that she "wanted to change" things, but right now, she "didn't have the power to change things." In my coding, I tried to focus on what the student was specifically trying to communicate as suggested by Saldaña (2015) when in vivo coding. I used words that were hers and targeted her main points from each sentence or idea as my codes. She really wanted to be in a position of power where she

could use that power to make a difference for the Black community. So, codes were chosen to reflect her meaning. Once the language of the participant was established with in vivo coding, Saldaña recommended having two first-cycle coding options. So, in vivo coding was followed up with *values coding* to investigate the participants' "motivation" and "agency" (Saldaña, 2015, p. 132). In my conceptual framework, the lack of detailed student perspective in arts-integration research was discussed, and it was anticipated that values coding could provide a view of the participants experiences to help address their perceptions and reasons for them.

Saldaña (2015) suggested that values coding is directly applicable to almost all qualitative research, and he wrote that it is well suited to interview transcripts as well. Values coding was an important part of this study as it focused on specific personal beliefs, attitudes, and values that the participants shared in the narrative. In a memo from April 2023, I wrote:

> So, values coding includes values, attitudes, and beliefs. Values are what the speaker finds to be important or valuable in themselves or other people/things. Attitudes are the way the speaker thinks or FEELS about other people or things. Belief is a system developed based on experiences that combines people's attitudes or beliefs. (Memo 4-3-23)

That memo was written after reading Saldaña, and I found the description of values coding so helpful in discerning what information in my narratives to focus on from each participant.

When values coding, the letter "V" signified a value that the participant held in the narrative. For example, Sunshine valued being able to help people as a physical

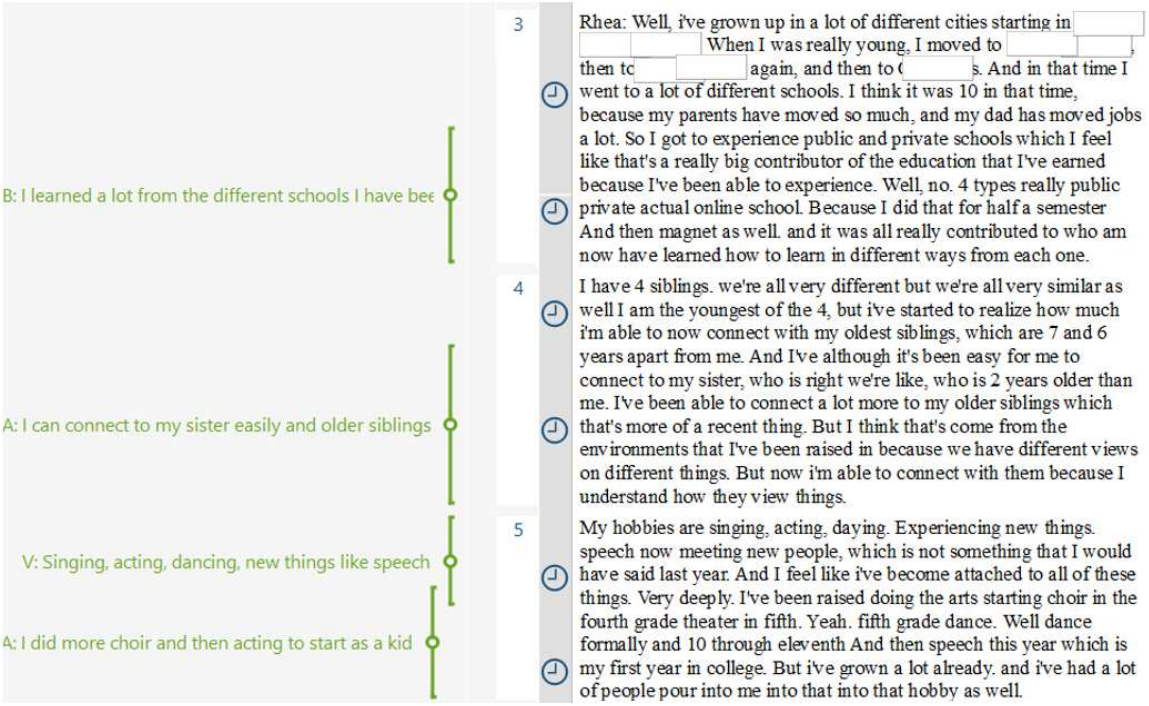
therapist: “I came across physical therapy. I can either choose to do physical therapy for older people or sports injuries, or even going to a dance company and helping dancers with their injuries.” This segment was coded as a value because helping others with injuries was important to her. The letter “B” signified a belief that the participant held. Sunshine believed that she needed a good education to be an independent woman, and so she shared the following: “If I were to marry someone, I can't just depend on them to take care of me. It would be nice if they did, but I still have to have the means of doing it myself because you never know what will happen in life.” Her beliefs about independence were based on the values instilled in her by her mother and her positive attitude towards learning. The letter “A” signified an attitude. Attitude codes were used to share how the participant thought about a topic. Starfox shared the following attitude towards biodiversity: “Biodiversity – I remember that being one of the first units we learned, and that has always stuck with me because it was one of the most interesting things in that class.” Starfox’s attitude was that biodiversity was interesting, which was based on her love of animals. Coding the data relating to values, attitudes, and beliefs was a very helpful way to uncover what these participants found to be important.

In the value coding process, I would read through the data and code the information beginning with a letter of either a “V,” “B,” or “A” to categorize the values codes. Figure 3 shows the process. In this passage, Rhea shared how her family moved around a lot and that she had the chance to attend private, public, and online schools in her time living in this state. She believed that those experiences gave her a unique perspective. She even defined that more clearly later when she expressed the view that she and her siblings have not always seen things the same way, because of differences in

their upbringing. She also shared her favorite hobbies, which shows how much she values the arts. I used all that information to code each segment as a belief, value, or attitude. Much like the process with in vivo coding, these codes were grouped and categorized to generate larger themes that allowed for larger patterns to emerge in the data. I needed to understand more about the student perspective and that begins with what they value and believe.

Figure 3

An Example of Values Coding from MAXQDA Software



With in vivo and value coding completed, it was time for the next cycle, or phase, of coding analysis.

In my second cycle of coding, a *pattern coding* method was used to focus on words that stand out as important from the first cycle coding phase and that present a summary of the participant's ideas (Saldaña, 2015). I used pattern coding to view the data

from the first round to draw connections between seemingly disconnected ideas (Saldaña. 2015). Pattern coding was used to focus on trends and themes revealed in the data from the first coding and analysis. I developed a total of 7,736 codes for both in vivo and values coding during my first coding cycle. I was helped in this coding process by engaging with a video clip my chair sent me of Saldaña in an online interview where he discussed the coding process at length for a qualitative class at the University of Minnesota (UMN_MCH, 2022). So, I looked over the first set of codes for patterns and organized those codes into 204 categories and began to create themes for each of my participants using Microsoft Excel. Table 9 shows a small part of the process in which I grouped codes from Bubblegum's second interview into a category:

Table 9

Example of Inductively Categorizing In Vivo Codes from Bubblegum

Bubble Gum, Second Interview Codes			Category
• Be like a lead on something • By ourselves • Chore • Do this together • Feed off each other's energy • Involvement • Less pressure • Included	• Feed off of each other's ideas • Feed off • Gave their all • Get tired • Give a 100% • Group • Holding people up • Huddle • In like 2 min • Observer	• Paired • Participation • Partnered • Put in our 100% • Someone who has all the notes • Think individually • Versus • Work best with • Work together	Group Work

After reading through the categories, I generated the following theme: In groups, students would work very hard and feed off each other's energy when working on a project together. I saw this theme develop from Bubblegum's data, and her actual words were used to generate the theme which is why in vivo coding can be so helpful. I was able to summarize the themes in the participants' own words. The participants' themes across the

different types of coding were used as elements in the reflection section of each narrative in Chapter 4.

This process was continued with values coding. All the values codes were organized by value, belief, and attitude.

Table 10

Using Categories to Generate Themes for Bubblegum

Category: Negative Views of AIL	Theme
• AIL can be distracting • AIL can be scary • AIL makes learning unnecessarily complex and time consuming • AIL was a lot of work. I dislike work dislike studying. Overwhelmed • Chorus was more professional than AIL • AIL can be distracting and performing for class is scary. Kids can get anxious about it. Can feel like an added layer of complexity and work that is not needed, sometimes ridiculous. • Doesn't like performing for people • Don’t like explaining things. Not in AIL especially. • Felt AIL was repetitive, basic meet criteria checklist • Gets nervous about singing (not her art) • People need the teacher to push them to try in AIL • She and others got nervous performing • Singing songs felt ridiculous • Song parody didn’t get much out of it, excited and nervous making it	AIL can be distracting and performing for class is scary. Kids can get anxious about it. Can sometimes feel like an added layer of complexity that is not needed.

Then, they were sorted into categories to generate larger themes from each of the participants. Table 10 shows one example from participant Bubblegum of how I used Excel to categorize these codes and generate a theme. In the Table 10, a category was

generated in which student value codes were grouped by negative views of AIL. Reading through the codes, I saw a theme beginning to form related to students' views on AIL as an extra step that often made them nervous. I performed this analysis for each participant individually, then I combined codes and themes from all six participants to look for themes across the data. I wanted to approach this individually as well as collectively because I believed that the individual themes would also be helpful when analyzing the vignettes for each participant. Once all the data was collected, coded, and analyzed, a summary of the themes was constructed in which meaning generated from the coding process. The analysis and summary of themes are presented later in Chapter 5.

Connecting Strategies: Vignette Creation

The theme discussed in Table 10 provided an overview of art-school student experiences in the classroom, but the individual perspective was missing. Coding is a categorization strategy that cuts the narrative up into decontextualized chunks for analysis (Maxwell & Miller, 2008). With this in mind, Maxwell and Miller (2008) suggested using connecting strategies, which require the researcher to create narratives that keep the context of the original story shared by the participants. Connecting strategies do not just maintain the transcript in its original form, however. The interview transcripts were analyzed for relevant connecting sections that could be cut out of the interview and then woven together into a narrative that help tell the participant's story and convey their meaning in a more coherent and connected fashion. Thus, the interviews were connected and storied into vignettes (Seidman, 2019) to share each participant's individual perspective. These vignettes can provide education stakeholders with direct views of student AIL experiences in context. Both the categorizations and connecting

strategies (Maxwell & Miller, 2008) were used to give a detailed student perspective on the learning process that could add to the literature.

In Chapter 4 of this dissertation, I present the student perspective using vignettes that I created from the collected interview data. Initially, I had plans to construct narratives from the participant data in the style of Clandinin and Connelly (2004). However, as Seidman (2019) mentioned, only about one of three interviews is "complete" and "will sustain display in the form of a profile" (p. 128). Participants rarely speak in a narrative format with a beginning, middle, and end including conflict and resolution, and so Seidman (2019) encouraged narrative researchers to construct vignettes, which are shorter narratives that cover a "more limited aspect of the participant's experience" (p. 128). As this study is only concerned with collecting stories of participants' experiences with AIL, vignettes are a fitting selection for story analysis. It is in the construction of the vignettes that the interview data is analyzed.

With the construction of any narrative, the temporality, sociality, and place are essential factors (Clandinin & Connelly, 2004). I include Seidman's (2019) vignette in that statement, because to create a quality vignette I had to describe temporality – the setting and the time over which events occur. As relationships influence the participant, I also discussed the people/places that impacted them for sociality and place as Clandinin and Connelly (2004) suggested. I also chose vignettes to present the interview data because vignettes are "an effective way of sharing interview data and opening up one's interview material to analysis and interpretation" (Seidman, 2019, p. 128). One of the goals of this study was to allow teachers and other education stakeholders to review and evaluate the students' perspectives on their learning in AIL, and these vignettes may

provide a narrative that shares the words and stories of the participants in a connected way that thematic analysis could not. The vignettes are more connected to the participants words because I built them from the interview transcripts into a cohesive, storied narrative and only added words in brackets for clarification or context, as necessary.

Seidman (2019) laid out the specific process for crafting the vignettes in his book on qualitative research. Using Microsoft Word, I took sections of each participant's interview that I deemed important, and I cut them out of the interview transcripts and grouped them in a way that fashioned the three interviews into one cohesive narrative. My only contribution to the vignette beyond adding some clarifying words was to rearrange the narrative into a more traditional storyline. The general pattern of the story centered on telling the timeline of each participant's experiences with science and art in their younger days. Participants described their experiences in AIL classes in detail along with some traditional class experiences. The final section of each vignette shared the participant's meaning generated from reflecting on their use of science and art in the classroom. I chose this organization because it allowed the reader to understand the context of the participant's life and experiences before they described their AIL classes and then shared the meaning they made from those experiences. This organization was designed to follow Seidman's (2019) three-interview series as he encouraged in his book.

Seidman (2019) also suggested cutting out the interview sections that I deemed unimportant to the study and smoothing out the words used – removing space-filling, hesitation words like "like" and "maybe" (among others) to build a flowing narrative. After prioritizing important sections of the interview and cutting the rest, I had reduced the total interview data to about a third of its original size, which Seidman mentioned was

typical of vignettes. Using clarifying words to connect paragraphs, when necessary, I pieced the narrative together. Any words that I inserted were demarcated with brackets. I am sharing an example of an excerpt from a vignette that shows the original statement as well as the edited statement with clarifying words. The segment was from the beginning of a paragraph in Bob's vignette:

> In that class, we did labs, and we took notes or looked at videos. We watched "Forensic Files" once.

Next, the edited version:

> [In forensics,] we did labs, and we took notes or looked at videos. We watched [the TV show] "Forensic Files" once.

I clarified the "class" by inserting [In forensics] to begin the paragraph and to allow the reader to understand the setting of that part of the narrative. I also clarified "Forensic Files" by inserting [the TV show] in case the reader was unaware that it was a television program. Otherwise, all the words contained in the vignette were spoken by the participant in the interview to maintain the voice of the participant.

All vignettes are presented in Chapter 4 of this study, including participant introductions and narrative summaries. By starting with the narratives and then moving to the analysis of the themes in Chapter 5, I hope to provide a complete picture of my participants experiences in arts-integrated classrooms. In my analysis, I discussed these themes and present select parts of narratives that support them being mindful of how I am the major source of risk to the validity of the study.

Validity

Maxwell (2013) discussed how bias and reactivity were the two primary threats to the validity of a study, and he provided a checklist and a matrix to consider when improving the validity of a qualitative study. The researcher who holds all the bias, therefore, will always be the biggest threat to the validity of any study, and that meant I must share my bias and acknowledge its potential effect on the data and analysis. In this section, I discuss my personal subjectivity (Peshkin, 1988) at different moments in the study and how I think it affected my research. I also addressed some strategies I used to minimize my participant's reactivity (Maxwell, 2013), and I shared how I plan to target Maxwell's checklist of validity threats.

Peshkin (1988), a professor of educational research at the University of Illinois, had a suggestion on how to approach subjectivity issues after realizing how much his bias and subjectivity affected a book that he wrote. Peshkin's recommendation was to evaluate constantly and meaningfully one's "subjective 'I'" when considering the influence of researcher bias on active research (p. 17). To Peshkin (1988) subjective I's were the aspects of his history or personality that directly affected his interpretation of the current situation in his research. His subjective I's would change based on the problems he faced and the scenarios in which he placed himself. I chose to monitor my subjectivity through memos. I also had to watch what I was doing with my face or my hands throughout the interviews. I did not want the participants to see a negative reaction to their words causing them to change their story so as not to hurt my feelings. By constantly memoing and taking ownership of my subjectivity on AIL, I could minimize its influence on the study.

In terms of my subjectivity, I have been a promoter of AIL in science classrooms for years by mentoring new teachers and leading teaching-improvement sessions for my district. I believed that my desire for the success of the arts-integration method may make me the perfect person (yet, perhaps also the most biased person) to pursue this research. I was steadfast in the search for truth and meaning in my participant's words. However, this desire also made me more susceptible to flawed analysis and poor questioning habits to achieve my research goals:

> I gotta remember I am trying to tell THEIR stories, not sway them to my way of thinking. Who cares what I think about these topics, I want to know what they think about them and how THEY experienced the moments! I also need to monitor my reactivity. I know that I have my own ideas and opinions about arts integration, and they may differ from Bob's. I cannot let my passion influence their story or perspective because I can't control my face. (Memo, Bob Pre-Interview 3)

I am very pro-AIL, and my constant worry was that my appreciation of AIL would influence the questions that I ask and the avenues that I explore. In fact, the more I ask questions, the worse the outcome of the study. I had to constantly remind myself to take a backseat and let the participants talk to hear their perspective. That's challenging as a teacher who asks lots of questions regularly.

Like Maxwell's (2013) discussion on bias suggested, the researcher was the biggest threat to this study's validity. So, I asked the participants to review the transcripts of my data, and I asked them to review my analysis of their interviews to be sure that I represented their narrative as they intended it. They all approved their vignettes. Connelly

and Clandinin (1990) purported that narrative researchers build the story with the storyteller. So, I was glad that I represented their words faithfully and built their stories while minimizing my personal impact on their vignettes.

Maxwell (2013) suggested that one way to limit the effects of this researcher bias was to use any discrepant evidence and give it as much consideration as one does the desired evidence. When a discrepant theory or theme arises, I evaluated it with due consideration to search for the truth in the participants' experiences. I did this with Quentin who did not enjoy his time in AIL:

> He didn't see how using the arts could be beneficial in and of themselves in his science class. He is more of a science guy than an arts guy though. I have to look for other examples of this in other participant interviews" (Memo, Quentin Post-Interview 3)

Because I actively looked for discrepant evidence during coding, I was able to find examples of students who found AIL to be nerve-wracking and stressful and turned that into a theme of the study. As a teacher who used AIL in my classroom, I never would have considered AIL stressful before conducting this study.

I have subjectivity as a teacher. I have a distinct teacher's perspective that I brought to this narrative analysis of student experience. However, a potential advantage when researching this topic as a teacher was my vast experience giving both traditional science instruction and arts-integrated instruction. Traditional science instruction is very analytical and very scripted, which some students like and others dislike (Braund & Reiss, 2019). AIL can inspire students, but it can also be overwhelming in such an open-ended project environment for students who were not used to being creative and taking

the lead in their education. My familiarity with both styles gave me an advantage in analysis of the effects of each. However, my perspective as a teacher impacted my analysis and collection of the student data. Again, having participants look over my analysis helped ensure accurate student voice in the narrative results.

In making these vignettes, I brought my subjectivity as a White male teacher raised in private schools while I was interviewing a diverse group of students who are in public school. I knew that my upbringing impacted my students and how comfortable they were sharing with me about their backgrounds. I hoped that the relationship that I already had with the students minimized any concerns students had about sharing any personal issues that affected their narrative when they discussed their lives. I realized that there was the chance that talking with me may make students speak more positively about AIL than they would to another interviewer. However, I think that because the participants had already formed a relationship with me during their time at school, they were more likely to share honestly and openly. I held no power or position over these volunteers as they no longer attend my school. I made it clear that I was looking for an honest reflection on their experiences. I also note that Maxwell (2013) discussed "reactivity" or the influence of the interviewer's behavior on the participant as a serious consideration.

Student openness issues can stem from reactivity, and my previous relationship with these students helped minimize how the participants reacted to me through the interview process. I think that they were comfortable enough with me to speak unabashedly. Regardless, I tried to make sure that I was not influencing the participant with my tone, interruptions, or questioning process:

> I wanted to focus on letting her speak while taking notes and jotting down questions. I knew that I had to hear her words and ask for explanations when certain words were very vague. I tried to take notes on how she was feeling and emoting during certain parts of the dialogue. I knew I had to be careful of reactivity as well and not influence her thinking by my choice of reaction. I think I did a pretty good job with all those things. (Starfox, Pre-Interview Memo 1)

As shown in the memo, I remained aware of my reactivity in my interviews, and I made every attempt to open the discussion to the participants. I tried to let them lead the narrative without interfering with varying levels of success. This openness is the basis of good qualitative research (Creswell, 2014).

Maxwell (2013) stressed a few other validity threats to consider, and I will highlight the ways I attempted to minimize their effects. First, this Seidman (2019) three-interview format was used to minimize misconceptions by providing rich data and context for the narratives. The first interview collected the participants' backstory, which gave context for their arts-integration experiences. The second interview discussed the participant's arts-integration experiences. The third interview allowed the participant to reflect on the how those arts-integration experiences affected them and what sense they made of those experiences. Since each interview covers information from the previous interview, the researcher and participants were able to address any misconceptions or gaps in understanding through the process.

I collected "rich data" during the interview. Maxwell (2013) suggested verbatim transcripts as rich data for an interview study. For triangulation, I also took notes during the interview and memos before and after the interview to try and get as much detail from

the interview experience as I could for validity. For example, here are my notes on Rhea's second interview:

> When we start talking about [AIL teacher], she starts to smile. Really starts smiling when talking about her [AIL] news report lesson. Definitely sad about having to retake Physical Science. Smiling and thoughtful discussing APES. Smiling when talking about using her body and her feet relating to her anatomy class. (Rhea, Interview Notes 2)

These notes were used in the vignette reflections to try to capture the emotions that participants connected to their words. It was a way for me to double check and make sure that my analysis of their perspectives was as accurate as possible and covered the relevant information that mattered to the participants. For example, Rhea really enjoyed her AIL activities – especially the news report, which I made sure to discuss in her vignette. She also talked at length in her vignette about her struggles having to take physical science so many times, and those emotions come across in the notes.

I became more familiar with the participants' moods over time because I had intensive, long-term involvement with the participants interviewing them three times in the span of a month. This long-term involvement allowed me to check my theories throughout the interview process by asking follow-up questions based on the previous interviews. Participants were also asked to perform member checks, which helped provide evidence for the validity of participant narratives because the participants confirmed the accuracy of the vignettes that I created.

There were limitations to this study based on the select nature of the school as well as the relationships that students had with me already. I also was a very

inexperienced interviewer, and while I tried to allow the students to speak with minimal questions, my natural teacher instincts arose. I would ask a lot of questions instead of letting the silence work for me. However, it was my belief that this study was conducted in a way that successfully obtained data from participants with experience in AIL in science classes. I took precautions to protect the narratives from my influence, but I must also recognize that I influenced the collection and analysis of the data at every stage – especially with my overeager questioning practices. I hope that, in presenting my biases, I helped minimize my impact on the participants and their stories.

Summary

In this chapter, I discussed my research design and the setting, including the school and the participant pool. Then, I described the process used to gain six participants for the study and their qualifications for the study. Once the participants were discussed, I explained how the data was collected for the study. This section was very important as it dealt with the very conceptual framework of the study and allowed for a deep exploration of student AIL experiences. The data analysis process was described in detail including the coding practices (Saldaña, 2015) and the creation of vignettes (Seidman, 2019), which were a connecting strategy used to maintain the context of the participants stories (Maxwell & Miller, 2008). It was very important to conduct the study with detailed one-on-one interviews with students because there was so little research into the student AIL perspective (Inwood, 2013), and the procedures for this study gave participants a chance to share their stories for analysis. In Chapter 4, I present the participants' vignettes, which tell the story of the individual participants and their experiences from their time in AIL science classes.

Chapter IV

VIGNETTES

One of the reasons for using a narrative inquiry approach to this study (Clandinin & Connelly, 2004) was to allow students to share and then reflect on their experiences and stories from when they were engaged in arts-integrated learning (AIL) during their middle and high school science classes. In this chapter, vignettes of the participants are presented. For each participant there is an introductory section in which I offer the reader the opportunity to meet the participant. I used brackets and italics to present my words, while a normal font is used for the participants' words. Their narrative storied journey with AIL and science follows. Afterwards, there is a "reflection" section where the knowledge gained from each participant as an individual is addressed. Finally, a summary of all the vignettes was used to highlight the common points between the different participants. These vignettes were extremely important to this study for context and for elevating the voices of the students who gave of themselves to help us understand their experiences, in addition to the teachers' stories that are already prevalent in the literature.

In the past, researchers would ask the supervising teacher to speculate on what their students were experiencing instead of interviewing the students themselves (Inwood, 2013; Ramey et al., 2020). The participants in this study were able to share their stories about the lessons they were taught, and they were given a chance to reflect on what they learned from those experiences and stories in AIL classes. Graduates of a fine

arts secondary school in the southern United States were selected as the participant pool. There are two science teachers at that school who regularly make use of AIL in their classes. Six graduates of the school volunteered to participate, and each of the six participants gave three separate interviews to allow me to gather rich data on the participants' backgrounds and experiences.

To explore their experiences through their stories, three research questions were formulated to guide the study:

1. "What stories do six recent high school graduates from a fine arts school share about their experiences before, during, and after engaging in AIL in their high school science classes, and what meanings do these participants create from their lived experiences?"
2. How did six recent high school graduates from a fine arts high school compare learning science in an AIL environment to traditional instruction without it?
3. How did six recent high school graduates from a fine arts school describe their engagement with science before, during, and after taking at least two AIL science classes.

After reading the participants' stories and the meaning they made from those experiences in AIL, it is my hope educators and administrators will personally connect to the students and evaluate the potential role of AIL at their schools and in their classrooms.

Using Seidman's (2019) suggested interview organizational structure, the first interview was used to collect background information on the participants and their interest in science and art during their formative years. The second interview focused on the specific AIL and traditional activities performed in the participants' classrooms. The

third interview explored the meaning the participants derived from their experiences in AIL science classes. All interviews were transcribed, and an in-depth coding process was conducted using in vivo, values, and pattern coding techniques (Saldaña, 2015). The codes were grouped by similarities and then placed in categories. I derived themes from these categories, which are discussed in Chapter 5.

After the generation of themes, participant vignettes were constructed to story their experiences in a way that maintained the context of the story while building an accurate narrative. After each vignette was constructed, I reflected on the participant's words and stories to understand more about their experiences. Seidman stressed the use of first person (as in the voice of the storyteller) in each profile to keep the researcher's voice from intruding on the participants' stories. Creating these first-person narratives allowed me to "be faithful to the words of the participant" (Seidman, 2019, p. 125), which was my main goal heading into vignette creation. Crafting the participant's words into a story allows the reader to gain context that the coding analysis removed when it chopped that same narrative into pieces. Maxwell and Miller (2008) posited that connecting strategies that privilege maintaining context after decontextualizations were integral to bringing the narrative together after the analytical process of breaking it down into categories.

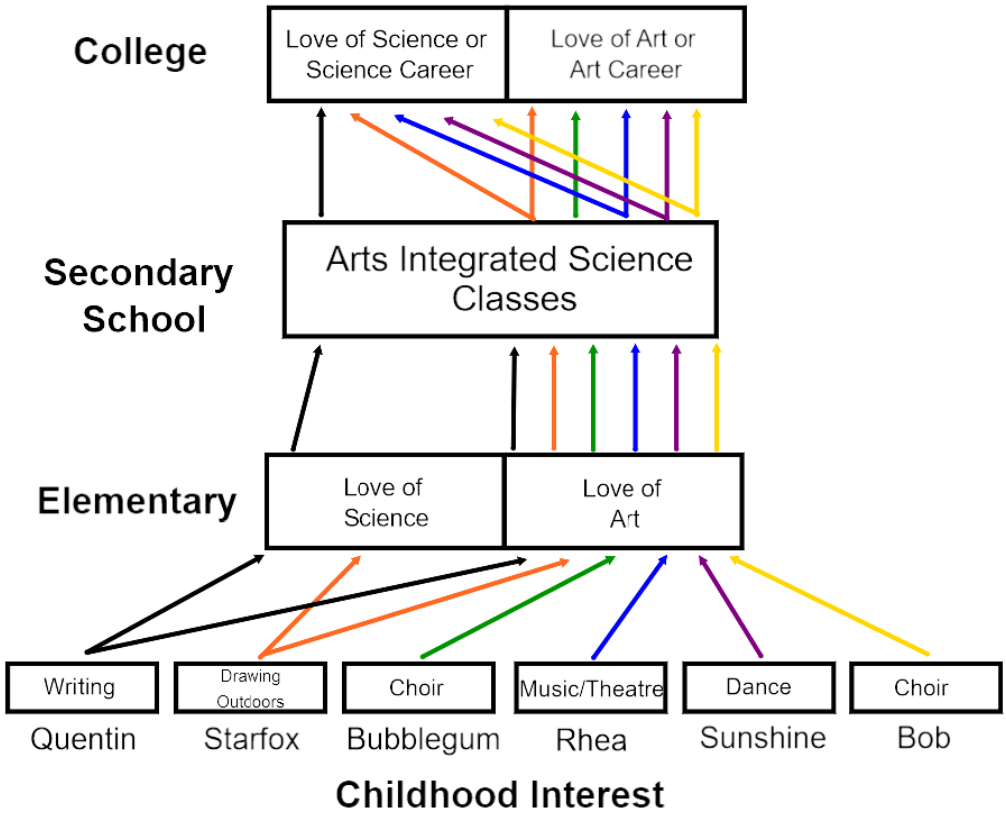
By presenting the participants' stories about their childhood and experiences in school, vignettes allowed for the participants' stories to be analyzed with more context for this study than solely using coding practices. To construct the narrative, the vignette was built in chronological order from childhood to college to allow for an understanding of the how the participants' views on science and art may have changed over time. The

details revealed in the vignette also allowed the reader to gain an understanding of the different settings of the narrative as well as the complex social interactions of the participant. By allowing students to reflect on their AIL experiences and to code and story those experiences, this study sought to document and derive meaning from their stories with the intention of sharing them with other education stakeholders. These vignettes can enable teachers to immerse themselves in the experiences of students engaged in AIL and to understand how these experiences can influence their interest in science.

Each participant had his or her own unique interaction with science and art growing up. Figure 4 maps out the participants' experiences over time.

Figure 4

Flow Chart of Student Interest in Science and Art



Each participant's path of interest from elementary to college is diagrammed via arrows in a color unique to each participant. The arrows begin at the bottom and show the flow of participant's interest in science and art over time through each stage of school. Participants shared their interest in science or art as children during their narratives, and those interests were displayed over their names at the bottom of Figure 4. The arrows show that four of the participants liked the arts and had little interest in science early in their lives. Three of the participants reported gaining love for science or an interest in a science career after taking AIL classes at the secondary level, while two of them kept their interest from childhood. Figure 4 was used to show a drastic change in science interest from the elementary level to the college level with AIL in secondary school being the common factor between each participant.

Interestingly in the figure, Quentin who was a talented guitar major at the school maintained an interest in science and computer coding from his time at the fine arts school through college, yet he said he never developed a real interest in pursuing the arts in his future. Each vignette in this chapter was used to present the details of the participant's journey shown in Figure 4, and as the figure shows, many participants had a larger interest in science after engaging in AIL. According to the interviews, some students engaged in more AIL lessons than others, though not all participants had positive experiences in their time doing AIL lessons. Participants were first asked about their upbringing and their thoughts on art and science growing up first. Second, I asked questions pertaining to their time in their science classes and, lastly, asked them to share the meaning they made of those experiences at the fine arts school.

The vignettes provide important context for the participant narratives that may have been lost during the coding and categorizing process. Each participant's vignette begins with a quote that I chose to frame their personality or their experiences, a "Meet" section where general information about the participant was shared, and after each vignette is a "Reflection" where the data is analyzed and major points were discussed. Again, my words are represented in italics to separate them from the participants' words in the vignette. I am very thankful for these participants and their commitment to this study. The first participant to be discussed is Bob.

Bob

"I think being in that [AIL] class helped me figure out what I wanted to do in my life because it solidified the fact that I wanted to be a teacher."

Meet Bob

Bob was a college student who attended the fine arts school for 5 years from grade 8 to graduation. Virtual video interviews were conducted and recorded to allow Bob to continue with her college classes while taking part in this study. Each meeting was for an hour and a half, and each meeting was about a week apart to allow Bob time to reflect on her experiences. She grew up loving the stage and singing. Bob was also a tremendously successful student in school and took both traditional science classes and AIL science classes. Bob was attending university to become a teacher at the time of this interview for either ELA or science instruction. However, she was considering moving to music education as of this interview as recommended by her advisor. As a successful student in both traditional and AIL classes in her time at the school as well as being a

teacher candidate, Bob had a great deal of insight into the learning process for students at the fine arts school for both AIL and traditional instruction.

Even though I had taught Bob twice – once traditionally and once in an AIL science class, Bob did not make much eye contact at first in the interview. However, over time as she gained confidence in her words, she spoke with more and more passion – most often when she talked about being a teacher. She would laugh and gesture constantly the more she talked about it. She was very positive and engaged any time the arts were discussed, as well, especially AIL activities. She was less enthusiastic about her time in traditional classes, crinkling her face up when she talked about subjects like math. Her family had a big influence on her, and that was clear in the interview.

Bob's Story

I have a twin, and it's very interesting growing up with someone just like you. You have a built-in best friend for life. She's hilarious and should be a comedian. We are identical, so sometimes people don't see us as individuals. They just think of us as the same person, and that can get disheartening because we do have our own personalities. We may argue a lot, but it's fun to grow up with a twin.

My twin and I spent our whole life in one city. We lived primarily with our mom and went to [our] dad's house every other weekend. When I was in seventh grade, my mom, my twin, and I moved out by ourselves. My mom is a very hard-working individual. She's very caring, but she's not too emotional or anything. She trusted us, but she was strict, [though] not overbearing. I share a lot of traits with her: the hard-working part and I can get a little bossy. Also, one thing about me and my twin, we're annoying.

So, my mom when we would be singing, she'd be like, "Quiet. Stop it, now," because she'd be trying to relax, and we were just being ourselves.

I can be a bit annoying and impulsive, I am very talkative, and I have very little self-control. I would do things without thinking about them. I don't know why my parents don't remember it, but I used to be in trouble all the time in elementary school. I would spin around the classroom because I was bored. I just gradually started to realize if I keep acting this way, then I'm going to keep getting in trouble. So, I thought, "Let me chill out. Let me just sit down." I was one of those kids who was always reading something because I would get done quicker than most kids. All I remember doing in school was reading in the corner.

After school, I used to force my twin and my cousin to play school with me and do worksheets. I was insane about it. Every weekend, I'm like, "Hey, let's play school!" I used to do it even when I was in sixth grade. I made PowerPoints and lesson plans and stuff. My grandma was an elementary school teacher, my grandfather was an assistant superintendent, and my uncle was a principal. So, I've always been interested in teaching, but I never really felt any influence from [my family] to do it, though. I just always been interested in it. I plan on becoming a teacher in either ELA or science. Yet, no matter which of them I am going to do, I will make my students sing in class like we did in my [AIL] physical science class. I like English and science and stuff, but I like singing a whole lot more. That's top for me. I like to read, but singing is my number one passion of all time.

When I was around 3, I started singing. Not lessons or anything. I just played this American Idol game. My mom doesn't sing. No one in my family sings. My grandma

says that my grandfather could sing, but he died before I was born. [My grandparents] and I, we're more arts people. My mom didn't understand my love for singing as she is not that type of person. If I had wanted to do sports, she would have been like, "OK, you could do track or you could do basketball." The arts were just something different to her.

[As a result,] I've never had voice lessons, I'm self-taught. I've just always sounded like that. I've never even learned how to play an instrument. I was a snake in "The Jungle Book" in the fourth grade, and I was the only person you could hear singing. [Eventually,] my mom put me in drama kids in seventh grade because I really like musicals. I just didn't really care about plays. If I'm not singing, why should I audition? But, in high school my drama teacher was like, "You should audition, even if it's not a musical." So, I started auditioning for the plays, too. I definitely thought about majoring in musical theater at my university, but I can't dance.

I had one – no – two good drawings ever in my life that my dad just loved. One of them is still on his computer. I don't know how he got it because I don't think I brought it home. I was in fifth grade. It was a picture. We were focusing on Japanese artwork, and I drew a volcano. There was stuff coming out of it. It was in the ocean, and it looked good. I don't draw though. I love music.

I like old school R&B. I like Whitney Houston and Motown. I love Michael Jackson. So, how I sing is heavily influenced by those people, specifically. When I was in middle school singing for events, it was always Whitney Houston. "The Greatest Love of All Things," I will always love to sing. I like classical music, too. I just don't like it when they make me sing too high because I'm not used to singing up there. I had to restructure how I sing, and I was just not good at doing that. I'm not classically trained or anything.

That's why I like doing theater because I was more used to singing how I naturally sing, but in our chorus, I was forced to be a soprano for years at the fine arts school.

I joined the fine arts school in the eighth grade from [a Title I middle school.] The Title I middle school was very interesting. Very unpredictable. You never knew what was going to happen from one day to the next. The children there could be unruly. You just never knew what was going to happen. One day, the entire class will be just fine, and then someone throws a chair for no reason. It was a very interesting environment to be in. A lot of the teachers did not like the fact that I was there because they thought [my twin and I] should be at a better school. We were fine there, though. We didn't have behavior issues, and we did very well there academically. But, when we told our teachers about [attending] the fine art school, they were quick to sign our applications. Seriously. They were so quick! The principal didn't want us to leave because we were good students, but some of the teachers said that we needed to go. I was fine at the Title I middle school, to be honest. I had good friends. There were some people I didn't like there, obviously, but there were some people I didn't like at fine art school, too. I guess when I was at the Title I middle school, I kinda acted how I wanted to, but at the fine art school, I felt more like myself than I did before. I kind of grew up there in a way.

Physical science was my first [AIL] science class at [the fine arts school,] and I had never been in a class like it before. Ever. It opened me to new experiences, and it made me realize that there is not one way that I can learn. It just meant a lot to be in a class where we could just be ourselves. I think being in that class helped me figure out what I wanted to do in my life because it solidified the fact that I wanted to be a teacher. I was going to teach something like ELA or science.

In class, we were taught raps and songs during class to help us remember the information and stuff, and I thought that was so funny! We were all rapping and singing Bruno Mars songs with science vocab [substituted] in it. We would learn all the science information first. Then, we would learn the song. We would go over it in class, but it was expected for us to do it at home, too, so we would remember it better. The information in the song helps us remember everything when I took tests in that class. I would just have to think about the song in my head, then I'd go through the entire song in my brain and look for what I needed. We learned recent songs that a lot of people knew. So, we already kind of had the flow of how the song would go, like the Bruno Mars song. We also learned rap songs because you can fit a lot more information in with raps. Songs were just easier for us to remember, I guess. I think it was 10th grade in a different science class, but, suddenly, I was surprised because we all started singing the songs again together [all those years later].

I remember learning about solids, liquids, and gases where we had to do a dance. The teacher would be up at the smart board with a presentation and would teach us the information. For solids, liquids, and gases, solids would be there on the board showing the solids were more densely packed together, then the liquids were more flowing, and the gases were all over the place. We danced close together to show solids. For the gas we were moving all over the place. Then, [we showed] liquids being more flowy and stuff. The teacher told us how to remember it. You would do this hand motion for the solid things, then like this for liquid, and then gases would be all over the place. Then, we were asked to do our own choreography. So, we went to groups, and we all did a solid dance, liquid dance, gas dance, and stuff like that.

I remember watching other people. I remember with the liquid one like they were going all over the place, then for a solid thing, they were all close together, and then with the gas, they were running around. We did this mainly in the classroom, but I remember we did some activities in the stairwell, too. I remember moving around a lot in class and having to interact with other students a lot as well. You might hear singing, rapping, and practicing the dances and whatnot. I didn't mind because I didn't want to sit in the chair anyways. I was glad to get up.

I remember we had to make a song about radioactive [particles,] but we didn't have to do a song. Some people did skits. I think someone made a story about it. The teacher would tell us what we needed in it – not exactly a rubric or anything – but they would tell us what science needed to be a part of it. We would watch other people's performances, and then, after we were done, we would all come back together and talk about what they did and how it fit the motions [of the particles.] We just kind of breakdown what they did and how it was supposed to help them learn the material. We could see how other people interpreted it. Other people might talk about other things or have done it a different way than you did. So, you just get more variety of information and ways of seeing it.

I thought it was going to be interesting. I've never done something like that before in science class. It was fun. We we're rapping and stuff, but then we would all get nervous when it was time to perform for the people. I mean it didn't bother me that much, but I would still be a little nervous. I just enjoyed being in a class like that. Especially, if you're in a school of the arts, it really meant a lot to me because we would sing, rap,

dance, and all that. All those things were things I was interested in, and a lot of my classmates were interested in it, too.

[In AIL,] you're using the information so often that you're not just memorizing. It makes it easier to remember things when you're applying rather than just memorizing the notes [in traditional classes]. At the fine arts school, it was mainly just notes like the whole time. I would be sitting down, and there would be a PowerPoint presentation on the board. The teacher would just have the information up there and talk about it. We would write notes and then on to the next slide. Sometimes, it would be like maybe videos or like something like that, but not really. It would just be information and notes. Then, you would go to your next class. I liked taking notes in middle school. It was just easy, but everything was just so boring.

In Biology, we would take notes and have worksheets and things like that. For labs, we would get a set of instructions, and then we would just follow it and answer the questions that went along with it. Would we get excited? Not necessarily, no. In honors chemistry, we had to work in groups reading the instructions with someone actually doing whatever we had to do [for the lab.] Then, afterwards, we would discuss what we just did to answer the questions on the worksheet. I don't like group work when my grade is impacted by what others do. I get scared when it's a big project because I don't like slackers. My grades can be impacted by you not doing anything. So, I get upset easily. I was interested in the labs, though, but, if it was a concept that I was having trouble understanding, I wouldn't want to do it.

I like to stay in the background for group work. I'll give my little .02 cents every now and then, but I don't like when people tell me I'm bossy. I can be the leader, but I'm

more of a facilitator. I just guide everything along because I don't like fighting to be the leader. I do like group work, but if I'm in a group with other people that don't know what's going on, I'm not going to know what's going on because some people will explain it wrong. I also think group work can be helpful because you get to hear other people's ideas. I like working alone because I know I can depend on myself for the grades.

[In forensics,] we did labs, and we took notes or looked at videos. We watched [the tv show] “Forensic Files” once. We listened to a podcast every Friday. We would take notes about how a lady went missing in order to put the information in a timeline of what happened to the person. I liked that class a lot too because I was very interested in it. I like watching “Forensic Files” and crime shows like “Law and Order.”

AP Biology was a lot more about taking notes because it was a lot of information. We would do some labs and [some AIL] things. I remember we put icing like on cookies once because we wanted to make the cookies look like DNA when you have to insert it or delete it. One of the questions on the final AP exam, was a lab or something. So, we did a lot of labs. I really like biology, but it was a lot at once. I struggled because it was a lot of stuff [to do and learn.]

AP environmental didn’t have many arts things either. There were a lot more videos and labs and discussions. Despite being traditional, I think that class was different because it wasn't just focused on taking notes. It was us talking about the information to help remember it more. I thought that the material itself was interesting, but most of the time I'm probably interested just because I like learning. I did like the class though, so it was easier for me to learn in it.

My interest matters to me because the more I'm interested in it, it's easier for me to remember it long term. If I don't like it, I'm just going to remember enough for the test, and then I'm going to forget all about it. I think [when learning] in any science class most of it happens because I am already interested in the material, and then, the other half of my learning depends on what the teacher does. So, just having more discussions about what we're doing with the teacher and with other people – and videos and songs – helps me understand and be excited about what we're learning. Most [AIL] lessons were group activities, and it was more fun doing those in groups. It's a little nerve-wracking cause you have to perform in front of other people, but it is better with groups as you won't have to come up with songs and skits all by yourself. So, when you have other people, more ideas are being thrown around.

[Once,] we had to make a comic about photosynthesis. We started with the story and what information should be in it, and then we go into what it looks like. I can't draw so you wouldn't see me doing that. I'll be more focused on what words are in it or like what it's about, but I'm not drawing a single thing. Everyone has their strengths and weaknesses. I can't draw, so why would I draw? But I like stories and writing, so I'll be better doing something with that. That's why if you do a comic strip, everyone has something that they could be doing. But, if you were working individually, you have to do it all by yourself, and that wouldn't be as fun.

[As a teacher,] I would want to put music in my classes because I love it. That's something that a lot of other students would like as well. If I was going to enroll as a science teacher, I would do more activities like that. I've always wanted to be a teacher, but I didn't know what I wanted to teach. A professor at my university helped me realize

that if music is my passion, then I should go for it, especially if it's something that I love doing. I could just combine the two and be a music educator.

When I was in sixth grade, I wanted to be a teacher. I would just think about how my day was in school to help create my imaginary class. I would make a PowerPoint, put some notes on the board, play a movie, and stuff like that. But, after going to the fine art school, I want to incorporate more of the arts into my lessons. We will be singing, dancing, writing, and drawing. I just want to make a good environment for students so that they want to keep learning and develop good study habits. I feel if you start early, then students will be good most of the time. A lot of students are already rapping, they're already drawing, but they're just sitting in the class taking some notes. If I were to teach middle grades science or ELA, I would have just tried to add some variety. Maybe I could be like, “We're going to rap about Mitochondria today.” Students could write a story about whatever topic this is. They could make a dance about how this works. So, they're not as bored and the classroom or zoning off or whatever. They could just fuel whatever other passions they have. That's what the AIL classes did for me. I feel like everybody should do something.

I feel like you should sing, dance, rap, write, write, do something. I feel like it's just a good way to be creative, be more expressive. I feel like AIL really helps with children's creativity and how they like express themselves. I also feel that doing those things will help [the learning] stick in their long-term memory. If you draw it, that digital imagery definitely helps the memory, right? And, I think with singing or rapping they're going to be able to remember it rather than just taking basic notes. Maybe, if they write a story or something about it, they would connect different ideas and topics. I feel like AIL

will be helpful because it makes everything a little bit more long-term for me. Notes were easy for me. I just wrote notes and went home, but that wasn't good for my long-term memory. I like writing random stuff, but that's not the most helpful method [to remember things.] It works for me, but it won't work for everybody. I was able to remember the songs way longer than the notes.

AIL helps with students' creativity and self-expression as well as long term memory, but you may not want to do it if it's not something that they're interested in. If they don't like drawing or telling stories, then I don't want to do that to them. For me, with drawing, I always tried to make it work. So even if it didn't look that good, I tried. I'm not a good dancer, but we did the movements for solids, liquids, and gases, and I feel like that might have helped in the long run. Being like in a class where we would do stuff like that, it made me not as self-conscious about myself with it. I'm just going to do it.

Maybe for the students that never had AIL before, it would be harder for them to come up with something on the fly because they're not really used to coming up with things. But, if they already had an AIL class, they wouldn't be as hesitant to do it. I feel like AIL has made me more creative. So, if I am asked to do something creative like that, I already have experience coming up with something. I feel like AIL helps me now in college when trying to do new things. Sure, I don't know how to do it yet, but I can learn. I can figure it out. That is what I feel I learned from all of [those AIL lessons.] Sure, I can't draw, but I can figure something out.

On top of the skills I learned, the fine art school definitely solidified how much I like science. I really wasn't interested in science until I was in seventh grade because I really liked biology for whatever reason. That's when I got my idea in my head. I was

like, “what if I like science?” ELA has always been at the top for me, but I would say that it would flip flop depending on who was my teacher or what specific topic it was. For example, I took a traditional biology class that my other classmates did not really like, but my love for science didn't die or anything. Nothing really happened to it. I still liked it. I didn’t even have to take a science class my 12th grade year, but I wanted to take AP Biology. I really like biology, and I wanted the GPA boost. My classmates have more of an issue, but me, personally, I do like the structure of traditional classes. I like knowing what to expect, but I also do think it is very important to have variety in the classroom. That's something I learned in my exploring learning and teaching class this year. I'm fine with notes, but I realized that might not be the most helpful method for everyone. I definitely do think that the variety of things is the best way to go. You can take notes, but if that’s the only thing that we do, it's easy to get bored.

In college, there’s no arts integration. It's mostly them talking, and you're taking some notes. That's what it is half the time. I do have a class where we play Kahoots, but that's pretty much an anomaly. For [AIL] there are pros, but a disadvantage of it would be that it's not how you do things in college. For [AIL] students, once they're getting closer to college, find ways to help them adjust to how things are done in college. I feel [AIL] is helpful in the long run, or I guess it's easier for us to remember. I feel if they didn't already have a love for the subject, I feel like they would develop one from doing AIL in science because it definitely helped me. I barely liked physical science, but I have an appreciation for it. I think by being in the AIL class I was more interested in learning it.

How I learned in my Title I middle school was very different from how I learned in the fine art school, but I thought that how I learned in the fine art school was way more

helpful than the Title I middle school. I feel like when you're in middle school, students are gauging their interest in an area to see if they can be successful later, and the arts-integrated stuff would have been a lot more helpful for those Title I students to make them more interested in the subject. AIL lessons are worth the effort.

Reflection on Bob

Bob was an education major who had an overall positive experience doing AIL at the fine arts school. She was extremely knowledgeable on education as she was an education major, and she could use that knowledge to help evaluate her time in AIL. The first thing that struck me was that Bob loved to pretend to be a teacher and teach her sister and friends when she was younger. She used the traditional methods her teachers employed in her classes since that was all she knew. After her first experience with AIL in science class, however, she changed her simulated educational approach to include more arts because she enjoyed it more, and she knew that her family and friends would enjoy it more, too. Bob said that she loved her time doing AIL, especially doing work with music as singing was her passion.

While there was much that she liked, the group work aspect of AIL made her uncomfortable as she did not always trust her classmates to do their work right. She never had any issues with nerves during AIL performances, and so even considering her dislike of group work, Bob believed that AIL was a must for her future classroom as an educator. As a further testament to her belief in AIL, she attended a Title I middle school where many of the students struggled in class and struggled with behavior. If she was teaching that same group of struggling students as a future educator, Bob would use AIL lessons that the students would find fun and engaging.

It's Bob's unique perspective as a future educator that highlighted her positive reaction to AIL. She believed that the AIL activities in her classes would enable students to make connections between ideas and concepts that they would not get in a traditional classroom. The more connections between ideas that students make, the more long-lasting the learning will be, and Bob saw that during her time in AIL. Bob reported that singing, dancing, and rapping built the learning into her long-term memory because it's so creative and expressive, and it forced students to think and use the information, often in evaluating each other's work.

Bob also addressed how her interest in science was affected by her time in AIL. She was getting by at her Title I school as a student, but she had been in love with music and theatre for years. She did not go to the fine arts school with any intention of looking for a science-related job, yet her experiences in science AIL were so positive that she considered becoming a science educator to do these same activities. Her time at the fine arts school "solidified" how much she liked science. In her vignette, she mentioned that learning science using AIL could improve a student's future success in college. When getting used to traditional college classes, there may be a struggle adapting to the style of instruction. AIL was not used in her college classes, but if it was, students could develop a love of science and learn better during their time in science class.

The themes constructed specifically from Bob's codes match the vignette well. To summarize, she believed AIL to be worth the stress because she learned deeply through AIL and she loved to be creative, dance, and sing. She felt the nerves in AIL even though she was a practiced performer, but she also craved the chance to use the arts every chance she got. She recognized the power of AIL in helping her learn and remember the

science information, especially when taking classes like physical science that she did not enjoy as much. Bob's vignette covered the same ideas and themes that her vignette discussed, which should indicate a good analysis if they both match this well. Bob, a teacher candidate, had many of the same ideas as Bubblegum whose vignette is presented next.

Bubblegum

"There were times where I was in a different, more traditional classroom and the science [AIL] kids were going crazy in the hallway. We didn't get why it was so loud. We didn't understand, but once we were actually in that [AIL] classroom, and we had to do it, we understood. We know they're learning."

Meet Bubblegum

Bubblegum was a college student majoring in social studies education who was getting close to graduation at the time of this interview. I had the pleasure of teaching Bubblegum twice, once in an AIL class and once in a traditional science class. An avid singer, Bubblegum attended the fine arts school for only 3 years and attended a different high school her freshman year. Bubblegum interviewed virtually because of her college schedule. She also had a lot on her mind as her father was ill at the time with multiple sclerosis, yet she still found the time to meet with me and share her thoughts on AIL and traditional instruction at the fine arts school. He later passed away after we finished our interview series. As Bubblegum attended a different high school freshman year, she had an added layer of perspective that the other participants did not. I was able to teach her in two classes, one traditional and one AIL.

Bubblegum was also an education major at the time of this interview and was able to share her perspective on learning while taking classes on curriculum and instruction at her university. She had many thoughts on instruction that were informed by her classes she was taking at college, and by the experiences she had attending Title I schools growing up. She did not rely solely on her educator classes for perspective. She included many stories and ideas from her time as a student. Bubblegum seemed unsure of herself somewhat in each interview at first, often looking around her room when she was speaking. However, she settled into the process the more we talked and became much more comfortable by the end. She would light up as she talked about her time singing songs with AIL, and she would laugh wryly as she discussed her trouble learning in more traditional classes.

Bubblegum's Story

I'm the youngest of two. I grew up in a house with both my parents and my brother. So, I always had my family around. I also grew up a lot with my grandmother. My dad was a hands-on parent – mostly because he was sick. He started to get sick back in elementary school with multiple sclerosis. My dad's very outgoing. He'll talk to anybody, and he's very encouraging. He taught me how to support people 100%. In middle school, when he was out of work, I started my day and ended my day with him. I hated middle school, but he would encourage me, "I believe in you" and "You can do this!" and because of that I thought that I could do it.

Since my dad couldn't work, my mom had to step up and take two jobs. She worked two jobs from when I was in kindergarten all the way up to junior year of high school. She's a woman who will [push] you, but I feel like she just wants to see her

children do better. My mom went to college, but my mom does not currently use her degree. We were comfortable, but we weren't completely comfortable. We didn't do family vacations. We were just: work, school, and home all the time. My mom wants better for me, and she knows my potential. She wants me to work hard, so I can live better. She would be my voice of reason, while my dad was [supportive]. It was a nice balance.

[With my brother,] I check up on him. He checks up on me, and we're good. Personally, how I see it is we were in competition a lot. He was older, I was younger, but I was smarter. They were less hard on me than they were on him. I didn't want it to be a competition. I showed a little bit more confidence in my learning, and I brought home As and Bs [on my report card.] That's what they wanted to see. So, I would bring them homework for validation versus he would bring home a C. If I failed or something, I didn't want that to happen. So, I would try harder. I enjoyed the validation because I would get all this attention. I wish I was congratulated without having to make him feel crappy, but it didn't go that way.

I was a pretty good student. As and Bs. I struggled a lot with homework mostly because I wanted to focus during school, but when I got home, I wanted to play. I hung out with my friends and went out on the weekends, but then, when I got older, it got to the point where I was a procrastinator. I would wait to the very last minute, and then I would get it done. Would it be my best work? Probably not, and that is a very, very hard habit to break. So, I did pretty good with grades until I got to high school. My freshman year, I went to a school that was all about academics. There were no clubs there. I didn't

like it, and I left. There was no choir or dance; there was nothing fun. It was just work hard, get your grades, and then go to college.

We went to church every Sunday with my grandma, and there she wanted me to join the choir. I liked to sing anything and everything. I would sing around her because I felt like I was comfortable around her. It was always an interest of hers to get me into a choir, mostly because I liked to perform. The first time she tried to make me do it I threw a fit and cried though. She had to come and get me off the [stage], but from that point forward, anytime it was an opportunity for me to sing, she would say, "You're so good. You should do that!" and so I did. She was proud. Even my grandpa, before he passed, was telling me this is something I was good at, and I should keep doing it, and I thought I just might.

In my time before the fine arts school, I went to a Title I middle school, and there were the kids who were behind and the kids who were ahead. The kids who were behind had teachers who would talk to them a certain kind of way. The teachers [thought] they were always doing something wrong, which was why they acted up. If we're going to get in trouble anyway, we might as well do what we want. It got to a point where the good kids, like me, were not learning. I was traumatized by my middle school experience. It had such big classrooms, and it was harder to stay on task and harder to learn. The one thing I wanted was to learn. I didn't want to be at school trying to deal with behavioral things all day long. Then, I heard of the fine arts school, and that's something I wanted to do. My parents loved the idea, especially my dad. I started going my sophomore year.

Teachers at this new [fine arts school] were off-the-walls different. I saw a lot more people's personalities at this new school when it came to teaching, and I liked that.

They incorporated a lot of what we were interested in into their classrooms, and it helped me learn a lot more. My classmates used to say that it was so hard and so much work, but once we sat back and thought about it, we realized how good we had it. We got to build this bond with our teachers, and it made math and science a little bit more fun than it was in middle school.

My mom was [concerned] about me going to the fine art school because it was an art school, and it didn't hold any academic value to her. However, I was interested in learning how to go further with music. I wanted the guitar and a piano, [but] when I got them, I wasn't very good at them. So, I walked away from them and stuck with singing. I learned how to read notes. Up until that point, you could sing, and no one was going to tell you that you're doing it wrong. You're just singing, and you sound good – until I learned you had to do it a certain way. I'm not going to look at someone's art and judge it [because] I understand that people do things in their own style in their own way. I like it for what it is, and not because of what I think it is, or how the last person did it.

As I've gotten older, I've gotten more reserved. I've grown out of a love of [performing.] I created a shell of I don't want to do that [because] I thought I was good. I thought I had the dedication, but I saw there were people just as good, if not even better than me. They had more of a driving dedication than I did, and they always had it right. I guess that's where competition comes into my mind when I'm like, "Well, if they're better they're not going to like you know say to the background I'm good enough to be where I need to be." So, I kind of stopped trying a little bit.

I would [still] rather be in a choir class or art class than science because science and math were always something that I struggled in. It took a lot more of my brain to do

it than ELA or history, I would do my best in art, choir, history, or ELA, because it's easy and there's no correct way to [answer a question] in those classes. But for science, you have to do a formula right. You have to do science, right. There are facts to science and math is logical, So, if you don't do it that way, it's going to be wrong, and I don't like being wrong. I don't want to sit there and do it over and over. I want to get [it right] the first time around.

In elementary school, science was about the planets. We talked about ecosystems, and they make it fun. You're learning about animals, so they show you what the animal looks like, and that's easy to remember. Then, I got to middle school, and that's where there's [talk about] gravity on this planet. Then, you're like talking about the temperature. I don't remember anything from eighth-grade science, obviously, as it was mostly worksheets.

My first high school science class freshman year was an elective, forensic science. I was excited to be in that class because it wasn't a standard science class. We didn't get a workbook, but there was a textbook and notes that the teacher would make. We would watch "Forensic files," and we all had this weird obsession about true crime. We would do lab projects and work under a microscope. We did drawings a lot, coloring and diagrams. It was always a creative, hands-on classroom. Because it was an elective, she made it fun. She made it entertaining. I'm a visual learner, and in the videos that we watched, we could actually see what we learned.

In my first science class at the fine arts school, I did not like the class mostly because of the topic. It was hard for me to grasp because I felt a lot of the information was unclear to me. It was a lot of learning from your notes, the book, or the workbook,

and I didn’t find that enjoyable. I don't remember watching any videos. If you don't understand it, then you're expected to sit alone or by yourself and do it. [Learning] becomes more like a chore, and it becomes hard to learn trying to understand it yourself. When I feel like I didn't understand something, I wasn't comfortable enough asking for help. Other people don't understand it either, and you're just both sitting there looking silly. Since a lot of it was worksheets, it was easy for students to copy off of each other. You just have to sit next to somebody who knows what they're doing. It's not really helping me learn. I didn't really have the best time in that class. Granted I did leave the class with the B. Truthfully, I didn't deserve it, but I’ll take it.

Physical Science was an easier science because that was simple math that we had to integrate into science here. We did get a chart where we had to write in the periodic table, and that was helpful. We got to color it. That was helpful. You know you got to make your own and you got to use it as a map, versus getting it printed out already. The [AIL] teaching was great. We were always asked if we understood, and we were always able to backtrack if we didn't understand. I did ask for help [in this class] because the teacher made it comfortable to where we felt we could ask. The teacher just wanted us to learn as best as we could and took pride in learning versus just trying to teach it. It was more important that we learned versus the teacher just saying, “Oh, I just taught that to you guys, you know.” And then, when we got to be able to do the arts integration, we were like, “Oh, so it's like not only that you care, but you care about us actually learning it?”

In a normal [AIL] lesson, we got presented with new information. The teacher read an example, showed it to us, and then worked through it with us. We didn't have to

start out doing it on our own. Then, the teacher would give us the problem and give us time to work on it by ourselves, or in our group, and then we would come back and discuss what we learned. It was the first class of the day, and we came in a little groggy. The teacher was like, “Let's start with a song just to wake us up,” because the teacher wanted to engage us when we're learning. We would always do a song when our energy was drained. I would say that it helped [get] your blood flowing and would also make sure we were on task too.

I remember acting [a lesson] out, but I don't remember what it was about. I was able to take the reins on it. That was the first time I got to produce something and be a lead on it and have it work out. I was proud of it because it was the first time that I had ever done anything like that. I did a pretty good job getting the learning across [in the performance] for someone who doesn't like to be in the spotlight. People were nervous, but the teacher still encouraged us to do it, regardless of how we felt about it.

Once, we did a comedy show where you make jokes about Newton’s laws. It had to be accurate information while being funny. You can't just talk about it, and no one understands what you said. You set it up with basic information, so your punch line is the law. Just be accurate as possible while being funny. So, you got to kind of integrate a lot of science and art. You have to think about it; there's a lot more thinking. You're exercising that side of your brain that you don't use a lot because you know you're in school. Learning can be fun, and you get to teach people something in a way that they probably didn't think they could learn.

People think schools should be all work and no play. I can remember someone saying to me why are you laughing? I was at lunch or something like that in middle

school, and it's like let me have a break. There were times where I was in a different, more traditional classroom and the science [AIL] kids were going crazy in the hallway. We didn't get why it was so loud. We didn't understand, but once we were actually in that [AIL] classroom, and we had to do it, we understood. We know they're learning. We would make videos or songs, and it wasn't by the book strict. It's not just noise. Not just sound. They are being creative with their learning.

I remember an interpretive dance lesson where we had to make up moves, describing the motions and energies of solids, liquids, and gases as a group. We had to physically show with our bodies what it looked like. We had to act it out without talking about it. Yeah, the teacher wanted us to have a visual of what it looks like. So, during a test where we couldn't talk about it, we would be able to picture it [in our minds,] and we would understand it that way.

The good part about working in groups is there are different types of people in your group. There's always someone who has all the notes and all the information that you need, and it is that really creative person who can come up with the idea of what we are going to do. We will all just like feed off of each other's ideas, and that way we could produce something that would make sense and it be accurate [in its science.] I would allow others to take the lead, because they were a little bit more confident about it.

During those times, I felt a little overwhelmed by all the [AIL] lessons, but at the same time I've grown in appreciation for it. At the time, I did not understand why my teachers were integrating the arts, so I wore that attitude of: why do we have to do this? It gets repetitive but it got to the point where I was annoyed by it. Some days I was up for the art integration. I was up for the acts and the skits. It was mostly us learning the

material just to pass the class. Now, I understand if I were to learn it [more traditionally], I probably wouldn't have understood it.

To understand something, you've got to have that basic knowledge of it. [It's] the only way you're able to execute a creative performance for something that you learned. [AIL] can gauge how much people understand and how much they learned from what you taught them. [AIL] had a positive impact on how I learned. It was more of if I can learn it this way, then what else can I learn this way? I had the same teacher again for AP environmental science as a senior. The teacher said that this AP class was going to be different and more traditional, and I did not believe them.

Our first class, we had to a create a video where we do check for bad [environmental science] things around our house, and I feel like I did pretty good. My first thought was that this is familiar to me. Then, it got into the serious nitty-gritty. We had slides, and we worked on assignments online. It went from, "Oh, maybe this is going to be fun," to "Oh, this is a lot of work," and it was a lot of work. I did not enjoy it. My biggest issue in my writing prompts would always be when I was describing something. When I was asked to do a discussion board, I had to pretty much re-learn all like the traditional [skills] that I hadn't done in a while.

We would still do projects, but I don't quite remember any performances. It was an AP class, and there was a lot of information that we had to learn in a very short time. We were pretty much learning for a certain test, and we couldn't be as creative as we wanted to be. I think it reflected on my end because I was used to learning a certain way last year, and I had to pretty much do a 180, and I had to learn completely differently, and I didn't really adapt to it well. The teacher taught the best way they could to help, but it

just wasn't helpful for me. I could have done better; a lot of it was just me. I didn't grasp the fact that this [AP class] is a different level of learning. You can't be as creative with this learning. You had to use certain words and be more descriptive in your writing prompts. You're expected to do a little bit more.

I shut down when it comes to science because if I don't understand something, I'm just not going to learn it. Having weak studying habits during that time, it was harder for me to learn, but, when I think on it now, a lot of what we were doing [in AIL classes] was repetitive so it would stick in our head. You're not reteaching it to yourself because it was taught to you in class already. It worked as well because [AIL] helps information stick for me.

I said that I was more reserved and a little shy. So, it was really overwhelming for me performing in front of people because I didn't want to mess up. The teacher pushed information, not perfection, which should have eased me a little bit, but I was more worried about my performance. As a chorus major, we pushed for perfection, and it gets ingrained in your mind. So, you're like, "Oh, man, what if it's not right? What if we don't perform it right? What if there's not as good? What if we don't execute it?" So, you overthink the whole project. You're supposed to have fun, and you're supposed to deliver the information. You're not supposed to, you know, give a "state of the art" performance in an 11th grade physical science class, you know?

See, [Physical science] was a morning class, and we were in high school. We were tired and bitter. We felt it was a chore and with a high energy teacher early in the morning. High fives when you come into the classroom? The teacher was loud, and ready to go. Half of us were still waking up and had just stepped into the building. We didn't

even have breakfast or anything. When I was getting there, I had woken up maybe 10 minutes prior. So, I am not fully awake. I am not ready. I just wanted to chill, but it did help wake us up.

It was always in the back of our mind: how are we going to execute this [AIL lesson] or why do we have to do that? Why can't we just learn it, have a test, and be done with it. In the long run, at least for me, I really appreciated it because it was a good distraction from life. When you're just getting to school and the teacher is a “leave it all out the door” type of person, that was a good way to start the day. [Traditional] classrooms, you got your quiet time, but when it came into the [AIL] class, the teacher would let us play music. So, we were prepared to have – not a crazy day, but – a normal day in the [AIL] classroom. It became normal. You know, it wasn't unexpected.

I enjoyed physical science way more than I enjoyed AP environmental for sure. It had us engaged more. So, we were paying attention way more, and there were different ways to help it stick. In an AP classroom, there was one way we had to learn it, and that way didn't work for everybody. It was strictly read it and write it, and that's not going to help me. If we had more arts integration in our AP class, it would have just stuck significantly better. Even though that physical science song was from 4 years ago, I can still remember some of it. So long as it is catchy, we can remember things that are catchy and that are easy to grasp. You can bring it up to other people who were in that setting with you, regardless of their feelings [about the AIL class,] they will know what you're talking about. You can ask them if they remember that song that we had to do 11th-grade year to the Migos, and they could probably sing a little bit of the song for you. I believe that's the whole purpose of giving us a song was for it to remain with us forever. If I had

even a poem or a little rap or something that has something to do with clouds [for my college class,] I bet you I could tell you about clouds.

At the time the teacher wanted us to learn it because we had to pass this test, but you don't really think about the long-term effect. It just sticks forever. It's repetition. Some students probably have negative feelings towards it because they had to do it so many times, but they can't say it didn't learn it or that it didn't stick.

I think the repetition would work for worksheets too because you know that's how I remember a lot of school, especially with math. You get those repetition sheets over and over and over again, so it sticks to you till you learn the steps and it works. Repetition works. If you were to set me down by myself and I had to do it, I knew what steps to go in. I knew how to execute it [because] I could see it in my mind.

After that [AIL] science class, we're little bit more open to doing AIL lessons because we've had a whole year's worth of experience. In my U.S. history class, there was times where the teacher had us do some AIL lessons, and we could execute them perfectly. If we had to do it the year prior, it would be a little dry. AIL lessons help you prepare for when that time comes, and you want to be creative.

[AIL] prepares us to work more efficiently because our science teacher only gave us 10 or 15 minutes to do what we had to do. You gain some skills with time management as you only have so much time to figure out what you have to do quickly and efficiently. You have four people in a group throwing ideas left and right, and you got to listen to each other, "Do you agree with that? Do you want to do that?"

Physical science, it was everything. The notes, the interpretive dances, the songs, you remember the whole class because it was so new. It saved a spot in your mind if you

had a positive outtake on it. People can remember better if you have a positive experience from doing it. Creativity is like a big, big part of making that class memorable. That specific class stuck with me so much that one of my final papers for my education class from the spring was: how would you teach some concept to a certain class? For starters, if I can, I want to be able to integrate the arts in it because I know that helped me and it might help some students. In a traditional high school setting, those like arts get a little lost. They get a little washed out by everything else. If you give kids who aren't really into [traditional class,] something to do, they will be more open to it than something straight from the book and boring. They're going to be engaged. Why have them watch a video, when you can act it out in person and gauge how much they know? It can be helpful to do something creative because you never know how other students learn. Some people can draw it better than they can say or write it.

For fine arts students, [AIL] lessons make school fun. Obviously, these creative beings went to this fine arts school because they were tired of traditional school. We wanted to be somewhere different. The arts can stimulate every part of your mind, not just that academic part of your mind, and in a traditional school, I didn't really have the best time because I feel like it was just learning, learning, learning, learning. That's not fun.

Reflection on Bubblegum

Bubblegum spoke calmly and quietly during the interview, and despite her initial hesitancy, she shared a clear picture of her time at the fine arts school. Bubblegum described her traditional science classes as a struggle for her. She and other students were expected to do a lot of learning on their own through bookwork, and there was very little

collaboration in those classes. Since so many students struggled, many students resorted to cheating just to get the grades they needed.

Much of Bubblegum's descriptions of her fellow students involved a very transactional approach to grades and classes. Students just wanted to get classes over with and get the grades they desired. Often, AIL lessons were viewed with disdain at first because they required much more thought and effort when many kids were looking to just get the work done for the grade. However, Bubblegum appreciated that AIL allowed her to get away from a bookwork-only education and allowed her to use her passion, singing. She looked back on her time in AIL classes and had an overall positive outlook. She believed that the AIL lessons were fun and engaging. She even mentioned that teachers who used AIL in class showed students that they cared because the lessons take a lot of time to create. She felt encouraged in AIL to make mistakes and ask questions, which was different from her time in traditional classes.

Bubblegum mentioned numerous times that AIL lessons helped her learn and helped the information stick longer in her head. She thought that students really had to know and understand the material to engage in the integration process, which helped them learn. All the songs and dances may seem like classes were out of control, but she came to realize that students were just thinking deeply and having positive experiences in their lessons. These positive, deep-thinking experiences really helped her learn and remember the information for her tests and in the years afterwards. The creativity required for these activities also helped her be creative in her later classes. She said that students who struggled in traditional classes would benefit from AIL because they get a diverse range of

experiences to learn from and they get a diverse number of ways to show what they have learned to the teacher.

Bubblegum did not show any change in her attitude towards science in her time in AIL. She opined that students who may not have enjoyed the rigors and repetition of AIL learning could not deny that they learned a lot in those classes. Bubblegum seemed to be one of those students who did not always enjoy all the time and effort that went into AIL lessons, yet, looking back, she realized that she learned a lot through the process compared to her other traditional classes and wished she had more AIL in her other classes, too. She saw that repetition mixed with a diversity of lesson styles made AIL a helpful process to students.

This reflection highlighted all the themes that were constructed for Bubblegum from the coding process. To summarize, Bubblegum knew that AIL was a lot of work and could stress her out as a shy person, but looking back, she would take AIL classes over traditional every time because she learned so much better and was able to be more creative in AIL than in traditional classes. Her themes were very similar to Bob's, but the reality is that both Bubblegum and Bob had spent time attending Title I schools and had seen how challenging it is to get a large group of students engaged in their classwork. They both are currently teacher candidates as well. So, they know what quality instruction is, which is why they both were willing to overlook the pressure of AIL to see the value in its instruction. The next participant, Quentin, had a very different perspective on AIL compared to Bob and Bubblegum.

Quentin

"Those [AIL lessons] were challenging in the sense that they're literally harder to do. [AIL lessons] don't teach them anymore about the subject. It's more just like an added layer."

Meet Quentin

Quentin was a college student who had plans to learn coding and join the FBI at the start of this interview series. Quentin attended all sessions in person and was always punctual. I had only taught Quentin in one traditional science class in his time at the school, and we had never spoken much outside of the classroom. He started each interview a little reserved as he was a self-described introvert, but as he gained confidence in what he was saying, he began to share a very valuable perspective on AIL different from all the other participants. Quentin attended the fine arts school for 4 years, but he did not attend because of an interest in the arts. Quentin came to the art school to get a good education without having to do all the work required of other magnet schools in the area.

He majored in guitar, yet he had no love for it, even though he was talented. He saw little future in the skill. Quentin was very straightforward and earnest in his appraisal of his time in AIL, and he had many suggestions for how to make AIL work better for students. He spoke with passion and conviction about his experiences, leaning back and cutting his eyes at me to make his points. He made it clear that he did not like any activities that waste his time. He wanted to learn, and he wanted his learning to be relevant to his life. His perspective helped shed more light on the experiences of students engaged in AIL.

Quentin's Story

I get big into video games – well, more into horror, which I've found very interesting. Stuff like Lovecraft and weird stories like that. Recently I started playing this Polish horror game that has been captivating me because it's terrific. It's a top-down game where you can only see what's in front of you, and your field of vision is super limited. You can only see what's in front of you at night, so all you hear is like footsteps, and then a door will just open. The game [forces] you to make choices where there's no good choice and someone gets hurt. The first one is a guy who walks out, and his dog is laying there whimpering. It's probably not going to make it, and I should put it down. So, you have the choice to do it or not. Binary choices are important. I was thinking I'll put the dog down, or else he'll just suffer. But, if someone could find a way to weasel around it and not have to make that decision at all, then it kind of loses the weight of the story. I love that game, or I'm starting to, because its dialogue is just super interesting.

Almost all the stuff I watch like or consume, in general, is [about] dialogue. As nice as it is to turn your brain off and just enjoy a good guy/bad guy story, it's way more interesting in the long term to see more fluid things happen. "Breaking bad" was a legend of a TV show because it's this good guy who turns into this horrible piece of [garbage.] That's so interesting to watch. That's real life. Back in tenth grade, I saw Pulp Fiction was on Netflix, and I turned it on. I remember it because it was the first real movie-movie I watched. I remember by the end of it my heart was pumping. I had never seen anything quite like it before. I think that's when I really started to get into questions of moral ambiguity.

I've started doing dungeons and dragons a lot because I have the brain of a sixth grader, and I like to sit there and play with lasers and dragons. The more open nature of the [story-based] game makes it so anything can happen, and that's fun. I'm a good public speaker now too, and I think dungeons and dragons helped me with that because I'm the dungeon master *(the dungeon master in dungeons and dragons creates and tells the stories for the players)* I've been thinking about D&D as a medium for telling stories because it's a communal story that everybody shares in. They have to curse some priest, and I start thinking about how many different ways they could approach that [quest.] Maybe it's a flashy spell. So, how are they going to [keep] from getting stabbed while trying to cast it? Well, they could just knock them out and steal them, or they could set a building on fire. There are so many ways to play.

I wanted to be a writer for most of tenth and eleventh grade, and for as long as I can remember I've been making up stories in my head. Whenever I listen to a song that I really like, I do the little kid thing of "There's a ninja battle happening!" When I was in the after-school program, the first thing I would go to is go to those blocks, and I would build a tower. Then, I'd think of some way to knock it down. I was always making little fictional-nonfiction science stories behind how things work. When I was younger, a friend and I were making cartoons about: What if we were awesome? [Those stories] would have been horrible to watch and so boring. There was no substance to it. Nothing behind it. It was just cool robots and ninjas. I was never a person to draw as it would look [terrible.] I might draw a machine, but not a landscape because it would look like garbage.

I'm definitely good at guitar. Not to toot-my-own-horn, but I was the best in the class. That's more because the other two people who are better than me moved, but I'm a natural talent in what I'm not super passionate about, which is weird. I mean there's not really any jobs in it. Art is important, but I want to do something that does something. I could be a guitarist, but there's a one in a billion chance that I will make it. I either [become] a massive millionaire, or more likely, I'd be the starving artist archetype, just sitting there playing guitar in the back of some Olive Garden.

I'm not talented at very many things, but I am attracted to coding. It's a puzzle. It's a show of knowledge when you are able to do something in it. Creativity is something that's always been something I've been interested in. So, I enjoy coding because it is also a creative process where there's an infinite number of ways to approach a problem. I'm currently majoring in cybersecurity. It's fun and interesting, and it's the best way to get to where I want to go: the FBI. Just a field agent, hopefully.

I didn't know what I wanted to be when I was a senior. Ironically, I've never been into making music, even though that was my major. I got into coding at the end of eleventh grade, and I started learning some things, but I was by no means awesome at it. I just don't want to do boring stuff [like] my friend's dad who works for a big bank. So, where do you actually do the Hacker stuff? You do it in a government agency. I saw a documentary by CBS on American hate, rising fascism, and stuff. I was so freaked out because all my friends from school are queer or LGBTQ, and I was thinking these [fascists] want to hurt the people I care about. The FBI has a task force for it, and I was like, "Okay i'm going to go do that." I get to be a cool hacker, and I get to take down

fascists while protecting my friends. I've never felt like I needed to protect people. It was mainly just kind of triggered by watching that video.

All through school, I kept getting adopted [as a friend] by people. I'm definitely introverted, so it depends on who I'm around. I can't talk to people unless they start it, and I can only talk to weird people. So, I did well at the fine art school. Now in college I'm mostly around normal people, and I'm not functioning. My friends and I are the kind of people whose comedy centers have been stunted ever since sixth grade. Sharing the same humor helps me [open up.] For me and my friends, the goal is to act as dumb as possible with normal people around. The joke is just: why is he acting like that and what was wrong with him? We keep building the joke up saying the dumbest thing we can. When people are joking with their friends, they are telling a story. It could be about what happened in the grocery store or something, but you're participating in a fiction. A joke is some form of fiction that you're doing at that moment. Religion is just collection of stories [that people remember.]

If you lecture somebody and don't tell them a story, they're not going to listen. So, many people just zone out because we don't learn that way. We learn from stories, but it's very difficult to design a story if you want to teach somebody about math. It's so difficult because their brains will be able to tell this person's trying to teach me something and turn off. If the story happens organically, then it's such a useful thing for learning.

[My] elementary school was a normal school experience, but, throughout all of middle school, I was depressed because they put me on ADHD medicine. It was making me sad, but I didn't say anything because I was a dumb little kid. So those 3 years sucked, but I think that middle school sucked for everybody. [For high school,] all my friends

were going to a different school, but I heard it was really hard. It was the summer reading that killed it for me. Legitimately, I was not doing that, but at the fine arts school, I made friends there that I wouldn't have made anywhere else. It was a very special place for sure.

[At the fine arts school,] we had to use our arts to explain concepts in our biology class. Because of a weird technicality, I didn't even do it. I got a free pass on it. It was just a bunch of arts and crafts or games and representations. There wasn't much [AIL] in the classes I took where it was really heavy and noticeable. One example was in my tenth-grade physical science class, and it was about the types of motion. We had to make a skit explaining all of it and represent these ideas as using the art form. That was the idea, but I don't think it's super helpful unless you already know the art form. You have criteria you have to meet [for the assignment.] You have to explain each concept or represent each one. We would group up in threes. Then, we go out into the hallway, and the teacher just sort of set up there and waited in case we had questions about the lesson.

Personally, that one ended up being a real headache because, ultimately, it wasn't really challenging. It was just a week where the first day we could do it just in class. You get yourselves together and talk about what you're going to do, and then, about a week later, the next Monday, we presented it to the class. It was good for science. So, you push or pull, and other things – I don't really remember. It's just using the notes.

For most [AIL assignments] we're all going in the hallway because there's not enough room for everybody to spread out in the class. There's a lot of chairs in there and people would be tripping over the chairs trying to do Shakespeare. We would sit there at the top of staircase, right next to the exit door, and we had that little square corner to act

in. We would just talk. We didn't really write much down, just [key] points. We didn't write out a script. We would act out and get one part of it ready, and then we'd think: okay, what next? How do we meet that next criterion? Then, we practice the whole thing.

I didn't feel like really developing any skills that I didn't have already. All I did was make it a comedy that's just easier for me. It was just making jokes that somehow related to the topics. I kind of have a sense for that because as a kid most of what I do is go on YouTube and watch funny things. I watch people be funny. So, it was natural to try and make something funny.

The group dynamic was a little bit [strained.] We had a person who was very bad at teamwork because he just steamrolls everybody and then goes off on his own ridiculous thing. One of our other group members was starting to have a panic attack that we might not get the [AIL] project done in time. I remember that I got partnered with people who actually do work once, and we made the presentation within a day.

Now that I'm in college, I actually want to understand why even they're giving me this work. What does this activity help and why do I need to know this? Does it contextualize the concept and really make sure that I understand? That's really the key that was not hit in my AIL high school classes. Those [AIL lessons] were challenging in the sense that they're literally harder to do. [AIL lessons] don't teach them anymore about the subject. It's more just like an added layer. I guess it gets them a little more engaged. Maybe afterwards, have them write a paper, saying: this is how we came up with our idea.

Doing [AIL] was like, if you had a piece of music, and somebody said: you have to hit notes A, B, and C, but I don't care what else is in between. They [just] have to get

an A, B, and C at some point. You just had to use specific vocabulary to get credit. As long as those words and those concepts were illustrated in a way that made sense – not just listing out things – then you get a good grade. Does it make sense to the teacher, and does it make sense to you? It didn't [even] have to be interesting because what's the teacher gonna do? When it came to the arts and crafts part of AIL making DNA out of paper and coloring, I hated that stuff. I'm not good at it. I hate it. When it came to other examples, we made that skit to describe actions within physics. That was fun, but it's because it felt like I was just goofing off.

My brain was off the entire time. So [AIL's] not really a way for the teacher to know if someone understands a concept. There is a way that I think art can be integrated into science, but it's more the science of the art. There's a specific lesson that I'll never forget. I was in guitar class, and it was kind of the opposite of [AIL]. We had a substitute, and we just sat there instead of going to practice. He was an older man, and he gave us like a lesson on string resonance. I'll never forget how that works, and I think that's really the key, at least for me. It's like a thing that you observe and how that can go to create a realistic story. [For example,] even in dancing, you could teach about motor mechanics or anatomy. Then those would be really interesting classes, and what you learn about both dancing and anatomy. Music and its physical properties. How instruments actually work in a theoretical sense and the math behind it. That would be really interesting to learn about those concepts.

All of science is interesting, and even though I may not find dancing very interesting, I can appreciate how it works and what goes into it. I would say science needs

to be integrated INTO the arts. You can misrepresent that way. Even a good piece of art can be misleading because while not everybody is an actor, everybody is a scientist.

[AIL] wasn't like the more in-depth things they have to do for AP classes where you show your understanding. Free response is a lot harder to do for an assignment. I'm pretty good at multiple choice but writing? That's the one you actually have to think on because, I can't really tell if I have illustrated the point. I may think it's a good [response.] I may think I've illustrated the point, but someone else reading it could think it's gibberish. There have been a lot of AP tests where I would read and write a good answer, and then I get it back, and it's like an F. I'm a naturally higher scorer on science tests, but when it came to ELA and history, I bombed those. They are especially hard for me.

AP biology, that was the only class I needed to study for because it was so hard. I passed the class, but I didn't really study because what am I supposed to study? I could try and write some essays. For the Ap. bio [final] I was pretty sure I knew all of the systems that you need to know and how they interact, and that's the important part. I think I got a 4 on the AP Bio test. All APs are well documented online. If you wanted to learn an AP class, you don't even have to go to class. You can just look it up on YouTube, and as long as you have the attention span, you can pretty much pass any test.

In traditional classes, we would all sit down, and then the teacher would say, “Okay, last time we talked about blah, blah, blah, but this is the next step,” or something. It's just each day you try to get through a certain amount of content. You’ll write it down. I try to remember it, and then move on. The next day, a new subject, and then that keeps going until some end of semester day when [there’s] a quick review of all of it to refresh

our memory. They do activities on certain days that aren't art, but there's still little games that serve the same purpose of reinforcing and understanding.

I want to get it over with because you're at school, and unless there was somebody in there that I talked to regularly, I wouldn't be over the moon to be in that class. In ninth grade for example, I wasn't paying enough attention, and I just didn't care. That was early on in high school right before your brain matures, and you can really force yourself to focus when you need it. My first AP science class was interesting, and environmental science really did engage me in how we are screwing up the Earth. I feel that got more interesting when we started talking about things that we were screwing up things in the real world.

The only way to combine the arts and environmental science would be to look at how the art is disposed of. The specific way this can pollute or how it's not easily taken out of water. Stuff that pertains to the art students. Otherwise, they're just going to be like: I don't care. When you're talking about noise pollution, what effects do big concerts have on the area around it? Not only noise pollution, but regular pollution or people throwing trash everywhere. [A teacher] could morph that into how the concert involves trucks and how the trucks have to be mined. Branch out until you're talking about the guy's zipper who mined the lithium that goes into the mic's battery or something like that. It's like just broadening their learning from a standpoint they understand. For anatomy, hands would be specifically interesting, and maybe you could talk about how calluses are formed or stuff. Or, for a singer, it would be like the lungs, the vocal cords, the tongue, all of this would be of interest. It would help them with their art exponentially. It would also get them interested in learning about other aspects of it. In

order to get them to think about your science and in order to improve about what they really care about, [their art.]

I remember for a history AIL project, I made a song about the Black Death. I'm not a good songwriter. Good [guitar] player. Not a good songwriter. Writing songs is just way harder than other forms of art. To me, it's easier to write a good poem than it is to make a good song because a poem is formulaic. People who could draw could just draw comics could draw whatever they want, but the art of making music is very difficult, especially if you don't know music theory. The music classes [at our school] teach you how to play music, not make music. That's a key difference. I still don't know music theory. I've been at guitar and doing music for over 7 years, and I have no idea. That's partially my fault, though. I could just look it up online, and I could probably start learning really quickly, but it's just, it's such a vast topic.

When I was writing a song for history, I was pretty sure my teacher knew even less about music because she's not even a music teacher. So, I just slapped things together until it sounded a little bit sad, and even that took me like couple hours when the song was not even a minute long. It was just like a couple chords that repeated. My music AIL experience? Not helpful. I didn't know what the Black Death was, and all this asked me to do was ascribe a tone to it. It was really more about the art than anything else.

Knowledge is simple. It's intellectual. Everybody has heard being a parent is difficult, and everybody knows being a parent is difficult – but, you don't understand how it really is until you've done it. That's understanding. Unless you've actually been through it, been introduced to it, or worked through it yourself, you don’t understand it. It's easier

to not get caught up in the art if the goal is to understand the science. It's better to think about the science purely rather than seeing it through a lens of art.

Before I went through the fine art school, I thought that I was going to be a surgeon, and then it was just science. Then, I ended up landing on coding. None of the [AIL lessons] really had anything [effect on] my interest in science. I was there from the beginning. Almost none of the artists from the school continued in the arts after graduating. This one student who was in guitar with me. He turned to psychology. I've turned to computer science. Yeah, there's another person I know who makes electronic music, but they're going into computer science as well. Music in general is just way harder to find an audience for. I guess the students were just passionate about something else. Me personally, the guitar was just my way into a nice school.

Reflection on Quentin

Quentin seemed uncomfortable at first in each of his interviews. He was not someone with whom I had spoken one-on-one for an extended period at the fine arts school, and so it took a little while for him to speak freely about his thoughts. Once he started to share, however, he shared a wonderful, unique perspective that added needed context to this study. First, he loved stories and believed in their ability to teach students. He understood a story's ability to gain and hold students' attention. He never saw AIL lessons achieving that same level of engagement. His experience with AIL lessons was disappointing. He had fun "goofing off" with his friends, but the tasks given to him in his AIL classes just felt like extra steps and hoops to jump through rather than helpful and engaging practices to build deeper understanding. He never believed that he was

thinking hard at any point during most AIL lessons, and in others he felt that the challenge was too hard, especially in music AIL lessons.

Quentin was similarly disengaged in his traditional classes, but he was a firm believer in AP-level free response questions as mechanisms to evaluate student understanding. Free response questions allow the test taker to write an answer to a prompt in any way they see fit. He believed that it required more thought and effort to write solutions to college-level AP problems. Quentin had always been a fan of writing and stories since he was young. So, it would make sense that writing prompts would be of interest to him and require more of his thinking. Other participants saw AIL as a good way to get an idea of student understanding, but Quentin saw AIL as more of a checklist that imitated understanding rather than helping build it. He believed AIL was often taught by a teacher who was untrained in the arts and could not teach them effectively anyway. He never described any AIL lessons that required writing, however. Perhaps, they may have generated more interest for him. He did not really gain any skills or special understanding from the AIL lessons he took part in, and his group work experience was often fraught with drama when group members did not pull their weight.

Quentin's time in AIL classes made no difference to his view of science. He just wanted his science instruction to be relevant and contextual. He once had a teacher give an amazing lesson on harmonics in his guitar class. It was a substitute who took the time to explain the science beyond harmonics on a guitar. He was fascinated by the lesson, and he suggested several ways for teachers to teach the science of the art to engage their students. He thought that art students should only be asked to do AIL in their art area

because they would not be able to maximize the integration of art and science if they are not experienced in the art form.

Quentin's vignette shared many similarities with the themes generated from his codes. He likes to goof off with his friends and is not a fan of helping others in a group activity because he sees that as their own responsibility to learn it. He likes science and relevant instruction, which is why he does not feel that AIL is needed for him to engage in the work. Quentin believes that bright students need complicated topics to engage their mind with that challenge building deeper learning, and Quentin never got that challenge from his AIL classes at the fine arts school. His desire for challenge and a quality education was prevalent in his codes and was a key theme generated from his interview data.

Quentin was very passionate about learning for his future because he wanted to do something important with his life. He did not see the arts as something that could help him make a difference the way coding could. In the vignette, Quentin had shown by choosing the arts magnet school over an academic magnet that he was not interested in doing lots of work to learn the material. He wanted work, but only a certain kind of work. Considering that he did not get much out of many of his AIL classes as most of the other participants had, I was glad to hear that he took a lot from his AP classes. He had clearly thought deeply about his learning for some time. He really believed that relevance and rigor is so important for any classroom, and showing students how science connects to their individual art passions could be a wonderful way to approach teaching fine arts students. Rhea was similarly passionate as a student about her learning and about making a difference in the world.

Rhea

"[AIL] allows me to choose the best way for me to learn [science], and then it allows me to feel like I've succeeded in learning it. Showing learning through art forces me to think about exactly what I know, so that I can fill in the gaps. I can't really portray the art without knowing the science knowledge that I need to put into the art."

Meet Rhea

Rhea was a college student who wanted to attend law school and make a difference in the world. Rhea was another participant who had to meet virtually due to the constraints of college classes and travel. Rhea grew up in a household where her family moved a lot because of her dad's jobs. She attended primarily private schools in her early years and really appreciated her later time in public school as the tragic death of George Floyd and the Black Lives Matter movement showed her that there was a lot of injustice out there in the world, and as a Black woman, she found she was undereducated in her time in private school about these issues faced by the Black community. Rhea wanted to do something about these injustices in her future, and so she has plans to be president one day (I'd vote for her.)

Rhea was a lifelong singer who wanted to minor in chorus if possible while in college, and now she has become a member of the debate group at her school. Rhea gravitated to positions of authority as a student and continues that in her college experience. In her time at our school, I was only able to teach Rhea once in a traditional science class. Despite only knowing each other for a year, Rhea was very open in her interviews and had many great stories of her time in AIL and traditional classes. There was a lot of laughter and joy and pride in her interviews that came across in her

narrative when she discussed her time in school. She would begin each interview a little reserved, but before long, she was smiling and gesturing as she reminisced. She was very proud when speaking of her family.

Rhea's Story

I've grown up in a lot of different cities, and in that time, I went to 10 different schools. My dad has moved jobs a lot. So, I got to experience public and private schools, which I feel was a big contributor to the education that I've earned and to who am now. Each school showed me different ways to learn. In hindsight, I've realized that in private schools, they were able to make their own curriculum. So, a lot of the stuff that is being taught in public schools is not taught in private schools because it doesn't fit what they want to teach the students. I didn't even hear the name Malcolm X until the eighth grade. [The year] 2020 was polarizing for me because at that time I realized how much was being left out of my education. With Black Lives Matter, I started realizing how much about the world I didn't know and started seeing things in the world that I really wanted to change. This is not the place I want to grow up in and live in for the rest of my life. It wasn't like I wanted to leave America. I just don't want this to be the America that I live in. That was when I first started considering political science.

There is an obvious difference between what my sister has experienced and what I have experienced. I visited my oldest sister in Texas like the summer before senior year, and we had a lot of deep talks that we've never had before [as] we're 7 years apart. She talked about was the fact that she didn't realize that the stuff that happened to Brianna Taylor and George Floyd could happen to us. For me. it's just obvious. A lot of the political stuff that I've found and taken in and analyzed for myself she hasn't – or she's

analyzed them in a different way. My oldest siblings spent so much time in private school that their worldview is just very skewed and censored.

[In middle school,] I had some issues socially that I chalked up to the fact that people didn't like that my dad was the high school principal, but it was racially motivated hatred for him. One of the reasons he ended up leaving was because he had so many issues with parents not respecting the fact that he was enforcing what was in the handbook and that they didn't think he should be the one enforcing it.

I'm not the type of person to care if someone likes me, but after a while it's tiresome. I went to an online school for a quarter in high school, and then I realized how important it is to be able to socialize with people. So, my parents took me out before the quarter ended. Socializing is so important in school. In my first year at the fine art school, I was a narcissist and prideful, and I saw that sometimes it would hurt some people's feelings – especially like some of my friends. So, I worked on changing that for quite some time.

[The fine arts school] was a great place for me because my hobbies are singing, acting, and dancing. I've been raised doing the arts: choir, theater, dance, and now speech. This year, which is my first year in college, I've grown a lot already as an artist, and I've had a lot of people pour into me as well. Theater began in fifth grade, and I played a bear in Aladdin, Jr. It was a lot of fun. It may be only a minute and a half of stage time, but that was the first experience I had in theater. I was like, "This is great! I'm enjoying this!" So, the next year for Seussical, Jr., I was a monkey with my sister. Then, in Peter Pan, I was a pirate, and I really enjoyed that too. I sing pretty much anything. I sing a lot of Christian contemporary right now, but I'm also listening to a lot of Broadway and musical

theater. As long as it's good, I will listen to it and sing along. I've always been drawn to being creative.

I know my mom used to tell me that I've always been very active, too. When my dad put on music, I'd just be dancing not knowing what I'm doing just like kind of dancing to move, and to this day I'll be in the elevator tap dancing. I've never taken tap dance, but it's something I do because I'm listening to music. In church, my parents would encourage me to sing with them, and that's continued my entire life.

Finding new ways to express myself is very important to me, and I feel like I don't really do that when I'm not listening to music. I really wanted to be a Broadway performer for a long time. Then, it switched to lawyer, and it went back to Broadway. It's switched to a civil engineer and that goes along with architecture. I liked that until I realized how much math there was involved. I might have gone back to Broadway at that point, but then I fell upon political science – my favorite show is Madam Secretary. [I know] I would be hard to support myself on a Broadway performer salary, but if I became a lawyer, I could go for Senate. Even better, I could go for President. So now, my ultimate goal is to eventually become President.

That means I could make the changes I want to see in the world, and it's something that's been pushed into my life because I've been put in a lot of leadership positions. It feels like I've just been prepped for this. During my high school years, I grew a lot as a person. I truly began to understand who I am, where I'm supposed to go, and how far I can actually go if I put my mind to it.

I'm really bad at math, [though.] I spent 3 hours every day in structured math last week from my normal classes to office hours and tutors, and it was just not working.

Classes like physics are so hard. Math isn't something that's ever come easy for me. Science was really hard for me, and there were some classes that I avoided. I took AP environmental, and then the following year took anatomy because I was scared to take chemistry. I took physical science three times because the credit didn't transfer from one district to another.

The classrooms that had less math I enjoyed more. I knew the teachers were working hard to help me understand, and I would do my best to understand. They were explaining it in really great ways, it just didn't really stick as well. It's mainly because when I see math it isn't going to make sense, as opposed to environmental science, [for example,] I've always cared about learning things that can make the world better. I want to improve the world for everyone.

[As for science,] My dad was a physics teacher. He taught math to seniors, too, and he's a pastor. He's very encouraging and pushes us to succeed. He guides us in our education and in our spiritual life, and he's the one who got me into music. Me and my mom are very similar, but she isn't a huge music listener. My oldest sister loves to sing, and my brother plays guitar. He would just be walking around just like reciting chemistry stuff to memorize it when he was a pre-med major and take breaks playing guitar. My other sister introduced me to the theater.

[When we moved to this city,] I ended up auditioning for the [fine arts school.] I had been nervous before my audition, but when the chorus teacher opened the door for me, the school just felt so welcoming. I had a sense that this is where I’m supposed to be. It was the students, the teachers, and the fact that the thing I loved was everywhere in the place. I could talk to literally anyone, and their faces would light up if I brought up what

they were majoring in. It's so nice when people have a purpose, when they're talented, and when they're passionate about something. I can feed off it and learn from it.

One class that I remember using arts a lot in was physical science. It would be a lot of movement and a lot of group work. We also used all different types of art mediums. We made songs, we made skits, and we made videos. I don't think the teacher ever repeated the same exact project. We could use any medium we wanted to create something to explain a topic.

She'd teach us the topic with slides and notes and then allow us to talk about it a little bit ourselves. Then, she'd guide us in what she wanted us to do with the information, and then she'd releases to work on it. All the groups go into different areas to work on it, and then we'll come back together at the end of class and present. Sometimes we'd work alone, but in groups, we were better able to understand the topic. If I didn't understand the topic, someone else in my group likely could explain it in a simpler way.

There was one time we made a news report about a topic. We wrote a whole script, and I spent so much time on that script. I remember that unit was the best score I had on a test in that class. I worked with a friend, and I knew she was a like she's a good person to work with. I [decided] I was going to put everything I have into this [AIL project,] and I really enjoyed it. Putting the science into it was a challenge that was very enjoyable, as well, because I was learning the topic very deeply, but also enjoying something new.

I did a lot of research on it on my own, and it was both active and passive learning. I thought: this needs to tie into this, but also this scientific term ties into this one, so I needed those to interact in the script as well. I became very aware of everything

in that topic that tied together. The project helped me know the topic better than the other topics in that class. I think it was the sheer effort that went into that project because I was so focused on connecting everything so well, and then, I was constantly in taking the same information in a different way that I haven't really thought about [before.] Confronting the material or the knowledge that you're trying to gain is an active process for a student, and if it is not presented in a way that I can confront it, I won't learn it.

I was excited to write a song for AIL, but composing my own stuff scares me. I've tried in the past and struggled a lot. So, anytime I've gotten an assignment in the back of my brain I'm thinking that this is not going to be as complex as say, Jacob Collier, but I want it to be. So, I wouldn't say I dread them, but I dislike them.

[My biology teacher] used a lot of AIL, too. The teacher explained what we were going to do at the beginning of class before we do the lesson. The teacher would do some type of experiment that had to do with the lesson. That way we were seeing it before we actually did anything with it. Then, after she taught it, we'd go back over it with the instructor. The teacher would tell us if we're going to do it in groups, how big our groups are, and then she'd give us a rubric, so we'd know what needed to be included in the project.

Sometimes there'd be some type of parts involved that involved drawing. We drew cells a lot. We would draw a food chain or food web. She's encouraged us to do our best with the drawing, but she wouldn't try to make us do it better than last. I don't really enjoy drawing anything scientific, really. So [it became:] let's get this out of the way. I know a lot of people around me were excited about drawing because that's what they like

to do. It wasn't really something that I enjoyed. It's an assignment that my brain doesn't really link to doing art.

I do think [AIL] could become a distraction, or it could be used to a fault where the student ends up not knowing how to study because they've never had to in the past because of all these [AIL] classes. I'm learning now that I don't know how to study because I haven't had to [before.] So now, I'm learning how to study while I'm in college, and it's frustrating at this point.

In my traditional classes, the teacher would stand up and put slides on the board. We take notes we might do an assignment on it, and then maybe we'll have a quiz that day or the quiz will be the next day. But really, it's just notes, lecture, then we move on to the next topic. The teacher will put notes on the board, and we'll just copy it down. Later on, I'd use it to review on my own or something, or maybe use those notes to help us with the assignments. In eighth grade, [I took a traditional] physical science class at a different school. We were working with elements and stuff like that. We would just label the periodic Table or do worksheets about balancing equations. We'd do 20 min of class just doing worksheets on how to balance an equation. If it was like a model, we'd just sit down, label it on a piece of paper, and that's pretty much it. Then, we'll memorize what each thing does.

When the traditional teacher moves fast, I'm stressed about writing down what's on the board, and it causes me to [struggle] to understand what they're saying. If it's a really interesting topic to me or if the lecture made sense to me, I'd get it done quickly. If the stuff went over my head, I'd get kind of upset and frustrated about it. A lot of times, even if the lecture made sense, I'd start working on my own, and then I'd discover that it

didn't actually make sense or that I didn't completely process the information. I just sit there kind of dumbfounded. Where did all this come from? I just sat through all this [lecture] and listened. I paid attention.

In AP environmental, we were talking about it, and it was very easy to see what was important and to make sure I had written it down. I was able to compartmentalize what I needed to remember a lot easier [because] it was a very engaging, discussion-based class. I knew that, if I was discussing things, I'd be able to remember better anyway, so I was able to use my notes as a guideline of what to study later.

Our anatomy teacher was very good at making sure that we had all the materials we needed to do the work. I'd sit down. She'd go through the slides, and then we do a bunch of worksheets on it, and that was pretty much our day. I feel like the material stuck [in my brain] for the entire year, but that was because I was using it every day. Because it's my body. So, like I learned the parts of the feet, and I was using that in dance and musical theater. I was like okay, that's this muscle moving, but I could probably tell you some of the ones in my face now because I still use those muscles every single day. I think that was just because it was just all like rote memorization because we did so many worksheets. I didn't really enjoy anatomy and physiology. It was an easy class, but I was just sitting here for an hour and 30 min, writing down notes, and then working on 3 worksheets that I would finish in 20 min. Then, I'd just work on stuff for other classes, so it felt more like a study hall. I don't think I studied for that class a single time.

I learned the most in my AP environmental science class because I had that interest in it from before. That's why I learned a lot in [that class] and why the information is still with me now. Since it was discussion-based, it catered to the best way

for me to learn. The teacher would talk about the topic, and we'd get into discussion. [Sometimes,] the teacher would give us a prompt, and we talked to our neighbor about it. It was more discussion based than my other classes because we'd talk more as a group.

Once we'd get into the topic, he'd ask what we already know about it, and then we'd start going through the notes, and we would ask questions. The teacher would get very in depth about the information itself and, sometimes, take a bit too much time on like one topic, but it was still very important that we talked about it. It helped us to remember the information on the test. We might have a one-on-one conversation with the person next to us, or work on a progress check assignment on AP classroom. It was more traditional than arts, integrated. Although, there were some arts integrated into it. We had arts assignments that I still remember. I made a Tik Tok about being an "environmental hero" where you had to talk about how you were saving the environment. I did learn a lot, and it's still with me now. I could still [figure out] a lot of correct answers if I were to take a test for that class.

I think mixing [AIL] and traditional learning would be best [for learning] because I know how helpful discussion-based learning is. I also know how important [AIL] is for people to apply what they learn in different ways with the [arts] they love because it will grab their attention. So, I would mix it up a little bit and do both. If you're experiencing new science material and a whole new art, then you [will] have to learn about both in order to do it well. [Using an unfamiliar art] helps you think about the science in different ways and adapt it to the art better, as well. I think it is important to switch up teaching styles because people aren't going to get everything when they are [taught] in only one specific way.

I've realized that in classes, like anatomy, that weren't [AIL,] I was able to remember this stuff because I use that learning every day, so everything stuck with me. Classes where that's not so easy, like Biology, it's better to have the arts in it. Arts integration classes were very engaging because I was using other interest areas in those classes. So, the classes I didn't really want to be in were more interesting when they had [AIL]. Overall. I think my experience with those type of classes was just more positive because I enjoyed getting to continue to experience my art throughout the day, as well as experiencing other arts that I didn't really use.

It meant more because, if it was a hard class and I didn't know how I was going to get through it, [the AIL lessons] showed that the teacher did care and wanted us to continue to learn the subject. They would try to integrate our interests into a topic that they know that we're probably not interested in and that means a lot. But, in the moment I didn't really ever think about how much thought goes into [those lessons,] and how it shows how much care my teachers put into their lesson plans. I think that if my experience in high school was all traditional it would have gone the same way. I would have struggled in high school a lot more.

[For example,] I was more engaged than my sister when she took physical science at the same time as me in high school. I scored higher on my final state exam than my sister who was taking it at another school in our district. I don't think that either of us went into it more prepared than the other. It was just that my teacher was more engaging and found ways to pique my interest. [AIL] allows me to choose the best way for me to learn it, and then it allows me to feel like I've succeeded in learning it. Showing learning through art forces me to think about exactly what I know, so that I can fill in the gaps. I

can't really portray the art without knowing the science knowledge that I need to put into the art. If I'm going to talk about a specific subject, I need to know what goes with that subject in order to make art that makes sense. [AIL] builds students' confidence in their learning abilities. It also saves them time trying to study the material [later] because they know it [already.]

Before the fine art school and [AIL] lessons, I'd say I didn't really care about science. I had no interest in it. I just go to the class, learn the stuff, take the test, and leave. At the fine art school, I'd say I was more interested in the moment with a lot of the subjects, but afterwards it didn't really – the interest didn't really stay for the most part. It didn't really stay unless I was actually interested in the subject before the class. I didn't care about it after, but it would stay with me longer.

If someone struggles with connection, then the arts will help because arts are about connecting with others. For a teacher who struggles making connections, I think it be a lot of help for them to use [AIL] because it helps them form connections by letting them get to know their students and what each student likes to do. [AIL] allows [teachers] to know who the students are, not only academically, but personally. You get to see how open people can be when they're doing something that they love.

Reflection on Rhea

Rhea grew up in many different school settings, which gave her a solid base of different instructional strategies for reflection. She had a serious passion for social issues like Black Lives Matter, which pushed her into a possible future in politics. She had several artistic talents making her a great fit for the fine arts school. She never really had any vested interest in science as a career as a child, but she did have family members

who were experienced with science and math. Rhea was, instead, passionate about the arts.

Rhea loved to dance, act, and sing. She became a music major at the fine arts school and loved the passionate art environment at the school. It made sense that she would connect with AIL immediately as she is talented in many art areas. Rhea really enjoyed her AIL physical science class and had a lot of positive things to say about AIL. She believed that AIL forced students to learn deeply and forge connections between the science content and the art. Those connections made her memories of the material last longer, even when her interest in science abated after the class was done. She really enjoyed getting to use the arts all day, except for drawing.

One AIL project she did was a news report in physical science. She worked so hard on that project and forged so many connections putting it together that she had the best test score of the year. She worked hard because the art form was one about which she was passionate, theatre. Rhea was taking physical science at the same time as her sister at another school in the district. She outscored her sister on a state final exam, and she attributed that difference in score to her AIL science class.

Traditional classes seemed to be more like study halls than anything else to her. She did some worksheets and notes, and that was it. It didn't engage her much. However, in anatomy, she was at least engaged with relevant material. She revealed that the relevance of the material helped it stick with her the same way that AIL lessons could. Since anatomy was about her body, she remembered the information because it was "her body."

Rhea admitted that years of AIL could impact a student's ability to learn traditionally and that mixing the two contents was the better way to teach. Rhea was a fervent believer in the power of discussion. In her traditional AP environmental class, there were lots of discussions, and she claimed to have learned a lot in that class. Considering her interest in the topic before the class, it made sense that it would become one of her favorite classes as the teacher was discussing a preferred topic.

The themes generated from Rhea's interview data align with much of what has been shared in this vignette. However, a couple aspects were highlighted in the coding that were not prevalent in the vignette. Rhea was not happy with traditional classes and repetition. She wanted variety in her lessons, and as shown here, she appreciated the teachers who worked hard to provide those chances. She believed that those AIL classes built strong bonds between the teachers and their students because of those challenging and engaging lessons. For Rhea, learning requires complex thought, and AIL is a great way to build those deep connections needed for long-lasting learning. Rhea did not realize it at the time, but AIL was so valuable to her and her learning when she looked back at her time at the fine arts school.

Rhea believed that AIL lessons show that a teacher cares. AIL classes showed her that the teacher was willing to put lots of effort into the lesson, which forced the student to put lots of effort in as well. Rhea saw AIL helped students form connections between the material and the student. Using the arts was one way to accomplish that, but Rhea seemed to appreciate it more as an art student. She thought that AIL builds students' confidence in their learning abilities and helps them remember the information longer.

The next participant, Starfox, had a lot to say about how AIL impacted her learning in her classes, contrasting it with her time in her traditional classes.

Starfox

"I think that a lot of people think of creativity and science separately, but I feel like there's an element of that creativity in searching for those unknown answers or at least coming up with those questions."

Meet Starfox

Starfox was a college student who was working on a degree in wildlife at the time of her interviews. She was able to meet with me in person for her interviews. She was a phenomenal student at our school whose academic achievements teachers still discuss. I was only able to teach her one time in a traditional science class, but we developed a close bond over environmental science. Starfox had grown up interested in wildlife and in visual arts as a kid. Her love of visual art was often fostered at school, but her family had to keep her interest in animals alive until she reached high school. It was then that she changed course from a career in the arts to a degree in wildlife science. Starfox was also a theatre kid growing up, though she did not stick with that very long.

Starfox was able to learn at a high level in both traditional and AIL classes. So, her perspectives on the pros and cons of both will be of interest in her vignette. She spoke haltingly at first in the interviews. In fact, she was always wide-eyed, excited, and nervous at the start, yet she always collected herself with a smile and launched into her narratives with gusto. She shared a lot of joy in her narratives, but she took her thoughts on AIL in the classroom very seriously. It was clear she spent a lot of time thinking about

her experiences in the days between interviews as she often brought up old points in each successive interview.

Starfox's Story

I grew up an only child, and I had a lot of free time to explore everything. So, I developed a curious personality. I lived out in the middle of nowhere next to my grandparents who rescued 20 dogs. My curiosity went to nature and animals, which transfers to what I study now – wildlife science. I was always poking around with things outside. I was definitely a lizard-catching kid with roly-polies in a jar watching them over a few days, kind of thing. I would steal a bottle of sunscreen and put it on rocks and then leave the rocks in the sun [to see] what was going to happen. I didn't really know much about science, but I did have a creative side, which is why I went to an art school later.

I'm a rule follower, definitely. Aside from moments of attitude, my worst fear was getting told that I was doing something wrong or being in trouble. Most parents tell kids to follow the rules or their own rules, but I think it was also just maybe it was that academic or perfectionist side of me at a young age manifesting: here's a clear definition of right and wrong, and I saw that as pretty black and white.

As a perfectionist, from the earliest point in an academic setting, I [liked] doing good in school. I think it's also transferred into other goals of mine like career stuff, internships, and applying for things. Everyday stuff too. I know the stereotypes: you're always organized, or you've got to have a perfect clean space. That is very much me. The state of my room or dorm reflects my mental state. If my room is messy then I'm probably having a pretty stressful week. It's mostly on a healthy level, like setting goals for yourself, but sometimes it can be unattainable perfectionism.

It got to a point in high school [when] I was volunteering in a hospital where I had a breakdown because I was too nervous about not doing it perfectly on the first day. That prompted me and my parents to [sign up for a] few months of a counseling service to talk about it, and I got strategies for managing my anxiety. We were able to deduce that the whole flare up was rooted in the fact that I was expecting perfection before I even knew what I was getting into.

Counseling definitely helped me overcome the idea that you're expected to do anything perfectly because you're expected to fail. Stress didn't really transfer over into my academics because I was very good at controlling my academic environment. I genuinely think it was because I liked going to school every day. I still do. In elementary, my teachers gave me pat on the back or I got to be in the school gifted club. I think, even starting in middle school or early high school, the better the grades and the better the class rank, the better the opportunity college-wise. I wanted to have all the doors open for any school that I'm interested in.

What I wanted to when I grew up changed a lot. If I had an interest at the time, I would be doing that forever. In elementary school, I started to get into acting and performing in early middle school or elementary school, and I just wanted to be like a performer. The skits and stuff were fun, just singing wasn't my big thing. I feel like that's when Disney started to make its way into [my life.] Disney was a big part of growing up and vacationing for me. So, I wanted to be a performer at Disney.

I became an understudy in the one act play freshman year. It was not a good experience, and then I was told I might get thrown into the play if one of the leads got the flu. So, I quit. I started to focus on the [visual] arts, and my intention changed to work for

Disney imagineering doing concept art for the parks. I had a passion for Disney in the parks and their storytelling, and so that fit perfectly with what I wanted to do.

I don't feel like I did any extra visual art stuff when I was little. I just took the normal art classes they put kids in, but I really enjoyed [them.] The one thing that I did do a lot – and sometimes get in trouble for it – was that I would doodle constantly. [When] the teacher was talking, I'd be doodling all over my work or on my notes. Some teachers didn't care, some teachers thought that I was distracted, but to me it was a focus thing. I actually enjoyed it when I was focusing on the drawing. It was just doing something with my hand muscle, and I'd be listening to what they're saying. Maybe, doodling was working my brain [so] instead of completely zoning out, I'd still be able to pay attention. I remember having problems with it through high school. In Spanish class, I remember my teacher being like, "Hey, stop doodling!" I would never be the kid to say no, though.

I did art most of those years, and that's where I actually started to build my skill with it and started getting a passion for it. In eighth grade, I started hearing word about an art school opening. I was fairly new to seeing visual arts as more than just doodling every once in a while, but it worked out because I just went for it. [My friend] and I were both big doodlers, and we both loved cats. I think we would try to prove to each other that we love cats because we would always be drawing, and then we ended up both going to the fine arts school for visual arts.

See, I don't really like a lot of sports, and the kids aren't very nice at some schools. So, I'm going to go somewhere more peaceful, and I chose the fine arts school. I was definitely not a music kid, so [visual] arts seemed like the best of what was available. I definitely enjoyed it. I took special interest in it, and then the fine arts school helped me

develop those skills. I started to get a knack. I could tell at that point I want to keep doing this because I can see my skill increasing. Why not throw myself into it?

I just loved drawing, coming up with little characters or something. I'm definitely a visual learner, so I loved the chance to draw pictures related to what we were learning about. I remember in middle school we had little workbooks that we could write in. If there were pictures, I would draw speech bubbles and make a little comic. I think it was just my own method of visualizing things, and I think it helped me to stay focused.

I'd get very committed to finishing a picture, and then I could not tell a teacher what they said in the last ten minutes. The doodling was never a hindrance as the intention of it was never to like completely checkout and stop paying attention. I think, overall, [doodling] helped me with that visual and organizational aspect of learning. It makes me feel like I've gotten something of substance accomplished within the time that I have. It's just something that's productive creatively or productive fun-wise.

I started watching cheesy Tv shows like "Criminal Minds," and I started to like biology and lab work. Forensics started to be on my radar [around middle school, but] now, I major in wildlife sciences. I considered doing an art minor, but, honestly, while I loved my time at the art school, it showed me that I didn't want to keep doing it.

Being raised in an environment where I enjoyed taking care of animals, I don't know why it took me that long to make that connection career-wise, but I started thinking about that interest in a science career. It was kind of just like there the whole time. I have loved caring for animals my whole life, and I've always viewed it as a passion. I'm such a huge animal person – animal rights, animal advocacy, caring for animals. I'm someone that pulls over on the side of the road and picks up all the turtles whenever they're in the

middle of the road. I'm seeing all these wildlife pathways as bigger applications of things that I have already done my whole life. It just took me a little bit to make that connection.

[In private school,] I was never taught evolution. We weren't allowed to watch Bill Nye because he believed in evolution – not even videos of him talking about something completely unrelated. So, I don't remember a lot of it, but we were reading textbooks and watching videos of people who were avoiding talking about evolution. I definitely remember having an interest in Darwin and evolution from biology class. I slowly started to realize that jobs like forensics, sound really fun, and I want to find out answers to questions that are super daunting.

Science is like a method of getting those answers for yourself. You can kind of like, take charge of your misunderstandings, and not just sit and be confused or nervous. Just go and ask those questions and run those tests and find out the answers. Science, on the most basic level, is visually modeling things and portraying them in that visual sense. I think that a lot of people think of creativity and science separately, but I feel like there's an element of that creativity in searching for those unknown answers or at least coming up with those questions. You [need to] think outside of the box to come up with those questions in a sense. My process creating an art piece and running an experiment mirror each other. They're both very formulated, and I see a lot of overlap between those things. They're both curiosity-driven as well.

In my first year at the fine art school, I was like, “Oh, I'm an artist now. I just got to get through the maths and the sciences.” I didn't really feel dramatically one way or another about the science classes because I didn't have a huge interest in the sciences at that time. My interest in science started more towards the end of that year or the

beginning of the next year. I was so excited and ready to get into the art, and science wasn't my big thing of interest, so [the experience] didn't really stick.

My first science class was biology. I remember it being a pretty crowded class, and it was more traditionally taught. PowerPoint, take notes, and there would be some in-class work. I remember having warmups, and we would do a problem, sometimes working with our table. Ninth grade, you're still exiting that middle school phase. So, it was very loud, chaotic class that I remember vividly. I think in class we'd draw out this cell or watch this cute, little music video about whatever we were going over, but it was definitely heavier on traditional [instruction.]

Anatomy and physiology was next. It was a similar thing, going through PowerPoints, but I do feel like there was a lot more collaborative work in that class. You would see a lot of sessions where we would map things out together. I remember a group project where we were given the like formulas for how anthropologists estimate total skeleton heights, just based on like certain links of certain bones that they find, and we would measure each other's like arms and legs or whatever. Then you plug it into some formula. Then you could estimate overall height and compare it to actual height. I feel like the tactile element of the lesson helps with remembering it a lot more. It's a better tool than just staring at a piece of paper.

I don't tend to like jump for joy when I get group projects. I'm really excited to learn this stuff, and that's not the case for everybody. You get put in a group, but you need to establish a pace for the entire group, and with science specifically, I wanted to fully dive into that interest but I didn't want to like drag everybody with me.

We had an [AIL project] with edible body systems, and everyone had something different. I remember someone made whole ear canal thing with all this candy. I know there's been other classes that do edible things, but at the high school level it was a whole expansive art project. Then, you had to come in and tell your class about it, and you actually ate each other's organs, which sounds terrible! We learned about the overall systems of the body and the organs that fall within the systems. You could pick from those systems, and then you go through the explanation. I just remember casually talking about it as we were sharing our projects with each other, but I think it was more to get you just kinda thinking. I still talk about that specific lesson to this day, and I feel like that was like one of the most creatively driven things we did in that class.

[I did the] lobes of the brain and how they're structured, the frontal and temporal. When I was making it, I remember like having a picture pulled up and like you know the shape of the brain is very specific to the placement of those lobes, and I also remember getting mad, because when I made that cake there was no feasible like structural way to include a brain STEM. And I was mad because it [wasn't] accurate.

That [AIL] lesson was definitely an exploration process because that was the first time in my life that I'd ever really made or learned about using a simple syrup. I was Pinteresting all these ideas, and I didn't know that it was a sugar water thing that you have to do. It was boiling sugar and water to make some kind of mixture to moisten the cake. But yeah, I definitely felt like I was on like food network, and I was getting more appreciation for people making cakes because I was just using a box mix and I thought how do [bakers] do this all the time. I've never used simple syrup since then, but I do know what it is.

In AP Biology, I remember feeling iffy about that AP test coming into the year with it being senior year and being virtual due to Covid. I feel like the majority of it was through a single PowerPoint, which I know can happen in all classes, but the AP bio was very content heavy. So, it felt like every day was just slides with information, and then we were given an assignment to work on independently at the end of class. It wasn't really break out and [work on a project] in that class because it was so fast-paced and traditional. There was never a given amount of time in the class period for you to work on anything or openly communicate with people. It was more on your own and then circle back to the teacher if you have a question. Labs were done sporadically, but I feel like that was the case with a lot in my science classes.

If someone asked me right now about the Calvin cycle, I could not tell you what happens [in it.] I think the teacher had said instead of just mapping it out, why don't you like make a video where you fully explain this step by step or do an explanation in some creative way and beyond just drawing a picture that you can find on Google. I think that would have forced me to know the details more in order to convey it to others.

I took AP environmental science junior year, and there were some [AIL] elements thrown in throughout it. It was structured to go through the AP standards, and it was video heavy. It was a more traditional lecture style with actual film footage of each phenomenon. The majority of class was taught through PowerPoint and taking notes. It was so fast paced you didn't have a lot of time to stop and do [AIL project.] It was more like whenever the chance to do [AIL] was there, we would do it.

At the very beginning of that class, we did [an AIL lesson] about bettering something in the environment with an alternative or something that you can do in your

household that's healthier and more sustainable. I remember making like a video explaining how I made a natural pesticide for a weed killer instead of using typical like chemicals because I live on a lake and the runoff is not good. I remember making a video explaining the reasoning for that. Later, I remember making a more complete video where you show multiple things in your life that you do to make your carbon footprint smaller, and I remember making a whole production iMovie with music, sound effects, and voice over.

The video is definitely more an even split between forwarding your knowledge in the science and in the art. I remember through the year that I got better at editing, and I got better at the timing of the music and the sound effects and adding some comedy here and there to keep it lively. I was almost entertainment, like a production how people in the industry do that. I was thinking: How do I convey that eating no meat in my household has an effect on like the greenhouse gas emissions? How do I explain that in a two min video? So, if you're making it work into the art required of you, you had a firmer grasp on it. They say that if you can teach it to others, it's [because] you know it well.

An art helps you learn the material deeply or better. I know we were just talking about the videos but honestly, I had to put a lot of research into it in order to make it in the first place like with those videos. I would have notes, outlines of the flow of information, and [with a lot of] topics, there's so many things to cover in that video. My first point of business is making sure I was familiar as possible with those [concepts,] and then putting it into the creative format, I was getting my wheel turning about other ways to communicate it or what's a way for it to be visualized? It was adding in layer of depth to it because it made you think about it beyond just textbook definition.

Forensics was an engaging, creative class. We would have PowerPoints and normal things, but at least once a week, we were doing some kind of lab project, like make all your fingerprints and identify what kind of fingerprints they are or we're going to go around this school and collect evidence. It was very active and engaging. It was more on the traditional side. I don't know if you would call it [AIL,] because we weren't necessarily just doing arts-focused things, but more lab-focused. We did applications of what we were taught. We spent the first twenty or thirty minutes learning what it is, and then replicating it or watching a TV show that shows the process happening or having someone come to speak that actually works in the field. It was very real-world application.

Every Friday, we would have a cartoon on the board, and it would give you a brief description of who, what, where, and when, and then you have a picture of the murder scene. You spend the first 15 min of the class talking with your table about who did it and that would be the warmup, acting out a murder mystery. You work together to present your case. Sometimes, you set up the murder yourself, and then you analyze it. We did a blood spatter lab [where you are] intentionally setting it from this angle or intentionally dropping it from this angle and then observe how those patterns change.

In forensics, [the AIL] took a unique, creative approach, but it was also directly applying what you would do if you were a forensic scientist in the field. I think that was really a meaningful experience because it allowed me to see something super relevant to what you might be doing beyond like the classroom in the actual career context of it.

With [AIL] lessons, you have a stronger memory of actually doing that activity, instead of just, “Oh, I remember looking at that.” I guess with the comparison between

the [AIL and traditional] is when you're doing the arts-integrated projects you're directly making that thing that you're talking about. With [visual] arts projects, I got so stoked and super excited, but not nervous. I know in my head I'm about to spend a lot of time on the [AIL] project because I'm an art major and I gotta make it pretty. I would get really excited because it was my chance to put all I know into it. If I had to sing a song or write a song or perform anything musically, I was like: No. We would all stand up as a class and sing the song together and do this little dance together. That was fine, but I don't think I ever had to like go up there and like actually like perform by myself. I did dance in the academic environment, and I would learn more about like choreography and stuff like in the process of learning it. I remember plate tectonics with the transform [boundaries.] That wasn't a full one dancing thing, but your body becomes that part of the earth showing it. It was refreshing that I got to engage that side of my brain.

So, what made me interested in science when I went to a Fine Arts school for art, I honestly think it was because of that because [the science] was taught to me in that way that was more engaging, made me want to seek out learning opportunities on my own. I viewed science a little differently coming out of that school, and thinking back on it, I attribute the fine arts school and [AIL] to that further interest in what I'm pursuing now.

I think when I was younger, I wasn't really aware that I loved science. I just found myself falling into those activities. In elementary middle school, I was very creatively driven. Throughout middle school I was really into theater, then I was really into art. By the end of middle school, I had my sights set on doing something with visual arts for my career. People ask when I decided to get into science, I [tell them it was] when I came to an arts magnet school. They ask if just hated art, and, no, I think it just added to it.

If I have something I'm interested in, I make that career connection with it, and I have a tendency to jump into it immediately. I like this, or I want to do that. So, I didn't abandon the art thing. I still love doing art, and I still do to this day. In one of those initial moments of wanting to go into science, I thought I could do this as a career. Then, I [immediately wanted to] buy these books about it and watch these shows and Google all these careers that that fall under that umbrella. As soon as that interest struck my mind – and it happened again with whatever I was interested in after forensics – 100% of my brain was fully focused on that career. Curiosity has always been a big driver with things like that, but my science classes did accelerate that interest.

Arts integration just expands some of those skills that you might end up using later. Visually identifying this plant pattern or this animal track or casting and impressions. That's art. Your ability to use the arts can influence your ability to do the science. I think a lot of how the artistic process translates over into those field methods or lab methods in science. [For me, visual art] is a lot like experimentation in science. Different variables are going to affect whatever you're testing, and I feel the same goes for art. It might be different mediums, it might be different subject matter, but there's going to be trial and error and experimentation with what's going to strike a chord with you and your audience on that canvas.

Traditional learning would definitely get you prepared for learning in college, but that is a lot of what students do all the way up to college anyway. So, I think [AIL] adds a level of value in terms of seeing [the material] from a different angle and getting those basic concepts nailed down in different ways to apply them to a college setting. [The AIL

lessons] might keep the interest level up and might allow the student to stay interested in it long enough to see the excitement in the career aspect or the major aspect of it.

Students won't become so burnt out on [learning] before they even leave high school, so that they don't want to touch it again. If it's going to be a struggle to get groups of students to hold on to that information, anyway, why not teach with more [AIL?] In my mind, why not teach it in a way that at least might give more life and enthusiasm about learning in general. I think there is value in the idea of like a student being excited to come to the classroom in general because their attitude is going to shape how they learn and how much they learn, and I think that approaching it in a creative way might reach further into your audience.

Reflection on Starfox

Starfox thought very deeply about her experiences in arts integration and shared great details about her time at the fine arts school. She was very eager to engage in the interview, and her perfectionist mindset shone through in her detailed account of her time and activities in her classes. She often looked to the interviewer for confirmation that she was doing well before continuing, and it took a bit of time for her to be comfortable speaking her own truth. By the end of the first interview, she was sharing her thoughts and reflections without reservation.

Starfox spent time doing both art and science while growing up. However, she never really considered her time working with her family pets as an interest. It was just something she did. When the option to go to a fine arts school appeared, she realized that her talents at visual arts could move her forward in life – towards that eventual job with Disney. She really enjoyed doodling and even made comics in her workbooks at school.

With her theatre background as well, she was very much invested in the arts. She just viewed science as a subject that she had to get through to get to more arts classes.

She chose to go to the fine arts school because of that interest in the arts, but she came away from the fine arts school with a major in wildlife science and a penchant for forensics. Starfox credited her time at the fine arts school for putting her on her future path to science, and she even suggested that doing AIL in her science classes was a contributing factor. She discovered that her middle school had held back her science education a little bit, and the science content she was being taught at the fine arts school was interesting to her and satiated her curiosity about the world.

It snuck up on her a bit, but slowly, Starfox discovered she was falling in love with science. She got so excited about visual arts projects in her science classes that linking her interest in the arts to her science class opened her up more to the material. I should note that she didn't lose interest in the arts; she realized that the arts and science share a lot of similarities and that all her skills from the arts perfectly fit her interest in science. The procedures and processes of the arts line up exceptionally well with the scientific method from her experience. She was not a fan of all arts but felt that any art used in her classes, even dance, were "refreshing" compared to her time in traditional classes.

Starfox was a capable student in all forms of instruction, but she mentioned that traditional instruction was very much a part of the college experience. So, traditional instruction would be important to any student looking to be comfortable in the college setting. However, Starfox went on to discuss how traditional instruction in her AP Biology class was never quite enough to help the learning stick. AIL, instead, would not only benefit the student's base understanding of content, which would be very important,

but AIL would also generate interest in students in science. In fact, she suggested that AIL could help students stay engaged in science until they see themselves in a science career like she did.

The AIL lessons that Starfox performed were a significant part of her blossoming scientific understanding. She mentioned that she was forced to learn deeply in AIL because of all the research and synthesis of ideas to fit them into whatever medium of expression is required of her by her teacher. It was more than the repeated PowerPoints, notes, and assignments she was getting in her traditional classes, and she would dive into the work no matter what. She believed that the AIL lessons really built a better understanding of the material, especially the ones that she had to record videos to and explain certain ideas to the audience. She really had to work hard to produce those videos, and the perfectionist-side of her forced her to make each video as full of good information as possible and as easy to understand as she could. All that helped her learn. This was very similar to Rhea's thoughts on AIL, and yet distinctly different from Quentin who did not see any benefits to his thinking in AIL lessons.

Starfox's themes from the categorizing process were similar to the vignette in that Starfox loved to learn and use the arts. In her themes, she was a fan of AIL because it was challenging and meaningful. Starfox knew what it was to "burn out" and overwork oneself in her traditional classes. She worked hard in AIL but had fun because, to her, it was bonus art time. These AIL strategies pulled her into science from a career in the arts because they expanded her learning and showed her how interesting the science material was.

In her final comments of the vignette, she said that improving student attitudes towards science was essential to improve student learning in science. Their attitudes directly affected how much students could learn in her experience. AIL could be a viable means for educators to maintain student enthusiasm and prevent students from burning out on traditional instruction. Sunshine, in the next vignette, had a very similar approach to learning as Quentin did. She wanted her learning to be directly relevant to her to engage her full attention. However, after her first AIL class and unlike Quentin, she enjoyed her AIL classes, often coming out of her shell in ways that surprised her.

Sunshine

"[AIL] helped me because I don't like standing out or getting attention. When we got to the high school part of the dance program, we had to start choreographing stuff ourselves, and I feel like [AIL] science lessons helped me be more open around others because you would have to come up with your own thing and then teach it to other people."

Meet Sunshine

Sunshine was a college student who was working on her degree in physical therapy during these interviews. She met with me in a mixture of virtual and in-person meetings to better accommodate her college schedule. I was able to teach Sunshine twice, once in an AIL class and once in a traditional science class. Sunshine had always been an excellent student who took high level science classes. However, her passion has always been dancing. She was trying to work dance classes into her college schedule more often because she loved dancing so much. She did not want to go into dance as a profession, however. She became interested in physical therapy as she rehabbed for injuries she sustained as a dancer.

In her interviews, Sunshine discussed her love of the arts, and how the AIL lessons really targeted that love to generate interest in the science material. She was very quiet as a student in class, and she was a little trepidatious at the start of each interview. She often spoke with her eyes looking down and used laughter to lighten her words a bit when she discussed something heavy. There was a lot of joy and passion, however, when she discussed her time in AIL classes, particularly forensics. She, too, had clearly reflected on her experiences in the time between interviews, and she was very prepared to discuss it at length in her interviews with very little prompting from me.

Sunshine's Story

I am a 19-year-old girl, a freshman in college, and I enjoy dancing. I am the youngest of four, and I enjoy reading outside when it's sunny. My major is exercise science, and I want to focus it to become a physical therapist. I initially felt interested [in physical therapy] back in freshman year of high school when I had that big injury to my knee during the open house [dance] performance. The moment my kneecap popped out of place and dislocated, no one believed that I hurt it. They didn't even pop it back in until later. I was in tears, and I said I needed to call my mom. They didn't believe me, so I called her anyway. My doctor said it was patellar pain syndrome or jumper's knee. I started physical therapy because I started having back pain, and now, my knee isn't popping out of place anymore.

Obviously, I can't dance forever. No one's body can take on that much pressure, considering the extremes [to which] you push yourself in dance, but I don't want to just sit at a desk and have a desk job because that's boring. Then, I came across physical therapy. I can either choose to do physical therapy for older people or sports injuries or

maybe even go to a dance company [to] help dancers with their injuries. When I'm older, if I still decide to go that route, I might end up being physician's assistant. I'm not 100% sure. It's really hard to choose.

[In college,] I'm pretty reserved. I have my best friends – and I'm fine hanging out with them – but there are certain people I hang out with that drain my social battery. They want to hang out every single day of the week, and then they just show up at my door and just walk in. So, I started locking my door 24/7, and they'll keep knocking. I just say I have homework so I can be left alone.

I watch some TV after doing my homework, or I'll read a book. I'll do some self-care by doing a face mask and stuff, or I'm on the phone with one of my friends. I like to watch "Scandal," early seasons of "Greys anatomy," because the last few seasons have been awful, and then Gilmore girls. I've read so many books, but I don't like dystopian or fantasy books for some reason. When I'm reading books, I want more realistic books – not non-fiction – just a contemporary drama. It's more of an escape, but also entertainment. While I don't want the drama in my life, I think it's entertaining to read about it.

I also like to watch "Criminal Minds," and I'd joke all the time about how I want to be a detective. They are identifying these serial killers, without even knowing them. They're analyzing behaviors, and that's so cool. I've been watching it forever. When I was younger – and supposed to be sleeping – I would search the channels just to watch criminal minds. I wanted to solve cases, but I don't think I want that as a job because in real life that would be very depressing with all the things that happened today.

I don't like learning things that that I don't have anything to do with me. I feel like that's just a waste of brain space. I remember when, after I started driving, someone hit my car in the parking lot, and my tire would keep getting low. I kept getting the blinking light on my drive to school, and I didn't know what's happening. I was like, "Oh, my gosh, I'm going to die!" So, I stopped at a gas station, and I was Googling what's happening. Eventually, I figured it out, but stuff like that I need to know because it's relevant.

[At school,] I used to think I wasn't that good of a student, or maybe no one's paying attention to me because I wasn't getting any academic awards other than all A's. One of my teachers told me I don't need that praise. I just need to know that I'm doing it right, and I shouldn't live my life searching for the validation of others.

I never really thought much of the awards because my mom was never the mom to give like an allowance. She was like, "Why would I pay you to do stuff you're already supposed to be doing now?" My mother is a business owner and an aesthetician. She is hardworking, very strong, and stubborn, but she gets things done. Once she has her mind set on something, she's going to do it. She built her business from the ground up, and she got it to the point where she had people working for her. Then, I have my oldest brother. He is in the Navy and has been for about 7 years. Then, there's my other brother, and he passed away last year. He was a construction worker. I [also] have a sister, and she is a journalism and broadcasting major at Georgia State.

My dad wasn't really there, it was always just me, my mom, and my brothers and sister. I don't really know where he was in those few years. I was younger when the divorce happened. I didn't really see the whole family dynamic, and since I didn't know

everything that was happening, my dad showered me with presents. It got to the point where he's not actually doing anything for me other than just buying stuff. I [stood up] for the first time to him, and he was like, "Oh, well, you're just like the rest of them blah blah blah."

My mom always wanted all of us to be in some type of club or sports because if we were busy, we wouldn't have any room to be mixed up in bad things. My brothers were put into soccer, football, basketball, and gymnastics. My sister went through soccer, basketball, gymnastics, dance, and then she wanted to cheer. When my mom put me in dance, I was the only one that stuck with that one thing.

I started dancing in kindergarten because my sister was at the studio first. My mom put me in little toddler classes, and I was having fun with it. So, I just wanted to keep doing it because I had nothing else to do. I just stuck with it until about eighth grade when I started at the fine arts school. I think I'm hard-working [as a dancer,] but I see myself as average because I didn't start early enough doing ballet like the other girls. I thought I was going to be a dance teacher or a professional dancer when I was younger, but when I think of myself, I'm too shy to branch out as a professional dancer to go out and do all that's required. I left that dance studio because there was too much drama [between the dance moms.] My mom was like, "Well, if you're not happy, we don't have to keep you there."

That's when we heard that the fine arts school was opening. I went back to the studio to get a recommendation from them, and I got into the fine art school [as a dance major.] Once I was there, I realized that I wanted to try to have a future with dance. We went through like a bunch of different dance teachers, as you know, but I think having all

the different teachers taught me a lot of different things about life and how to go dance in a college class.

I joined the fine arts school in eighth grade [when it opened], but I had to make a PowerPoint to be able to stay there for high school. My mom wanted to send me to an academic magnet high school, instead. I understood [why she wanted that,] but why am I going to a school with crazy hard classes that don't even aid in dancing, which I was passionate about? So, I begged her to let me stay at the fine arts school. The classes at the fine arts school weren't as rigorous, so I didn't really feel like I was learning. So, my mom was like, "Well, if you're not learning, why are you here?" And I was like, "I'm here for dance."

When it came to art in school, I was always drawn to art. I loved the arts classes in elementary school. I loved painting, and then, once we got to music, I loved that class because you were just banging on instruments and making sounds. In both of those classes, those teachers gave us little certificates saying: dedicated, always doing the best work, and stuff. Those were my favorite classes of the day to go to. I hated P.E. It was so boring. They would just throw balls at each other, and we were in our school clothes. Why weren't we given P.E. clothes? So, I did not enjoy that at all, but I liked the music and art classes.

My fourth and fifth grade year, they started having musicals at the school, and I joined those for fun. I joined chorus because my music teacher from elementary school was best friends with the chorus teacher at my middle school. So, I joined that. I don't necessarily like singing, but I like being in chorus because it was just fun and easy to do. Then, I started getting into theatre because it was fun, and it had dancing. The fine art

school was literally everything all in one. I appreciate art more than science because I've been doing it for most of my life. With science, I'm learning this because everyone's making me learn it, not necessarily because I want to.

In elementary school, I did not enjoy my science classes. I enjoyed history classes because they were all easy and we were just learning information. With science, I was just coloring stuff and drawing stuff, and I didn't know what I was actually learning. I can't even think of anything I learned back in elementary school. I think it was life science, seventh grade where I thought this [subject] is kind of interesting. I don't love science, but I don't hate it. I do remember a lot about my physical science class at the fine arts school.

I mean, I didn't like the material [in physical science,] but I learned it. We learned the basics of cells back in middle school, but I really liked biology in high school because you're learning more like in depth. I don't know if I can remember all of it, but I remember liking that class. Chemistry, though, made me think that I absolutely hated science. What I like depends on both the material and the teacher. There are classes where I like the teacher, but I absolutely don't care about what we're learning. There are also instances where if the teacher's bad then, I feel like I'm not going to learn anything. If they're not bringing in enough effort to teach us, then I just won't enjoy the class. I feel like it's just a waste of time.

The first thing I remember about my [physical science] class at the fine arts school was Bruno Mars. Seriously, we had to sing a song for class, and there was important vocabulary in the song itself. The teacher was basically teaching us the lessons with the songs. I thought I could get along with just doing it in my head, but, no,

everyone was singing. It was ridiculous, but it was kind of fun because we're all singing it over and over again. When you are singing lyrics over and over again all day, certain sections would just stick in your mind.

The teacher broke the song up to learn on different days, and we had homework to go over it ourselves. The teacher would sporadically turn on music, and we were supposed to [recite the song.] So, the teacher would test us to see if we knew it. I didn't actually want to do the song or participate, but I did because I had to. It would be rude not to because the teacher took the time to make the song. The amount of effort that the teacher put into the lesson makes a difference for how much I participate. If a teacher only uses PowerPoints that everyone could find on Google and just sit here while they just read straight off the PowerPoint, I don't engage. I think after about 10 minutes, everyone was actually engaging in the song and having fun. The teacher explained that it would be easier [to learn the science] since were always singing songs.

If I got a test question on covalent bonds, I'd just go back to this vocab word or concept in one of the songs. I just start going through all the lyrics in my head, and there's my answer. I loved doing it. It was like a cheat sheet in my head. As we did more songs. I thought "this is actually helpful" because I probably wouldn't have remembered all that information if we didn't learn the songs. I remember on the [end-of-the-year] test I felt a bit more prepared. I wasn't freaking out as much as I would for any other test because I had the information in my head, no matter what. I feel like you remember songs more than you remember anything else, because it's like a story.

I know we did arts projects too. We would have to teach a [science] concept through whatever art form we chose. We got our notebooks out where we did all of our

reflections and definitions in class, and then we just went through the different topics we needed to show in the project. If we didn't know how to do something, we either went to the teacher or we googled it if it wasn't in our notes. We chose to do a dance [for our project,] and we just went topic by topic for our dance. We used 3 different songs to break up the topics. I remember one time I was working on that [AIL] project in a different class, and then I got in trouble because I wasn't paying attention.

To show radioactivity, we had the song “Radioactive” in it, and then we did that Meghan trainer song, “Future Husband.” We did that song because it was about relationships and how ionic and covalent bonds we were sharing and stealing and all that stuff. We just thought that be funny. Then the last one I don't remember. It was great how it worked from a visual aspect. I think that's why we chose dance instead of like a song. I think someone could do a PowerPoint if they chose to, but we wanted to make it fun because we heard other people trying to make songs and skits.

When you do a movement, I feel like it sticks [in your memory.] You connect that to something in science, and you will remember it the whole week. Solids, liquids, and gases, we used hand motions for that stuff, and I actually remembered some of the stuff we did like through the dance moves on the test and other stuff we had to answer. I feel like when you're doing movement, you engage more because people can see if you're not. So, you might as well give it your all.

Oh, and the pressure. OK, so imagine there's a classroom full of everyone doing the [AIL] lesson, and there's like one person not doing it. Everyone’s going to know you're not doing it. So, if you're being graded on it, obviously your grades are going to be bad, but you should feel embarrassed everyone's doing it and you’re not. You can't

complain [later] and say, “Oh, I don't know this. I don't know how to do it,” if everyone else does because they learned the movements and they were engaging in it.

I have more appreciation for science, now. That it’s not just boring, like social studies where you're just sitting there. I actually walked away from my [AIL] science classes remembering the majority of things versus the traditional classrooms. Before I started biology in college, the only biology info I could tell you is from a song that I learned in elementary school. I don’t remember anything I learned in my [traditional] high school biology class, but I can still remember stuff from forensics and physical science because we were so engaged, and we were always doing fun [AIL] activities. So, I liked science.

The [AIL] class promoted teamwork and my ability to work with others because it gets you out of your shell. In college, you have to work with other people, and had I not done that before I probably would have just never talked. I would have been so confused my grade probably wouldn't be good because everyone [in the group] calls you out if you’re not doing your work.

I also feel like [AIL] group work prepares you for the real world. I know when you're an adult and working, you have to work with others and talk to people, get ideas and bounce them off each other. Even as teachers, I saw y'all talking all the time, and I remember classrooms where other teachers would come in and ask teachers for help. I just realized last year that teachers don't really know what they're doing either. We're all in the same boat.

I feel like [AIL] helped me because I don't like standing out or getting attention. When we got to the high school part of the dance program, we had to start

choreographing stuff ourselves, and I feel like [AIL] science lessons helped me be more open around others because you would have to come up with your own thing and then teach it to other people. So, I felt like it helped me with my creative process. If I didn't know how to make something up on the spot, I would think back, "Oh well, I did fun stuff in the music video where I was just like jumping up and down." I can like connect movement with the radioactive decay thingy where we had to just come up with moves to show the different parts [of science.] I feel like I always have like a piece of that in the back of my head because that's the back of I already did that.

In ninth grade, I had biology. I remember coloring a lot and PowerPoints. We just came in and do whatever she decides for the day. The teacher was just writing from her knowledge telling us what to do. If you choose to take notes, you're writing it all down, and then eventually we ended up having a test on all that stuff. Labs would just follow the sheet of instructions, and then we had to answer questions. Well, in college, you have to [make up] the labs, yourself. So, that was a major change.

In chemistry, we were always learning, but we never touched anything with the arts. I know this teacher teaches more traditionally, but I also feel she was a very careful planner. They would set a timer for how long we have to work on it, and I liked that because we at least got everything done and were never like running behind. It could be because there is a lot of math in Chemistry, but it was harder for me to comprehend and remember everything.

We had whiteboards and a warmup. You probably had ten minutes to do it, and then you have to answer. She'd go over it and then on to the next topic. While she's teaching us, we're sitting there, and she's asking us questions. If you still didn't get it

right, then she just goes over it at the end. So, everyone's getting an explanation, and then there was more instruction and a worksheet and that would be like our homework. She did a ticket out the door, but you don't find out what you made until the next class that stressed me out, too, because now, we have the block schedule so I had to wait another day.

In AP environmental science class, the teacher prefaced the class in the first day by saying it was going to be [very traditional.] It incorporated some weird comics and drawings, though. Learning physical science, I didn't think I would ever use that information for anything, but in environmental science we were learning about the Earth and how different things happen. The teacher would keep telling us we needed to know this stuff. This was stuff we would vote on, but I still wasn't all that interested. The teacher was good about putting energy into it, though, and so the first half of the year, I was into it. We had discussion posts. We had reflections on what we learned about. Recent events like wildfires and climate change. The teacher had pictures up on the board asking us questions about stuff, and then some people might know something about the topic and raise their hands to engage in the conversation.

All that stuff from [AP environmental,] I don't remember. It's either something that interests you – and you're into it – or it doesn't interest you. I prefer to learn something I care about. I'm obviously not going to care about everything, and there are important things that I don't care about – but I still have to learn. Right now, in college I don't care about the stuff I'm learning, but I have to learn it to graduate. Not even just to graduate, I have to learn it to get into the actual program I'm trying to get into, and then

graduate. I remember as much as I [did] in physical science because of the songs and everything, but I only managed to remember stuff for the tests, not necessarily for life.

In forensics, we would listen to podcasts about murder cases every week on Friday. We had it on, and you were like filling out a case book that was like 200 points. You have to listen and fill out things. Some [of the details] were so specific. We were doing activities where you were a detective on a case, and all around the school, there were pieces of hair and evidence and stuff. So, it wasn't necessarily [AIL,] but we were always acting and doing something.

With the school-wide cases that the teacher would create for us, they told us what we were supposed to do, but they didn't tell us how. For the fingerprints and stuff, we just had to do it ourselves and analyze them. The fact that it was a murder was all that it took to go from being just a lab to being something you were looking forward to. Because we weren't just sitting and listening to a teacher, I was excited for it. I love “Criminal Minds” and “Law and Order,” and we were actually doing activities where we're solving cases and fingerprints and dusting for stuff. That was really fun. I really I got to play a detective.

I think a teacher could use [AIL] to help in other subjects too. Especially in a [fine arts] school like this, if more teachers put [AIL] into their curriculum, scores would be higher. People would actually pay attention and not just watch Netflix or YouTube videos on their phone. They’d just be more engaged, and everyone would be happy because students aren’t upset or complaining that they [are forced] to teach the content to themselves.

When you're learning songs in class, you learn the skill of rhythm and tempo and memorization, and then when you're doing visual things like the visual arts, you learn how to make stuff pretty. Then in movement, you work on your coordination and memorization. All of them go back to memorization at the end of the day because you have to be able to put what you learned into it and memorize what it is. In dance, you have to memorize all the different moves along with the movement, and then the songs you're memorizing the lyrics – but in order to memorize, we actually have to know what we're talking about.

[AIL] does not help with the technical aspect of dance or songs because if you really want to get deep into the art, the teacher has to be just as qualified in the science and the art. If you just want to touch the surface, then of course the teacher can learn the basics to teach that art. I believe that [AIL] would help a regular person depending on how far you take it because you could do certain things for them to make it work with annunciation or tempo or rhythm. I feel like you could find a way to make it work because somewhere online that I saw, and I remember there was a standard about creating and the ability to perform. I feel like doing the dance movements in the science class falls under those standards. In [AIL] if you're performing and creating this stuff, then it falls under choreography.

If people are used to [learning traditionally] and the teacher is only doing [AIL,] then I guess they wouldn't be getting all the information they could because of the fact that it's not the way they learn, and their brains are not processing it. That's the only negative I could think of. I learn better when I'm actively learning. So, whether it's writing notes or having a conversation [with the teacher,] I feel like I learn better. I also

think I tricked myself into thinking of that. So, at the end of the day, I really don't know. What I do know is that if someone is just talking at me, I don't remember things. When people tell me something in a conversation it's different.

In my brain, when I'm having a conversation, I can more than likely remember everything we talked about, but if I'm sitting in a lecture hall where I feel like the teachers just talking to like everyone versus having it feel like they're talking to me, it doesn't help. But, if I put in like that mindset of a conversation, then I remember more. But if they're just talking, I don't know what's going on. I just forget everything as soon as I walk out the door.

If the lesson is in the form of a conversation, then in my head I'm responding – if that makes sense. It kind of sounds crazy, but when teachers ask questions, I'll answer them in my head. When a teacher's not asking questions, I rephrase [their statements] as questions, which I write down to look up later. If a class was traditional, I just need to do worksheets to learn. The teacher can't send us on our way [after lecturing] the entire time.

I feel like being at this fine arts school gave me the privilege of having a majority of students want to be in the class. They purposely signed up for these honors and AP classes for a reason. With on-level classes, there's always going to be some who just don't want to do anything, and they're going to make it hard for everyone else. That hinders learning for everyone because the teachers are upset at them and they're purposely trying to get the teacher upset. I feel like to work with those students you have to appeal to what they actually like to make them feel like they're benefiting from it. Find out their favorite artist if you're doing songs. If I was one of those disruptive students, soon as a Taylor Swift song came on, I'd start engaging. As long as the teacher is holding them

accountable to make sure that the information is there, they'll be really excited because they're not used to doing something fun like that in the classroom.

If you were to learn biology freshman year of high school through [AIL,] then when you move on to biology in college, you'll remember more – instead of saying, "Oh. I don't remember that." I feel like if people learn [with AIL,] they have an advantage because they have all the tools they need. They can remember certain songs or movements for a long time, and it'll make it easier for them to transition to that next level, no matter how many years between when they took it.

Classes where my teachers have actually cared about what they're teaching and are excited to teach it made a difference. Some teachers just do it for the paycheck, teaching us but not getting us to understand. They have their PowerPoints and they just read it out, but they don't do anything with you to make sure you understand it. Then, they just throw the test at you. You really have to put your all into it to make sure your students are understanding. I also feel like I could be biased, but I prefer [AIL]. Making things fun, but not just fun for the students just because you want them to like you, but fun to where they can still understand it.

Reflection on Sunshine

Sunshine was a shy and reserved student by her own account, but she was very comfortable sharing details about her time at the fine arts school. She laughed and smiled as she recounted much of her experience at the fine arts school. She enjoyed her time in AIL and felt that if more of her classes, especially Biology, were AIL, then she would have remembered more of her learning in college. She took several traditional science classes in school and was not happy with the instruction. She mentioned that

teachers who incorporate AIL lessons showed that they cared more about their students than traditional teachers because they were trying to connect the learning to student interests. Sunshine was only interested in educational content that was directly relevant to her, but she still responded to teachers who put the arts into their lessons to engage their students.

The material had to benefit Sunshine directly in some way to be considered of interest. However, the classes that incorporated the arts really engaged her. Her love of the arts helped her move past her lack of interest in the content, and using the arts helped her learn the material deeply and for a long time. One of her first classes at the school was physical science, an AIL class, and she remembered more about that class than any other. Whether it was the songs or the dances or skits, she really felt that the movement and interaction of her other senses helped the material lock into her brain. The students responded to the AIL activities because it incorporated so much of their interests and showed that the teacher was working hard to make class fun for them. Dances, songs, and performances also required her and her classmates to engage meaningfully with the content. If they did not, their lack of understanding would be exposed when presenting for the class. She believed that student state assessment scores would be much higher if more teachers used AIL in their classes. These AIL lessons were just more fun for her and her classmates and helped the science information stick. While her science knowledge expanded in AIL, she did not feel that her abilities as a dancer grew in AIL classes.

As a very accomplished dancer, she was quick to say that, while AIL can teach dance standards, it takes an expert to teach the technical skills needed to improve a dancer's ability. The science teachers that she had were not experts in dance. So, while

the technical aspects of dance did not improve from AIL, she said her ability to be creative and work with others improved greatly. She was more comfortable stepping outside her comfort zone and taking the lead on many dance projects because of her time in AIL. She believed these collaboration and leadership skills would be extremely helpful to students in their future career. Art students were not the only ones who could benefit from their time in AIL.

Sunshine believed that AIL could also help engage students in regular classes who struggle to pay attention. She saw that incorporating AIL made the teacher seem more empathetic to the students because they went out of their way to make engaging lessons, and students really respond to teachers who show that they care. She loved her forensics class so much because the teacher designed these intricate student-centered activities where she got to play the role of a detective – one of her interests. So, Sunshine believed that using AIL was a great way to engage students through their interests and forced the students to think deeply about the information. She wished more of her high school classes were AIL-based before going to college because she believed she would remember more of the information, now.

I generated themes for Sunshine just like the other participants, and her specific themes were covered in great detail in this vignette. Sunshine had fun and learned a lot in her AIL classes but found traditional classes tedious and boring. She cared about science when AIL was involved and felt that it prepared her more for college classes because she remembered more of the science content than in her traditional classes. One theme that I generated from Sunshine's data centered around teacher feedback. Teacher feedback is essential to student learning and AIL effectiveness. Groups need the feedback to stay on

task, and students need the feedback to confront their understanding and learn from their mistakes. Sunshine really enjoyed her time in her AIL science classes because they incorporated dance and song – two of her major interests.

Summary

Five of the six participants joined the fine arts school because they loved the arts and wanted a future in the arts. While a few of them were interested in science when they were younger, many of them credited AIL lessons as the precipitator in their newfound appreciation of science. The fact that so many of them got to use their art skills in their science classes resonated with many participants, and the integration allowed them to link their passions with science content.

These participants credited AIL instruction for their enjoyment of their science classes, and they appreciated that AIL engaged different parts of their mind while in school. They believed that the unique lessons helped them forge more connections between key concepts and retain information much longer than they would in a traditional science class. Three participants seemed certain that traditional instruction could be useful, especially to prepare for college-style instruction, but the learning only stuck in their mind for that year before it was forgotten. Even with traditional instruction helping participants prepare for their traditional college classes, most students wanted AIL instruction in high school – or at least a mixture of traditional and AIL – because AIL could help them remember the information when they got to college. The more science they remembered from high school, the easier they believed that the college classes would be.

Participants also shared that they saw growth in their creativity. Their AIL classes were very different from their traditional ones, with songs and dances that challenged them as learners. Three participants noted that the group work and presentations helped them learn because they could see other students' work and use their framing of the material to understand the science in a new way. Students in AIL were expected to think a lot, which helped their learning, and for any students struggling to see the material as relevant, AIL was one way that participants suggested teachers could help engage students. Three participants stated that using AIL lessons could show that teachers cared about their students because they took the time to design such engaging lessons.

Not all participants found the AIL lessons engaging or helpful, however. Bubblegum and Quentin found their AIL lessons stressful and to be an extra step required in the learning process. For Bubblegum, she thought the process to be too much work at her time in high school when she wanted school to be easier. However, she changed her mind in the years after when she realized how much she learned from those AIL classes compared to her traditional ones. Quentin never had a very high opinion on the arts. So, it would have taken a significant, relevant experience to make him enjoy adding the arts to any science class. For Rhea, Sunshine, and Bubblegum, the stress came from the performance aspect of AIL lessons where participants were stressed or nervous about the assignments. Starfox and Bob believed that group work could be unhelpful as group members might not pull their weight and as the requirements in AIL lessons were not rigorous enough.

This belief makes sense when you consider that the two of them were top students who often viewed other members of their groups as obstacles to a good grade. Quentin

really wanted to see more individual thinking being asked of students, and he found that AP class free response questions, where students write a lot on their own, were very challenging and helpful. However, four participants had positive things to say about those performances, despite the stress and nervousness. Bob, Sunshine, Bubblegum, Starfox, and Rhea saw the group work as essential to learning future job skills in collaboration and leadership. They even felt that group performances forced the whole class to engage meaningfully with the information in ways that traditional classes did not. The participants revealed some issues with group AIL performances. However, five of the six participants believed these activities benefit students and their learning.

These participant narratives were very insightful into the student learning process, and they can bring a better understanding of the AIL process to any teacher or administrator who reads them. Although there were only six participants interviewed from a particular fine arts school, there was a wealth of data that can be used to inform instruction. The vignettes were a means of understanding the context of students engaged in AIL, and in the next section, while Chapter 5 focuses on themes generated from the decontextualized coding processes used to look more analytically into participant experiences and observe the data in new ways that generated understanding of the AIL process.

Chapter V

THEMATIC ANALYSIS

After creating thousands of codes and compiling them into categories, I was able to construct themes based on my interpretation and analysis of the newly created categories. I was able to use the coding process to focus on unique details in the interviews, which could provide new perspectives and interpretations of the data. Each theme will be discussed and supported with data from the participants' interviews in this chapter. These themes pertain only to these specific and unique participants attending a very specific and unique school. However, the stories that the participants shared, and the themes created from coding and categorizing those stories might provide insight into the AIL teaching process for educators who are curious about students' experiences in AIL science classes.

The six participants were interviewed three times each for approximately 4.5 hours. From these interviews, over 7,000 codes were generated. A combination of in vivo, values, and pattern coding was used. An in vivo coding strategy was used to honor the participants' chosen words. Values coding was used because this study was intended to explore the meaning that participants made from their time in AIL, and their beliefs, values, and attitudes were essential to gaining a better picture of what the participants learned from their experiences that shaped their perceptions of AIL in science classes. Pattern coding was then used to generate and group categories and themes by searching for patterns in the codes. I created these themes inductively from analyzing the patterns

and categories that I observed in the data. The themes for this study are presented in Table 11.

Table 11

Themes Generated from Coding

Themes
1. Enhanced engagement and long-lasting learning occurred as a result of AIL lessons that encouraged creativity, built critical thinking skills, and fostered teamwork making learning more meaningful and more memorable than traditional lessons.
2. Although AIL benefits far outweighed its challenges, performance anxiety and group management were concerns for participants.
3. Success in traditional learning environments did not lead to it as a preferred teaching method when AIL instruction was equally relevant.
4. Participants became more interested in science or a future science career when their science teachers used AIL in their classes.

The theme that I began to create early in my interviewing and analysis was that students enjoyed AIL and their level of engagement was much higher in AIL than their traditional classes. The largest group of in vivo codes that I generated from the interviews were relentlessly positive descriptions of the AIL process. Five of the six participants felt this way and were very specific with respect to those benefits in their interviews. They believed that AIL helped students learn deeply, become more creative, and work better with others. The second theme that I generated from the data centered on how nervous students became when performing AIL lessons with peers observing their work. It was difficult for four of the participants when they had to stand in front of their classmates to engage in AIL lessons. Third, the participants were consistent in their perceptions of traditional instruction. It wasn't "fun" or as helpful in learning as AIL, but as good

students, they could still learn in that system. Lastly, participants mentioned growing a new interest in science with some even moving towards a future career in science.

I have placed quotations from each of the participants that highlight the themes into a matrix in Table 12.

Table 12

A Matrix of the Themes and Supporting Evidence for Those Themes

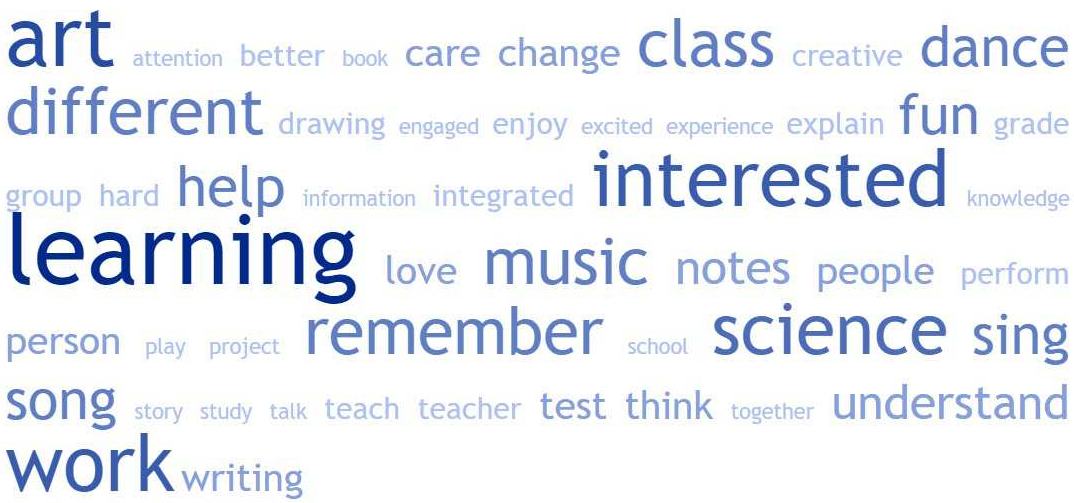
	Bob	Bubblegum	Quentin	Rhea	Starfox	Sunshine
Theme 1	"You get more opinions that aren't your own. That will help. enhance what you're learning"	"It can be helpful to do something creative; you never know how others learn"	"It's getting you to think of it in a different way and apply it to something else"	"But we're going to have fun doing it"	"I feel like [AIL] is more fun to think about and how to transfer it creatively."	"Rapping by myself was eh, but when others were engaged in it, it was more fun"
	"It will stick in long term memory"	"I had to switch over to a higher way of thinking and a more critical way of thinking"	"When it's a group project, it doesn't feel like learning. It's more like having fun"	"Knowing it deeply is not something that I really have to think about."	"I'm saying through an art like helps you learn the material deeply or better"	"Movements just convey a story. So, you're going to remember for like a year at least."
Theme 2	"I would still be a little nervous doing this in class"	"I was super nervous. I didn't I didn't really like speaking in front of people"	"We were essentially just goofing off in the group"	"Composing my own stuff, scares me"	"I'd get very nervous depending on the who's in the group"	"They can do exciting things as long as someone is holding the group accountable"
Theme 3	"In [traditional] classes, it was easy for me to get bored and zone off"	"[Traditional] becomes more like a chore, and it becomes hard to learn"	"Worksheets, suck no, but maybe they could be super helpful"	"It can get pretty redundant. I don't enjoy it as much. It kills interest"	"So burnt out before they leave high school, that they don't want to touch it again"	"Writing random stuff works for me, but it won't work for everybody"
	"Instead of us trying to get them to the next test, make it more about something we need to know"	"[Traditional] was more just like a passing game, but I wanted to have a little bit more fun with it	"I wanted more real-world stuff or application based"	"I was still using the [learning] every day because it's [about] my body."	"Seeing it happen and how it produces clean water and that's important"	"[I prefer] when it's relevant, because some things I don't know if I need to know"
Theme 4	"Being in the class it definitely made me more interested [in science]"	"I was kind of excited to be in that class because it wasn't a standard science class"	"I was going to be a surgeon. Then, just science. Then, landing on coding"	"I might be auditing an environmental engineering and sustainability class, next semester"	"Started to turn my brain in terms of like wanting to get in the sciences"	"Being here, I actually cared enough about science to actively participate"

Maxwell and Miller (2008) encouraged this practice when coding to allow the reader to draw conclusions and make connections across the data. The matrix shows that the themes have supporting evidence from the interview data, and each theme is discussed in greater detail later in this chapter. Each theme was well evidenced from the interviews. The participants were all wonderfully cooperative and had many great stories to share about their lives and AIL.

Allowing the participants to share their thoughts about AIL was the focus of this study. Because of this focus on the specific language of the participants, in vivo coding was used to break down the stories into snapshots of the participants' experiences. There were almost 6,000 codes created from just in vivo coding alone, and I generated a word cloud from the in vivo codes in Figure 5 using MAXQDA. The darker and larger the word, the more prevalent that word is in the text.

Figure 5

Word Cloud of In Vivo Codes



This word cloud helped reveal the most common words on participants' minds in the interviews, which was very useful to the study. These in vivo codes were all identified by

me using the actual words of the participants from the interviews. Since there were so many codes, some words like “book” appear in this word cloud. So, a major issue with the word cloud was that the generator used did not link words from the codes together. So, the code, “not remember,” would be split into “not” and “remember.” This limitation of the word cloud reduces its utility, but again, it was very helpful to get an idea of how to proceed in my analysis.

After analysis, the largest set of words dealt with learning, and the words following that were “interested,” “work,” “art,” “science,” “music,” “remember,” “different,” “class,” “fun,” “help,” “dance,” and “sing.” In a discussion on AIL in science class, these words made a lot of sense. Other words like “engaged,” “excited,” “think,” and “creative” were well represented in the word cloud. These repeated words from the coding gave some insight into how overwhelmingly positive the participants’ views of their AIL experiences were. Showing these words at the beginning of the thematic analysis may also provide some context for the themes developed throughout the coding process.

Theme One: Enhanced Engagement and Long-lasting Learning

The first theme was well supported by the participant narratives, and it addressed the main research question of this study regarding student experiences in AIL classes. This theme was developed looking for patterns in the in vivo and values codes to help answer the first research question: How do recent high school graduates from a fine arts school describe their experiences, before, during, and after engaging in AIL in their high school science classes and what meaning did they derive from those significant

experiences? As an example of this theme, one of the participants, Bob, reflected on her experience in her first AIL class in her third interview:

> Physical science was my first science class [at the fine arts school,] and I had never been in a class like that before. Ever. It opened me to new experiences. This [AIL] class made me realize that there is not one way that I can learn. I really enjoyed being in a class like that, especially going to a school of the arts. So, it really meant a lot to do projects and assignments that I was interested in. We would sing, rap, and all those things I was interested in – and a lot of my classmates were interested in, too. (Bob, Interview 3)

Bob said that her AIL class transformed her perceptions of what a science class could be. She had spent much of her childhood pretending to be a teacher, but she would always teach in the most traditional fashion as that was all that she knew. She became so enamored of AIL instruction that, after graduating, Bob chose to attend college to become a teacher and use techniques from her AIL science classes to help future students. Bob shared several engaging and creative experiences from her time in her AIL classes.

Bob was very moved by the experiences in her AIL science class that connected her to her creative passions. Another participant, Sunshine, also appreciated how much AIL instruction was able to bring the arts into her science classes: “I see academics as a chore, where that arts are a passion that anyone can have. So, if you're combining them, it gives you an appreciation [for the arts,] and it makes you want to learn the sciences.” Looking forward to learning science was important to Sunshine. Academics were a

“chore” to Sunshine, but much like Bob, she revealed that integrating the arts could help make students passionate about their learning in science.

Five participants found AIL engaging and fun, but not always right away. At first, Bubblegum found AIL to be a lot of extra work for an early morning class, yet her opinion changed the more she started to learn and remember in that class from the AIL lessons. In an example from one of her value codes, Bubblegum had this to say about how much she enjoyed her AIL experience:

> Probably just the excitement of learning. We were getting to apply what we had learned to make it fun. You know, we try to make sure that information is accurate, and so we had to practice it. Whatever [performance] that we decide to do, we’ve got to practice and then go over it again to make sure that we were right. It's just the excitement of it. We were having fun. (Bubblegum, Interview 3)

According to Bubblegum, each student doing AIL had to do a lot of work and a lot of thinking to be sure that every part of their performance and of their science information was correct. In their AIL classes, participants would have to learn science vocabulary and concepts and communicate them using different forms of art, or the participants would have to learn the science content through the arts, by dancing or singing, etc. Bubblegum revealed that she valued being able to learn using this reflective repetition during which she could think deeply about what she learned and how to best communicate that to others. These creative challenges helped the students think hard and learn deeply in ways that stuck with them for years into their future.

I uncovered a lot of data on creativity from their interviews as well. There were a lot of data points concerning the complex nature of AIL lessons that students had to

tackle using their creativity. Participants, like Starfox, were drawn to these creative projects: "[AIL] was more exciting to me and more of an opportunity to exercise that creative muscle." Starfox felt as though the creative projects piqued her interest in a topic, and she would become invested and want to learn more about the science on her own. She elaborated later on a YouTube video editing project that she created, for which she had to teach a concept as though she was a YouTube influencer:

> [When making the YouTube video,] I would have notes – an outline of the flow of information – because I had so many topics and so many things that that I was trying to teach in that [AIL] video. My first line of business was making sure I was as familiar as possible with those things and then putting them into the creative format. I was getting my wheels turning asking what's another way to communicate this or what's a way for it to be visualized or what's a way to make it entertaining? So, it was adding a layer of depth to it because it made you think about it beyond just textbook definition. (Starfox, Interview 2)

Starfox recognized that she was being asked to go beyond the basics for her AIL assignment and accomplish a complex task that required the best of her. Because she had to work with so much information, she was forced to think deeply about the material and make decisions using the material. This constant use of the information helped her learn it all deeply, which multiple participants agreed was a characteristic of AIL lessons and provided some insight into this theme.

The complexity and creativity required by the assignments in AIL really helped five of the participants learn. Sunshine brought this idea up in her interview as she could access these AIL memories very easily:

> So, I felt like [AIL] helped me with my creative process. I don't know how to make up stuff, myself, but then I would think back [to science class.] Oh, well, I did fun stuff like the music video where I was just jumping up and down, or I can connect to the movement of the radioactive decay activity where we had to come up with moves to show the different types of decay. I feel like I always have a piece of that in the back of my head because I did that activity. (Sunshine, Interview 3)

Sunshine noted here that the creative nature of her assignments helped her be creative in her other classes too because of her experiences in an AIL science class. She didn't forget the activities, and she retrieved those memories about her learning when she needed them. She would think back to her time in AIL science classes and she would use those same creative skills in her other classes years later. Three of the participants were able to see improvements in soft skills and collaboration skills doing AIL group work as well.

Two participants had reservations about it, but four of the six saw group work as a bonus to doing AIL. Whether they were working with their friends and having fun or sharing ideas and pushing each other creatively, students got a lot out of group work including those wonderful soft skills, like teamwork and collaboration, needed for their future careers. Bob framed the benefits for her this way:

> With a group, you're talking more because not everyone thinks the same. So, there's going to be more ideas and information that everyone's going to think about, and you get more opinions that aren't your own. That will help enhance what you're already learning about. If you're just doing it individually, all you've really got is yourself. (Bob, Interview 3)

Bob saw that she could get so much more learning out of a project when she worked collaboratively with others – as students often do when learning using AIL strategies.

Starfox, an avowed perfectionist, had a similar experience to Bob. Group work was always a tough experience for her as she often had to rely on others who she perceived as less capable than her of doing the heavy lifting on her projects. However, reflecting on her experiences in AIL classes, she had this to share about the benefits of group work in AIL: "I think that [AIL] helps you develop that basic understanding in a different way. I might have been struggling with this idea in the classroom but seeing it from another [group's perspective] helped me. I get the definition now" (Starfox, Interview 3). AIL students are exposed to new ideas and thoughts through these collaborative projects, and when another group's learning is presented in a different way through an art form, something clicked for Starfox, and she had a firmer grasp of the material thanks to this new lens given to her by another group's art performance. By sharing ideas, classmates could fill in gaps for each other in their learning and build a better picture of the content in their minds. This description of student collaboration really addressed the second research question about student perceptions of their learning.

Five participants believed that they learned the material in AIL science classes in ways that enabled them to remember the information longer. Bubblegum explained the situation when asked to do a lot of challenging AIL work early in the morning: "We had to pass this [state assessment] for class. You don't really think about the long-term effect of learning, but it just sticks with you forever, fortunately" (Bubblegum, Interview 3). Bubblegum and her classmates had a test that they had to take at the end of the year, which would impact their grade and, thus, their GPA. Despite the test's importance,

Bubblegum's class would often grumble when given a challenging project early in the morning. However, looking back, Bubblegum believed that doing these intense AIL activities was a good thing for them because that information would stick in their minds for the test and long after it.

Even Quentin who struggled to see value in AIL practices had to admit certain benefits to engagement when using AIL:

> [AIL] is getting you to think of [the science] in a different way, as a reinforcement – applying it to something. I understand the reasoning behind it. I don't know if [AIL]'s like this for everybody. I think I'm just lazy, you know? [AIL] works better when it's a group project, but it doesn't feel like learning. It's more like I'm having fun. Recording that [eutrophication video] for my AP class with the river was fun.

Quentin understood that AIL was used to help him learn and that he even had fun with the group work aspect of those lessons, but he never believed that using AIL could make him learn best. He claimed he was just being lazy, but through the entirety of the interview series, he made it clear that he did not respect AIL as a learning process – at least how the teachers at the fine arts school used it. So, Quentin had fun with AIL, but he did not believe AIL to be a rigorous or relevant enough process for him.

Rhea also had fun doing AIL lessons, but from her perspective, AIL was great at helping students learn because of the unique way it makes students view the material. She broke down her experience with the AIL in her interview, and she really focused on how student thinking influenced how deep student learning was:

> I think it's all about the interaction with the material, or the concept, because the more you practice something the better you're going to understand it. So having [AIL lessons] where you have to think constantly about a concept for a long period of time – giving you a bunch of practice – it becomes something, second nature, that you just know. People would make jokes and memes about mitochondria, the powerhouse of the cell, and that being something that everyone always remembers but like it's there's a lot of science that was like that for me, in high school. I remembered it all the time, throughout high school, for the most part, and I think a lot of the time that it was linked to my [AIL] classes. (Rhea, Interview 2)

Rhea saw the nature of AIL in science was thoughtful and repetitive practice. Many participants mentioned repetition as being key to learning, but the style of learning meant a lot to Rhea as it was more fun and helped her remember the information much longer. Constant, creative repetition and fun, engaging practice on a topic helped solidify her learning.

Theme Two: Performance Anxiety and Group Management

There were many categories and codes centered around these fun, positive experiences with arts-integrated learning. In fact, it was the largest group of codes that I had. However, four participants did note in their interviews that, while their learning was lasting longer and they enjoyed class more, AIL lessons could also be stressful for them. The second theme generated from the coding process was that AIL can make students feel nervous participating in them. This theme goes directly to the first research question

about participant experiences. Bob, a theatre and chorus major, had the following to say about the process:

> It took so long waiting to perform for people. It didn't bother me that much, but I would still be a little nervous doing the [performance] in class. I'll always remember how another teacher in the room next to us came in to check on our classroom because they were always confused as to what was going on inside [because of the noise]. I didn't mind doing [AIL] because I didn't want to sit in the chair anyways. I don't like sitting down. I was glad to get up. Even though I can't dance or anything, let me get up because sitting in that chair for an hour was tough. (Bob, Interview 2)

Bob enjoyed many of her AIL lessons simply because she could get out of her chair. However, even though she was in multiple shows and performances in her time as an actress at the school, Bob still felt nervous waiting for her turn to perform and for how her class would receive the work. This nervousness was a particularly surprising find because this idea was never addressed in any of the literature that was reviewed for this study. One of the reasons for this may have been that most researchers only interview the instructors of AIL lessons, which was why the nervousness of the students wouldn't be discussed. Instructors would be less likely to know the true feelings of their students without actually speaking directly to those students.

Rhea also spoke to her stress and anxiety in AIL performances. However, her nervousness had more to do with a very challenging music activity with her own very high expectations of herself weighing on her as a music lover, rather than performance anxiety. Rhea was a consummate performer who took her performances very seriously,

which would make the situation more stressful than it needed to be. Whenever Rhea had to use music in her class, she described her emotions this way:

> I think both excited and nervous because I want it to be good, but I'm nervous because I don't exactly know how to do this. I am excited to figure it out, and I'm always excited to get to write music. So, I think I'm more excited than nervous, but there is some nervousness to it as well. (Rhea, Interview 3)

Rhea noted that she was excited but would be nervous performing in front of her peers. Any person performing or speaking in front of others would likely feel nervous, but there are higher expectations when the art form was in your major. Also, Rhea shared that many students would not know exactly what presentation or production the teacher wanted for their AIL project, which was hard on them. Without any exemplars, many students would become stressed out because they just wanted to do well.

It is important to point out that Sunshine was also nervous about the process and was very concerned the first time she stepped into an AIL class with all these projects and presentations. However, she believed that those stresses helped her in her future classes. In the years after her AIL classes, she discovered that performing and speaking in front of others was something she could handle and enjoy: “If you were to put me in an [AIL performance project] I'm probably like, ‘I don't want to do it by myself,’ because it makes me nervous, but now, I think it's fun! Where before in [my AIL classes] I was like, ‘what is this? What are we doing?’” She could see her growth in her creative ability and her willingness to participate in active learning projects from before AIL to after AIL, and she discovered that she now had the courage to do it – as long as she was in a group.

Participants also recounted situations in which AIL group work became unhelpful because it would make the work students have to do more complicated than necessary. The values codes suggested that participants believed that the teacher was at fault when AIL projects became frustrating for them. After giving the assignment, the teacher might leave the students to do their work with little monitoring and surface level evaluation. Participants believed that students took advantage of that lax oversight to lose focus and play with their friends. Quentin was quick to share on this topic from his experience:

> For me, when it came to the arts and crafts part of [AIL] when we made DNA out of paper and colored it in, I hated that stuff. I'm not good at it. I hate it. I hate doing it, but when it came to the other example that I was talking about where we made a skit describing actions that can be done within physics, that was fun. It felt like I was just goofing off, really, because that's what I was doing. We were essentially just goofing off. (Quentin, Interview 2)

Quentin did not care for anything extra he was being asked to do in the class. Where others explained that they enjoyed using the arts to learn material, Quentin saw it as an extra, unnecessary step that only made him work more for the same learning payoff. Further, he described his AIL group work as being very unfocused and more interested in playing around and "goofing off." He continued in his next interview to break down his experience with the previously mentioned physics activity:

> Well, we're not doing the work [because] it's more about messing around with friends. Cracking jokes instead of really doing the [AIL] lesson, and then eventually just being like, "OK, let's actually do it now." Usually, those projects are too simple. That's a good way to explain it. They're too simple to require

> critical thinking a lot of the time. It's like, “Oh I can apply it to this…” It's a very one-way thing: “This logically equals this, and I'm done,” you know? When [we were representing the word] push for the physics thing every group did the same thing because of course they did. There are only so many pushing things you can do. They pushed something, pushed someone over, pulled them back up… Then, there were a couple more things, but everybody did some version of the exact same thing because there's not really that much freedom there to reinforce the learning. (Quentin, Interview 2)

Quentin highlighted his major issue with AIL in that passage. He did not see AIL as essential for building student understanding. When the science ideas were simple, AIL students did the same things in their performances, and students were not required to think deeply in his opinion. The majority of Quentin’s time in AIL classes or doing AIL lessons was not engaging to him. This perspective is very different from what was discussed earlier by other participants, like Starfox, who reported learning a lot from those different representations. Further in the interview, Quentin went on to say that these AIL lessons did not meet his requirements for an engaging lesson unless they included something relevant or real-world that the students had to work hard together to learn. Real world/relevant lessons were coded often in the data as points of value to participants during the analysis process. The teacher’s ability to focus the class could make a real difference according to the data from multiple participants.

The teacher also had an important role in keeping the groups focused on learning the material as well as the art in each lesson. Rhea addressed this point in her interview: “I know some students who would just be focused on: ‘Let’s make this pretty!’ They'd be

more focused on the art side than the academic side. [Teachers should] make sure that there's an even balance between science and art within the [AIL] projects as well, so that they're just focused on the academic side – or at least some accountability [from the teacher] may help." The participants' teachers used AIL to teach both the arts and the science together, and the participants knew this from their time in AIL classes.

Rhea shared that the allure of the arts could overwhelm students so much that they would forget to give the science they were supposed to be learning just as much time and attention as the art they were creating. Students should be learning both science and art in AIL classes. So, Rhea recommended that teachers spend more time inspecting what their students are doing during these lessons to keep them focused. At the very least, teachers should be working with students to make their time and work less stressful for the students. Quentin also asked for teachers to do more to monitor and guide students in his interview because there was a lot of stress in creating these assignments when students were left on their own to figure it out – especially in groups. Altogether, Quentin did not find AIL lessons as helpful as Rhea did, and he suggested using real-world, relevant lessons in a more traditional fashion if necessary.

Theme Three: "Fun" and Learning Beat out Learning Traditionally

One of the major topics coded in the interviews concerned participants' views on traditional instruction. Traditional instruction and AIL instruction have often been considered opposites or rivals of each other. Traditional instruction was the baseline of science instruction for me growing up, and it's what most students expect to receive when they enter any classroom. All the participants were surprised by the kinds of lessons they were asked to do in these AIL classes because they had only experienced traditional instruction up to that point. Universally, participants did not value traditional

instruction according to the in vivo codes I generated. Their attitudes towards it were generally negative. Many acknowledged that they learned enough in traditional classes, but all of them were quite candid about the fact that traditional lessons were very rarely engaging. Bob shared this statement about her time in traditional instruction: “It was easy for me to get bored and zone off.” Bob was a tremendously successful student at the fine arts school, but even though she found success with traditional instruction, she had no plans to use it in her classroom as a future educator.

Bubblegum, also a teacher candidate, had a very detailed description of her experiences in a particular traditional class: “It would be strictly book and worksheet, and if you already don't understand, then you're expecting to sit alone by yourself to do it. It becomes more like a chore, and it becomes hard to learn. To sit there and try to understand it yourself? That was just, I feel like, a problem” (Bubblegum, Interview 2). Bubblegum reported struggling learning traditionally as she was not well versed in science growing up. So, when asked to learn on her own using traditional methods of reading books and doing worksheets, she did not have the requisite prior knowledge to be an independent learner. She tried to turn to her classmates, but they didn’t have much more knowledge than she did. So, most students were forced to cheat just to maintain their GPA in their traditional science classes. This cycle of struggle continued through Bubblegum’s time in traditional science classes at the fine arts school.

Quentin had a very different view of his time in traditional classes compared to the other participants. Quentin was not in school to do a lot of extra work that he did not see as necessary. He appreciated traditional instruction more than AIL because he could learn what he needed to quickly, and while he was never excited about taking traditional

science classes, he found that he was capable of succeeding in them: “I don't mind [a] traditional [class.] I understand why it's there. It's very informational, and for somebody who's determined to learn, it's very easy to learn” (Quentin, Interview 3). Quentin went on to say that he just needed the information and that the additional AIL workload and arts instruction was not what he wanted from his class. He was there to gain the knowledge he needed and to move on with his life. He appreciated relevance before anything else when it came to his science classes. If the learning was relevant, he would be interested and work hard. If not, he did not want to participate – not even in group work. He was not there to explain the information to anyone else by working on AIL group projects. If students wanted to learn it, they could focus and pay attention like him.

Rhea was similarly up front about her need to learn the information, but she wanted more challenge and creativity in her lessons. Next, Rhea noted her challenges in a traditional class while recognizing that she did well and learned important information:

> I think I went into [the traditional class] with the expectations of it being similar to all the other AIL science classes I had taken at [the fine arts school,] but for the first time in all of my high school years, it was just sit down and take notes and work on worksheets. So throughout it, I was just like, “I’ve got to go to anatomy now.” or “Thank God, I don't have anatomy today!” I did really well in the class. So, I did like that about it. I did like that it was predictable, but it was kind of a drag sometimes because we're doing the same thing every day. I think my interest in science lowered but it wasn't enough to impact the way I was learning this stuff, because I was still using the stuff – every day – because I’m using my body. (Rhea, Interview 3)

Rhea reported being successful in traditional classes, but she did not enjoy those classes. Many participants reported the importance of liking a class in improving their learning, though Rhea did not see that enjoyment as necessary for her. However, later in her interview, Rhea mentioned that the information she learned traditionally was typically forgotten after that year unless the material was super relevant to her or her interests.

Rhea's comment about relevance was part of a theme that I found in the coding process: students want relevant, real-world learning in whatever form that takes. Whether traditional or AIL, students just wanted to have something to learn that was important. It could be important to them, or it could be important to the world. Sunshine summed the idea up succinctly: "I don't think I like learning things that that don't have anything to do with me. I feel like that's just a waste of brain space if I'm not into it. Then, I'm like, 'Why am I learning this?'" (Sunshine, Interview 2). It was a fair point. Five of the participants had at least one class that resonated with them. Whether it was because of the content or the instructor, the class grabbed their interest right away. Starfox, Sunshine, and Bubblegum were all very interested in forensic science from shows like "Criminal Minds," and their teacher used that in her AIL lessons. Starfox described the experience roleplaying as a detective:

> With those creative projects I talked about – like the blood spatter project that we had, – you literally do whatever you want and sling your fake blood at this piece of paper and see how the marks leave evidence of where you were slinging it from – or let's crawl around on the floor and pick up fibers and try and visually match what that could have come from. I think honing those visual and those artistic skills was the most relevant field work we could have done. In that class,

> yes, it was a creative approach, and, yes, it was unique, but it was also directly applying like what you would do if you were a forensic scientist in the field. I think that was really like a meaningful experience because it was allowing you to see that arts integration isn't just like another cool way to teach – which it is – but it also can be super- super- relevant to what you might be doing beyond the classroom in the actual career context of it. (Starfox, Interview 3)

Starfox really caught fire when she started talking about real-world learning in her forensics class. The lesson she described was a mixture of AIL and traditional instruction, and she described the whole scene with so much passion. She loved every second of that class because it was her dream to take what she watched on TV and do it in the classroom.

Sunshine and Bubblegum had similar experiences in their forensics classes, which were very traditional in structure. Through relevance, they all maintained high levels of engagement in the classes as they described in their AIL science classes. The greatest push for relevance came from Quentin who had an interesting twist on making AIL more relevant to artists. Instead of teaching through the arts, he suggested "teaching the science of the art." He relayed an amazing story about a substitute guitar teacher who taught him the science behind guitar harmonics. Quentin had never really considered the science-side of the arts themselves, and he recounted his memory of that day perfectly as it clearly stood out in his mind. Relevant instruction can really help focus the brain of a learner to build the learning in more deeply. Relevance was important to this study.

Relevance aside, five of the participants shared a belief that college would be a lot easier if more of their high school classes taught using AIL on some level as they learned

much better in those classes. This fact seems counter-intuitive as most colleges use traditional instruction as the primary method of teaching, yet many students saw enough benefit in their science learning that they felt it more helpful when taking those college classes to have the material already remembered and mastered. This mastery of the content seemed to encourage many of these participants to consider a science career, despite originally attending the fine arts school to explore their passion for the arts.

Theme Four: AIL Increased Interest in Science

One pattern that emerged from these codes was that many of the participants gained a positive view of science from their time in AIL. Participants were asked in their first interview to share information about their life history, experiences in art and science growing up, and the meaning they made from those experiences. Participants did not expect to enjoy their science classes so much when they joined the fine arts school because they came to the school to major in the arts. Starfox described this transition when she first came to her new school:

> I was so excited and ready to get into the arts, and I was doing fine in my classes, but [science] wasn't my big thing of interest. So, it didn't really stick. I can't remember if it was at the end of that year or beginning of the next because that was the only science class that I took that year. I remember the science classes at the school that I that I took maybe starting Sophomore year were the ones that like started to turn my brain in terms of like wanting to get in the sciences. So, I think it might have been the next year, but I was starting to get interested in [science,] but I remember the interest, level and peaking sophomore year because of the classes I was in. (Starfox, Interview 1)

Starfox credited her classes for increasing her interest in science. Even though she grew up with interests in animals and conservation, she came to the school with the full intention of moving forward in a visual arts career. She believed that the style of her science instruction made her more interested in the subject.

The third research question of this study was seeking to discover any changes in participant interest in science, and the pattern I saw in the codes clearly showed that participants believed their AIL lessons got them more interested in science than they had been before joining the school. Bob believed that AIL can make any student care more about science:

> It's just easier for us to remember [the content,] and I feel if [students] didn't already have a love for the subject, I feel like they would develop one from integrating the arts. Because [AIL] definitely helped me. I barely liked physical science, but I have an appreciation for it, I guess. I didn't have an interest in this subject before, but I think, by being in the [AIL science] class, it definitely made me more interested in it. (Bob, Interview 3)

Bob, a music major, directly credited AIL lessons in her science credits for building an interest in science. She also suggested that other students would gain an interest in science too if they had AIL lessons in class.

Sunshine shared a similar story. She believed that her willingness to engage in science developed in her time at the fine arts school:

> I don't think I ever enjoyed science before [this fine arts school.] The only thing that sticks in my mind about science that I can remember, like elementary school and my first two middle school years at a different school when we did stuff like

> making it cake to show the cells. Everything else? I don't remember, but I feel like being here actually not enjoyed science, but I actually cared enough to actively participate. (Sunshine, Interview 1)

Sunshine was a quiet student who would very rarely want to step outside her comfort zone, yet she reported in her interviews that she has grown in her willingness to engage in her classes more and actively participate because of her AIL lessons. She said that she has never been a science person, but she identified a change in her perspective on science from her time at the fine arts school. A tremendous dancer, Sunshine had plans to continue dancing in college, but she chose to work on a degree in physical therapy, in which she will have to take many science classes.

Sunshine was not the only participant who reported considering a future profession in the sciences. Many of the participants reported similar plans for their future. Participants described shifting values from being solely arts focused to seeing science as a legitimate future career for themselves. Two of the participants had shown an interest in science from a young age, but for the others, they grew an appreciation for the subject in their time at the fine arts school. Bob, who has plans to go into education had this to say:

> I think being in [an AIL] class helped me figure out what I wanted to do in my life, as well. It helped solidify the fact that I wanted to be a teacher in a way because I was like, “I'm going to be a teacher. I'm going to teach something like ELA or science.” I’d like to do something where I would put music in it and things like that because I love doing those AIL activities, and that's something that a lot of other students would like as well. And so, I guess it just inspired me to do things along that nature. That's why if I was going to do science middle

> grades education, I would have tried to do the same stuff that [my science AIL teacher] was doing. I thought it was very cool. (Bob, Interview 3)

Bob was considering a position in music education when we spoke in our first interview, but she shared that she was currently majoring in secondary education for ELA or science because of the experiences she had in her AIL classes. She had always wanted to be a teacher, and those lessons inspired her to use AIL her classes in the future.

Starfox revealed in her interviews that she was attending college for a degree in wildlife sciences, and she was going to intern with Disney Parks. She also worked with the Atlanta Zoo in the summer, but she was not expecting to be working in this field when she started her time at the fine arts school: "Science, I started to gain interest in, and that was a new thing. This is cool! I could see a career in this, and then I started to explore it. Same with forensics – I had an interest in forensics, 'Oh, I could be a blood spatter analyst!' That's so specific, but it's so cool because you can just learn so much about one [topic] in science" (Starfox, Interview 2). Starfox's vignette went into more detail about her career choices, but it was her interaction with science at the fine arts school that really solidified her career choice in her mind. She loved that in science students could learn about a topic in incredible detail, and she often found herself engaged in that detail researching for her AIL projects.

Participants shared stories of a love for science that started at the fine arts school or that continued through their time there. Rhea chose to go into politics where she could make use of her passion for environmental science. Sunshine majored in science to become a physical therapist despite dance being such a major part of her life, and Bubblegum chose to become a history educator and plans to use AIL practices to engage

her students. These participants acknowledged that AIL in science helped them choose their future path.

Summary of Themes

The goal of this study was to allow participants to explore their experiences as students in AIL science classes. The themes that I generated from this data showed that five of the participants had very positive thoughts on using AIL in the classroom. Participants believed that AIL could help them learn deeply and have fun in their classes, especially in subjects that they didn't normally enjoy. Five of the participants valued working in groups with their peers to gain more perspective on the concept they were learning. All but one participant revealed that they had a better view of science and enjoyed their learning more when AIL was included. Participants stated that they even viewed the teachers who used AIL in a more positive light because they believed the teachers were trying harder to teach them the information. All but one of these former art students just appreciated being able to use the arts in their classes because it allowed them to perceive the content in different ways and worked their brains in different ways, too.

Participants did not only share perceived benefits: they also shared some issues with the AIL instruction at this fine arts school. Participants reported that AIL made them feel nervous and stressed when doing performance AIL projects. They were also stressed by group members who did not participate or when the group was so unfocused that their learning and grades were affected. One participant called out for more open-ended writing prompts that forced students to think because in his mind AIL was not rigorous enough. Some students accepted the simplicity of traditional classes, and they

acknowledged that they could learn adequately in those environments, despite being bored.

It is important to keep in mind that these six participants volunteered for a study about arts integration in their science class, and they initially chose to attend a school that allowed them to focus on their preferred art form. Their strong beliefs about AIL and science likely predisposed them to consider joining this study when other students who felt less strongly declined to join. Therefore, this study is not being used to generalize for other populations of students. However, one of the purposes of this study was to provide an opportunity to hear students share their stories and experiences. The conclusions and limitations of the study will be discussed in greater detail in the next section.

Chapter VI

DISCUSSION

As a science teacher at a fine arts school, I found it challenging to engage my art students in science lessons because students came into class with the preconceived notion that science and art were just too different: “The arts continue to be positioned by teachers and students as distinctly different from the sciences” (Varelas et al., 2022, p. 495). Therefore, getting my art students to see themselves as successful science students was difficult. If students do not see themselves being successful in a class, it can be so much harder to help them learn the information. This chapter focuses on discussing the findings of the study and how they apply to each research question, before addressing the implications and limitations of it.

Research Questions Revisited

The goal of these research questions was to investigate students’ perceptions of AIL in science classes and how that perception could impact student learning and student interest in science classes for students. In my first job as a Title I middle school science teacher, I struggled to reach and connect with students, but I found success when I began to use the arts more in my classroom to teach science concepts. After transferring to a fine arts middle/high school where I could do more AIL instruction, I started to see very positive results there as well. While constructing the literature review for this study, I found that most of the research on AIL used in science class was presented from the teacher’s perspective, and that researchers like Inwood (2013) and Ramey et al. (2020)

were recommending that researchers start interviewing students. This study was designed to hear the stories and subsequent meaning created by students, not teachers. Student thoughts on arts integration have long been absent from the literature, and collecting them brought much needed insight to the AIL process.

I had a vested interest as a science teacher at a fine arts school in learning more about how to teach art students in their science classes effectively, and I was able to explore student learning through this study. The six participants who volunteered for this study were from a pool of students who had engaged in AIL in their science classes at their fine arts school. To get a more detailed description of their experiences, each participant was interviewed three times for a total of 4.5 hours. I constructed vignettes from their interviews to maintain the contextualized perspectives of each participant and prioritize the individual. Then, I coded the data to look for themes that ran across participants as well. As Varelas et al. (2022) described, art and science have always been viewed by students and teachers as distinct and unrelated ideas, which can make engaging art students in science more challenging. Any information on how to engage art students in science was important to me as an educator. So, the research questions in this study were focused specifically on the participants' experiences in their AIL classes.

Research Question One: Impressions of AIL

The first research question was, "How do recent high school graduates from a fine arts school describe their experiences, before, during, and after engaging in AIL in their high school science classes, and what meaning did they derive from those significant experiences?" There was so little research on the AIL experience from the students' perspectives in the literature (Inwood, 2013) that the meaning derived from these

interviews can be very helpful increasing the understanding of student experiences in arts integration. There was certainly a variety of experiences with four participants sharing negative remarks or concerns about their time in AIL. However, five of the six experiences described were overwhelmingly positive as shown in both the thematic analysis and the vignettes that were constructed.

One such positive outcome was an improvement in creativity. Five of the participants reported loving how they could be creative in their AIL classes, and they believed that their creative abilities transferred to their other classes in the future. The research agreed with this finding. For example, Varelas et al. (2022) wrote that some of the benefits of using AIL in the classroom included creativity and teamwork. Sunshine was adamant about this creative growth when she described how she learned how to be brave and creative from her AIL physical science class. She used that creative skill to great effect in the years afterwards. Gurnon et al. (2013) wrote that creativity and thinking outside-the-box were very important to allow our next generation of scientists to keep making new scientific discoveries. Three participants shared stories that reinforced the idea that their creativity improved with more practice. In her narrative for example, Starfox found that when pushed to create AIL projects in entirely unique ways by her teachers, she found that she improved as a learner and as an artist. AIL helped her be more creative and gave her more tools to be creative with in her day-to-day life with her newfound YouTube video editing skills that she developed in her AIL class. While she enjoyed many of her creative assignments and activities in AIL classes, one part of AIL that Starfox rarely enjoyed was working in a group.

Group work was ever-present and certainly contentious in the participants' narratives. Three participants liked the teamwork aspect of AIL and three did not, yet all but one participant saw benefits to these opportunities to work together in a group in class. Many enjoyed the camaraderie, others reported that different perspectives from their partners helped them learn more than they could have alone, and Sunshine shared that even her leadership skills improved. Interestingly, one point that Sunshine, Bob, and Rhea all shared was how the group work aspect forced students to learn. Since the material would have to be presented later for the class, it forced all the students to try their best so that they would look competent in front of their peers. This aspect of AIL I had not come across in the research, but I saw it often as a teacher – even if I had never considered it before. According to participants, there was no greater motivator to learn the material and put on a good performance than to have to display what you have done for the class. No students could hide from the evaluation. Sunshine said that it forced all the students to care more and try harder to learn the material because their classmates were judging them. Students had to engage in the lesson or get exposed in the performance.

Motivation was certainly a key facet discussed in the literature. Ajayi (2019) and Moyer et al. (2018) reported AIL fostering great improvement in student engagement, and the participants in this study agreed. Having a final performance that the group can evaluate did contribute some to the engagement, but it was the lessons themselves that led to student engagement. In fact, engagement was the topic with the largest set of interview codes, which helped develop the first theme of this study: participants reported that AIL was engaging, which lead to improvements in their learning. Ajayi's (2019)

research highlighted the cultural importance of allowing the arts to be part of student learning. Reading the vignettes, the passion that the participants had when discussing their AIL class assignments came across very well – as did the lack of interest in traditional instruction. Participants found traditional instruction "boring" and "unhelpful" in building long-lasting learning. As good students, they all found measures of success in traditional classes, but traditional classes were not considered "fun" for any of the participants. Quentin, however, appreciated learning the information quickly and without a lot of unnecessary extra work in his traditional classes. The other participants enjoyed working hard in their AIL classes.

Rhea, Sunshine, and Bubblegum all put forth more effort during AIL lessons compared to traditional because they believed the teachers who designed such creative AIL lessons cared about them. They understood that it took considerable effort and time to put together a creative lesson plan. So, if teachers were using AIL, then they must care deeply about the students and their job. That was a surprising finding that did not appear in the literature because very few studies have investigated the student's perspective. There would have been no way to elicit this information without in-depth interviewing of AIL students. Just knowing that their teachers cared enough to pour their heart and soul into the work to create fun and engaging lessons made these students want to participate.

Participants felt motivated during AIL but the work was not without its challenges. Participants reported issues that they encountered in AIL lessons when they were participating in these fun and engaging activities: they got nervous. This feature of AIL was also not present in the literature. Nervousness and anxiety about performing in front of others were a serious part of these participants' experiences in AIL. Many

students overcame these issues with time, but even consummate performers like Rhea reported becoming nervous when performing art forms that were different from her major. In fact, Rhea said that performing in her major was nerve-wracking too because she felt there was pressure to perform well since it was her major. There were some benefits to this pressure, however. Sunshine, who was very shy, shared that she became braver and more open to trying new things in her classes after AIL. She became more comfortable the more she did AIL lessons and lost her nervousness. In the literature, teachers reported many positive experiences and personal student growth as well (Ajayi, 2019; Romanski, 2019; Valls et al., 2019), yet because none of them had students describe their experiences, the research was missing the idea that even the students noticed there was personal growth alongside their learning when AIL was used.

As teachers were usually the ones interviewed about AIL lessons, the issues that teachers faced in AIL were addressed extensively in research. For example, Taylor and Iroha (2015) noted just how much time and effort it took teachers to create these lessons. Hannigan et al. (2022) continued this idea and described the issues teachers face in carrying out AIL lessons with students who lacked focus. Students were not always on task, and groups of students could become disruptive and distracted. The participants experienced these problems as well. In his interviews Quentin was quick to point out all the issues that he experienced, and many of those echoed the issues mentioned by Rhea and teachers from the Hannigan et al. (2022) study. In Quentin's experience, AIL groups were opportunities for students to play around and not focus. To him, these issues arose because there was not enough thinking involved for his group because the lesson was too easy, and the teacher never came by to inspect the students' work quality. Hannigan et al.

(2022) discussed the importance of teacher oversight in their study too. So, there was definite overlap about the required solution to students who are disengaged in AIL. The consensus about group work for all participants was that having many different students in a group gave them multiple viewpoints from which to understand the material. However, if the teacher was not monitoring actively or was too vague in lesson design, the students would abuse their time goofing off and get little done.

More than anyone else, Quentin had very negative experiences with AIL. However, I'd argue that his experience proved just how needed quality AIL instruction can be. Quentin acknowledged that if his teachers had engaged more in the AIL process with the students and found activities that were relevant and interesting to their students, then Quentin would have gained more from the experience. Keep in mind, from his vignette, that Quentin was not a fan of most art forms and that he saw no future for anyone who tried to move forward with a career in the arts.

So, any lesson activities that require use of the arts would naturally be frustrating to him as he would not see the value in the instruction. Teachers play such a big role in engaging their students by designing and monitoring the implementation of these lessons, which makes all the difference in these participants' experiences. This fact was discussed at length in Hannigan et al. (2022). Students needed the teacher to share the vision of what a good AIL performance should look like. Once the teacher communicated that vision and high expectations for student work, students were able to push themselves to meet the mark. Quentin recognized the need for that aspect of teaching in his vignette. Students were more engaged, had more fun, and grew more creative and confident in

their AIL classes when their teachers were engaged and pushed their students. All this improved engagement and led to greater learning by the participants.

Research Question Two: Deep Learning

In the literature, there were many quantitative studies that evaluated what students learn or gain from AIL lessons. Breznovik (2017), Ramey et al. (2020), and Rosen-O'Leary and Thompson (2019) all found significant quantitative improvements in student test scores, which matched what many of the participants discussed in this study. Therefore, the second research question, "What comparisons, descriptions, and values do recent high school graduates from a fine arts high school attribute to their learning in AIL compared to traditional instruction?" targeted participants beliefs about their learning. The participants believed that their knowledge in science was vastly superior in their AIL classes compared to their traditional classes. Valls et al. (2019) reported similar improvements in student learning in their qualitative study. Researchers, Graham and Brouilette (2016), postulated this improvement in test scores was because, through AIL, students were allowed to conceptualize the material in ways that they had never considered before through AIL.

Bob mentioned this new learning experience that happened to her. She said that she had never known that a learning experience could be so different and unique. All the AIL experiences and lessons that she engaged in gave her a whole new perspective on what education could be like for a student. Those unique lessons helped her learn the material well – even in a subject that she did not enjoy because she was allowed to see her learning in a different way and conceptualize the material better. Sunshine saw similar benefits when she described how learning by moving her body during creative

AIL lessons changed how she could learn the information. Her natural connection with her body (as a dancer) enabled that learning to penetrate her mind and stay with her longer than it did in traditional classes.

Participants reported that AIL generated deep levels of learning that stayed with the students for much longer than their traditional classes in the first theme. Bob, Bubblegum, Rhea, Starfox, and Sunshine all reported this long-lasting learning in their interviews, and they wanted high school classes to implement more AIL to help the students remember more when they get to college. This point was important because all the participants were in college when these interviews were conducted, and they would know exactly which classes they remembered information from and which they did not. In the literature, Marshall (2014) and Bradshaw (2016) saw great improvements in student learning over long periods of time as well. AIL showed distinct similarities to constructivism in that students were able to use the arts to build an understanding in their own mind of the content they were learning.

In a series of case studies, Varelas et al. (2022) conducted small scale interviews of teachers who observed similar long-lasting benefits in their students, and they found that being able to learn and express themselves in different ways helped the students make sense of the information they were learning. So, there was a commonality there between the participants of this study and the research. Participants were finding success in learning science content. In many cases, they had not had success in their previous traditional classes, and this success made them more open to science as a content area. Many of the participants who initially attended the fine arts school specifically to pursue the arts have subsequently gone to college for science professions.

Research Question Three: Views on Science

The third research question was designed to evaluate how AIL may have influenced the participants' views on science, "How do recent high school graduates from a fine arts school describe their engagement with science before, during, and after their arts-integrated science classes?" Of course, there are many reasons why a student would choose one profession over another, and yet after interviewing these participants about their history and background, three of the participants described a complete change in perspective on their future career after engaging in AIL in science classes. Knowing how their interest in science may have changed over time was a goal of this qualitative study.

In a qualitative study on AIL, Mark et al. (2020) spent time interviewing Black female students about their interest in science. The students were actively taking AIL classes at the time of their interviews. The six students he interviewed reported having more interest in science during their AIL lessons than during their traditional lessons. What sets my study apart is that this study's participants have graduated high school already and can look back at how their opinions on science may have changed over their time in school. This study's participants reported a growing interest in science during their years at the fine arts school because of their AIL classes. Oftentimes, participants described themselves as surprised to be enjoying science because their whole lives had been spent preferring art. Starfox described at length how her interest in science changed over time in her interview:

> It's always funny when people ask when I decided to get into science. [It was] when I came to an arts magnet. They're like, "Oh, did you just hate art?" No, I

> think [the arts] just added to it, but it's a weird evolution for sure. (Starfox, Interview 3)

Being able to combine the students' interests in art with the science they were learning gave the students new ways to connect with the material and gain an appreciation for it. Braund and Reiss (2019) came to a similar conclusion in their study. They reported severe shortcomings in the current way that science education was being taught to students and suggested that combining art and science would be an excellent motivator for students.

Sunshine was motivated enough in her AIL classes to consider switching from a dance major in high school to being a physical therapist in college. Bob loved science AIL so much that she considered becoming a science teacher despite never being interested in science before her time at the fine arts school, just so that she could do the same fun and engaging lessons. Rhea considered going into environmental science for a career or at least taking a couple college classes in it because of her interest in the material. Starfox realized that art and science share so many similarities in their process that it was easy to switch from art to science and still achieve her dream of working for Disney. The way she evaluated and constructed her work as an artist lined up perfectly with the scientific method. That was a breakthrough moment for her because her love of animals, which was fostered at home, was now allowed to shine as she chose to major in wildlife sciences at university. Quentin and Bubblegum had no changes in their perspectives, but I think that is because Quentin did not have a great experience with his AIL science teacher and Bubblegum had expressed a dislike of any subject that had definite right-or-wrong answers, like science or math.

After reading through all the interviews and evaluating the themes generated from the codes developed, it was clear that five of the six participants greatly enjoyed their time in AIL science classes. In the case of Bubblegum, she liked the classes more in retrospect because she did not like working so much early in the morning at the time, but there was a clear preference for her AIL science classes than her traditional classes.

Summary and Implications

The participants in this study had an overwhelmingly positive reaction to AIL with the only exception being Quentin whose issues with AIL are explained as being because of a lack of rigor and relevance in the AIL process by his AIL instructors. Participants reported growth in areas that matched the literature: motivation (Ajayi, 2019; Romanski, 2019; Valls et al., 2019), creativity (Breznovik, 2017), engagement (Carpenter & Gandara, 2018; Moyer et al., 2018), learning (Bradshaw, 2016; Corbisieros-Drakos et al., 2021), teamwork (Corbisieros-Drakos et al., 2021), and science interest (Mark et al., 2020). If science teachers are struggling to reach their artistic students and to engage them in their lessons, then this study shows that AIL is one possible way to make the content engaging and relevant. According to Corbisieros-Drakos et al. (2021), AIL motivated students and gave teachers ways to embrace and grow their students' creativity, and the participants of this study reported great improvements in their learning as well as their creativity and motivation.

It is not surprising to see art students be more motivated by using the arts in their science classes, but it is surprising to see that five of the six participants described deep, long-lasting learning that stuck with them for years afterwards compared to their traditional science classes. Bradshaw (2016) and Marshall (2014) also found that AIL

improved learning, but the long-lasting part was new in this study. The participants believed that the multiple means of representation and presentation (CAST, 2018) allowed them to view the material in several different ways that improved the depth of their understanding. The implication, here, is that teachers may be able to use AIL in their classroom to help their artistic students learn the material better than traditional lessons. If any high school teachers are scared to try AIL practices because they are worried that AIL might not get students ready for college science, the participants of this study who are currently in college overwhelmingly wanted more AIL science instruction in high school. It did not matter how often I asked them to consider the fact that college science classes only used traditional methods. They simply felt that they learned the material better in their AIL classes than their traditional classes and AIL was more beneficial to them overall.

Quentin stood out from the other participants as he did not see any benefits to AIL learning in his science classes. However, during his interviews, many of the issues with AIL lessons that he brought up had more to do with the teacher's directions and the teacher's willingness to monitor the students while they work. Quentin's groups were often off task, and the AIL work he was asked to do he felt to be simple and not challenging enough compared to his traditional AP classes. Quentin's stories are excellent examples of some of what teachers need to consider when employing AIL techniques. Students should be monitored closely as they would with any other assignment. Yes, the students are engaged and motivated, but often, Quentin found his groups got off task quickly. Without rigorous and relevant requirements in the work, Quentin and his fellow students could not keep their focus. A teacher who is considering

using AIL in the classroom or an academic coach giving a professional development on AIL should use Quentin's stories as examples of what can make AIL instruction ineffective. AIL has a number of positive benefits, but AIL requires teachers who are as motivated by the work as their students.

The positive AIL benefits that participants shared matched the literature very well, but there were aspects of AIL that the participants shared that I had never considered before or even read anywhere in my review of literature. For example, I was aware that working in groups could allow students to bring new ideas to the table, but I was unaware that students felt empowered to work hard to prepare for the eventual performance just to be well thought of by their peers. This peer-pressure factor can be very helpful to the teacher in ensuring a high-quality performance where the students must learn both the science information and the art techniques well since their peers will be evaluating them, too. However, performing in front of others was stressful and AIL brought a surprisingly pervasive fear of failure to many participants in their AIL classes.

I had never considered the nerve-wracking aspects of AIL and the peer pressure involved when students give their best efforts to impress each other. If more teachers, like me, knew about these challenges, then the teachers could take greater precautions to alleviate those nerves. Four of the six participants found that they grew out of those nerves the more they did AIL, and a three of them believed that they had a newfound ability to be brave when AIL was used in their future classes. However, the anxiety issue remains an area in need of attention for students trying AIL for the first time. With the knowledge of this stressor presented in this study, teachers can be more cognizant of building a safe and secure environment where students can be vulnerable without

judgement. They can even consider alternative assignments or alternative presentations for students who do not have the social abilities needed to perform in front of a large audience. Educators need to read these vignettes and gain an understanding of what their students might be experiencing and the challenges that they might face in performing these AIL tasks.

The knowledge gained from this AIL study is very valuable to me as a science educator and could be valuable to any teacher who uses or wants to use AIL in the classroom. Administrators and academic coaches considering bringing AIL into their schools can get a clearer picture of what to expect from AIL and how to get the best out of the practice in their classrooms. Interviewing former students directly helped me uncover unknown aspects of AIL that students experience in a way that interviewing teachers about their students never could. What made these improvements discussed by my participants so important and so significant to the literature was that these were the words of the participants themselves. Not teachers. Not administrators. Not researchers. I find the students' perspectives to be more valuable to any teachers or administrators thinking of using AIL in their classrooms or looking for ways to improve their AIL lessons already in place.

Limitations

I was the main limitation of this study because I was the instrument of the study (Maxwell, 2013). I had my biases and subjectivity that influenced this analysis, in both positive and negative ways. I tried to be as transparent as I could in my process by writing memos and asking for member checks to minimize any negative impact of my subjectivity. As an educator who employed AIL in my classroom, I had many preconceived notions about student experiences in AIL that colored my interpretation of

the data as well. I took steps to address these biases in the study, and a constant awareness of my bias was maintained. As I had taught many of these students before, I had to make sure that each participant had an AIL class that was conducted by a different teacher at the school other than me. Since I was reporting on some of my own work, I could unduly influence this study, and having data from different AIL teachers could minimize that bias. Memos were written to document my thought process, and participants were allowed to member check and review their vignettes to ensure that their views were represented effectively.

There was a small participant pool for this study, partially by design but also because after reaching out to the 75 recent graduates of the fine arts school, only six of the graduates agreed to participate. The participants were all volunteers, and many of them shared positive feelings about AIL in their interviews. Those positive feelings may have inspired them to volunteer when others did not, and that may have shaped the data that participants shared. However, Quentin's presence could show that participants who had bad experiences in AIL were still willing to volunteer – but not many participants held a viewpoint like Quentin's. Also, there was no effort made on my part to educate the participants in the distinctions between different types of AIL. So, students shared their stories and experiences using the arts in the classroom, but there was no differentiation between arts integration and arts enhancement by the participants.

Each of the participants had taken a class with me at the fine arts school, which may have made them more likely to volunteer for this study. That relationship may have affected how open and honest the students were about their time in their AIL classes as they knew I was a proponent of AIL. They may not have wanted to share negative

thoughts on AIL and risk upsetting their former teacher. However, I tried to frame each interview with the idea that I was looking for the truth of their AIL experience. If AIL lessons were not working for them, as a teacher, I wanted to know why so that I could improve my instruction. Meeting for 4.5 hours, the participants and I were able to have very open and honest conversations about their background and life history. There was a lot of truth shared in that first interview, which made the participants more willing to share openly in their second and third interviews. I also believe that our prior relationship was helpful because I did not have to build a relationship through the interview process. The students were able to be more open with me than they would have been for an interviewer they did not know. Ultimately, this study should not be used to generalize as the population was so select that this was not an experience that most teachers can expect. However, there are certain recommendations and applications that I would like to suggest for education professionals who are looking for ways to implement this research.

Applications in Education

As a teacher in the classroom, I have experienced tremendous success using AIL in my science classroom, and, in researching for this study, I have discovered numerous studies that support my belief that AIL can improve student outcomes in the science classroom (Breznovik, 2017; Ramey et al., 2020; Rosen-O'Leary & Thompson, 2019). In this section, I have several suggested actions that teachers, administrators, PLCs, and colleges of education can take to improve student instruction and to engage learners in science using AIL.

Teachers

The two science teachers at the fine arts school were able to engage their students at a high level using AIL in the classroom. If traditional teachers are looking for a way to start including AIL in the classroom to engage more of their learners, then they should begin by educating themselves on the fundamentals of arts integration. The Kennedy Center (2022b) has several great instructional videos to learn the basics of AIL, and they have a stockpile of lesson plans and resources to get teachers started using AIL in the classroom.

For a teacher beginning with AIL, there is a shift in mindset that is required for the teacher and the students. AIL's focus is not on memorization of facts or vocabulary. The focus of the AIL lessons is on using the arts to understand the material and engage students in the educational process. Often, in my experience, the abstract ideas students must learn in science can only be made concrete through the arts. To implement AIL, there should be a consideration of the science standards that educators would like to teach, first. Next, science teachers can look through the art standards specific to the grade level they are instructing to find art standards that they can teach in the classroom. It may seem very daunting at first for any science teacher to implement art standards, but that is the exact same issue that art students encounter entering their science classes every day: bias. As Varelas et al. (2022) discussed, science and the arts are viewed as too dissimilar by both teachers and students. Science teachers are often as biased against the use of arts in the science classroom just as art students are biased against learning science.

What many science teachers do not know is that the standards for art are explained very simply and are easy to implement in small amounts in any classroom.

Here is a dance standard used at the high school level: “Recognize how the use of choreographic structure is used to communicate meaning in a dance” (Dance, n.d.). If a science teacher takes the time to unpack that standard the way they would for a science standard, the requirements for assessment are simple: did the student choose choreography that correctly showed the meaning they were trying to convey in the dance? Any project is going to require some interpretation from the teacher, and it is relatively simple to let the student share the meaning of their dance with their teachers to evaluate them effectively. If science teachers are still concerned about their ability to teach the art standards correctly, they need to remember that many science teachers do not teach the science standards very well the first few years of teaching either. All teachers need time and practice to get better no matter the standards that they teach. They can ask art teachers to come observe their classes or meet with these art teachers to discuss how to assess student movements properly. I have spent many planning periods discussing art principles with art teachers, theatre teachers, and dance teachers. Education in the arts is not that dissimilar from science education. Science teachers just have to read the art standards and give their best effort to evaluate the students.

Once science teachers have selected an art standard that might pair well with their science standard (visual arts for modeling or movement for dancing or creative writing for explanatory standards, for example), they need to build a lesson that teaches the students about both the art and the science. If a teacher wants students to learn how to move their body in a way that represents the movement of atoms in a solid, liquid, or gas, teachers must spend a little time explaining how moving the body in different ways can communicate different ideas. Brainstorming key words about solids, liquids, and gases

and then asking students to offer suggestions for movements that fit those key terms is a great way to start. Once the students have an idea, give them space to be creative and figure the rest out on their own while the teachers monitor and move about the classroom. Quentin considered that monitoring process essential for success. The focus is on letting the students think and figure out their representations in their own way, which is a centerpiece of UDL (CAST, 2018) – a major part of teacher preparation programs. So, AIL fits in quite well with current views of instruction.

AIL can be worked into the classroom in many ways. I recommend using it whenever student engagement or student reflection is needed. When introducing an abstract concept that students do not find interesting, AIL can be a great way to engage students in the learning process. Students can act out what they are learning, or they can model the process using visual arts. Teachers can think of AIL as a perfect hook for any lesson plan. It engages the students and gets them thinking about the material. AIL is also great to use at the end of a unit as all art requires reflection. Reflection on what you know or what you have learned on a topic to share your vision of it with someone else. Therefore, AIL is a great summative learning activity where students can design an arts-based project that shares their understanding of the material, while also improving their understanding of their chosen art. Teachers are essentially using UDL principles to allow students choice in how they share their learning. AIL lessons on a large scale take much time, learning, and practice, but there is a large payoff for teachers who are willing to learn how to implement AIL effectively.

Implementing AIL also requires a knowledge of the challenges that students will face in accomplishing their tasks. One of the major themes in this study centered on the

stress that students experience doing AIL lessons. Arts teachers are more likely to be familiar with these stressors, while science teachers are less likely. There are lots of arguments to be made that some stress in school is good, because it builds character and resilience that students may need in their future. Sunshine and Bubblegum were big believers in the helpfulness of AIL stress in making them more confident in their future classes. However, if teachers have concerns with the student stress levels, they can teach their students breathing exercises to control their nerves, or teachers can allow students to record their arts integration lessons and have viewing parties in class. These viewing parties may be less stressful than performing live in front of their friends. I know that I will be implementing these stress reduction techniques in my class to improve my instruction. Regardless, Sunshine shared that the pressure of presenting this information to their peers can often get students to learn the material better and more deeply, because they do not want to do anything wrong in front of their peers. AIL instruction is just like traditional instruction in that it takes time and effortful practice to improve and make it an enjoyable process for everyone.

To begin, teachers can start implementing AIL lessons once per unit until they get more proficient at incorporating the arts. Have an academic coach, an administrator, or a colleague come into the classroom to observe and offer feedback or to co-teach the lesson together. Recording the lessons to observe and improve AIL instruction is a great idea as well. The more reflection and feedback that the teachers receive, the better for their growth in AIL. There are also professional developments that teachers can attend to learn how to implement AIL on a larger scale. The time and effort required for quality AIL instruction is high, but as these participants have shown, the students respond to that

effort by giving their best as well. Start simply and make improvements to find success. Success in AIL – as with any educational practice – often requires the support and encouragement of the administration.

Administrators and Professional Learning Communities

For administrators searching for strategies to improve student achievement at their schools, teachers using AIL have shown the ability to generate significant gains for students (Breznovik, 2017; Ramey et al., 2020; Rosen-O'Leary & Thompson, 2019). If an administration wanted to bring AIL into the classrooms at their school, it would require a culture change at their school. Implementing any policy or practice at a school requires education, oversight, and support. Administrators should start this process by taking professional development courses in arts integration with their teachers so that the administrators know enough about the practice to offer support and feedback in the classroom.

Academic coaches and other interested administration officials must understand that AIL is a very different way to view education that is based on the principles of Dewey (Eisner, 1999). The focus in classes is less on enforcing order and churning out assessment scores, and the focus is more on integrating ideas and teaching students to think and collaborate using their creativity. So, AIL classes will look very different (and possibly more chaotic) than more traditional classes. Administrators should start this paradigm switch at their school by working in small practices at first. Have teachers make one lesson at a time, and the administrators should try to attend that session to support. If they cannot be there, they should meet with the teacher to ask how the process went and discuss ways to improve it.

Teachers will need lots of support and encouragement. The focus on thinking and reasoning often means a lack of direct vocabulary instruction. This lack often scares teachers used to "drill and kill," yet the students will still learn the vocabulary because they will be using the terms repeatedly and in context when completing their arts tasks. One of the ways that my science department improves our instruction through AIL is having discussions during professional learning community (PLC) meetings and department meetings. The science teachers share successes and challenges using AIL, and we often brainstorm lesson ideas for implementation together. Coming up with AIL lessons is challenging for teachers by themselves. However, working together with content partners or other science teachers in PLCs, it is much easier to generate ideas for AIL lessons that address complex science topics.

AIL is a challenging practice, and it will take lots of time to work the practice into teachers' curricula. The main suggestion here is to start small and assess the practice. Teachers will need help designing lessons and assessing their students in the arts as well as the sciences. Administrators can help this process as well by having the arts department meet with the science department to collaborate on improving the science teachers' understanding of the arts and how to assess them. Science teachers would have an easier time, though, if teacher preparation programs taught future educators about arts integration.

Colleges of Education

I had to learn about arts integration from professional development opportunities that I was lucky enough to receive at my school as an in-service teacher. If I had not received these trainings, I would still likely be struggling to reach my students. When I

was a teacher candidate, I was trained in simple and basic techniques of lesson planning and traditional instruction. Every teaching lesson that I learned was very factory-based and designed for simple and easy assessment. The goals were clear for all of these activities. The students were expected to think with a KWL (Know, Wonder, Learned) chart, but activities like KWLs are so simple and disengaging for many artistic students.

Every participant craved the chance to learn in ways that are relevant and engaging. Starfox – a very successful traditional student – said that she wished that more students could experience AIL because students get to learn, and they get to have "fun." Students should want to come to school, and they will want to come to school when they get to be creative and have "fun" with their friends. Colleges are already instructing teacher candidates in UDL principles (CAST, 2018) so there is a natural fit here to include AIL, which mirrors many of these UDL principles. However, this outcome cannot be realized without teacher preparation programs teaching instructors how to be successful specifically in AIL classes.

Science teachers need help understanding how to incorporate and assess the arts in their own classrooms, and college is where they should be learning these skills. It would not take much to give future teachers the skills they need to integrate the arts. Teachers should be armed with as many tactics and techniques as possible to help them reach their students. They should be presented with as many different ways to educate students as possible because teaching is an art itself. Some teachers, like me, just need exposure to certain ways to approach education to help find their way to reach kids. Some science teachers may be excellent traditional instructors who easily reach all of their

students, yet there may be some teachers who struggle to teach students traditionally, like I did. They need exposure to AIL to see how it may fit into their pedagogy.

Teachers need a diverse range of instructional tools if they are going to connect with as many students as possible. There is a lot of room for growth in our teacher preparation programs at colleges and universities. These programs should incorporate AIL into their classes because it can give teachers a new way to view thinking and learning in the classroom. The more AIL that colleges of education incorporate, the more my goals for this study can be met.

Summary

My personal goal for this study (Maxwell, 2013) is to help science teachers incorporate AIL into their lessons more often. I think that the lessons learned from these participants have highlighted many ways to improve AIL instruction making it less stressful and more effective. Practically, I want to help increase student science achievement. AIL has numerous examples of significant quantitative improvement, and the participants in this study believed that they learned better through AIL as well. So, there are several practical reasons to pursue AIL in the classroom. Lastly, my intellectual goal was to learn what sense participants made of their time in AIL. Five out of the six participants wanted more AIL in the classroom because they had experienced its benefits. So, there may be a lot of work for teachers and administrators and colleges to do in order to implement more AIL in the classroom, but the benefits in the research are clear. This moment is also an opportunity to learn more about AIL and its place in instruction through further AIL research. There is a lot more to learn about the process of AIL and how AIL impacts students from more diverse backgrounds.

Suggestions for Future Research

Gaining more perspectives from other groups of students is essential for learning more about the impact that AIL has on students. There was a lot of information shared by these participants on AIL. Bob, Bubblegum, and Sunshine who identify as Black or Mixed all postulated that AIL may help students in Title I schools engage more in their science classes. It would be so helpful to investigate AIL's influence on Title I students and students of color.

Five participants addressed AIL and its ability to translate to success in college in their interviews as one of the research questions asked them to evaluate their interest in science before and after AIL instruction. Those five participants reported learning the material better, but they brought up college as a reason teachers should use at least some traditional instruction at the high school level. The participants said that AIL would help them learn and understand science better for college, but some mentioned that learning how to learn in a traditional class setting was a skill that students need to practice more. To further educational research on AIL, a researcher could investigate the outcomes of students who engaged in AIL learning in high school compared to the outcomes of students who had more traditional classes.

Participants also shared that AIL helped them learn the material more deeply. A goal of this research was to explore how effective AIL was at helping students learn. It did not explore how AIL helped students learn, cognitively. Researchers could investigate how students learn in AIL, but instead of interviewing teachers about the learning process, researchers should interview the students and have them describe the thinking that occurs as they engage in AIL. Many participants described forming

numerous connections in their minds as they did AIL lessons, but the focus of the study was not on their thinking process.

In summary, the main goal of this study was to amplify student voices by allowing participants to describe their own experiences as students in AIL, and there is more left to learn. Six participants cannot reveal all there is to know about the process. Expanding this study to a larger group and collecting more information from the student perspective could help reinforce the findings of this study. There are a lot more viewpoints out there to obtain without the influence of the researcher's prior relationship with the students.

Conclusion of the Study

The goal of this study was to allow participants to share stories of their experiences in AIL science classes and the meaning they created from them. Six former fine arts school students volunteered for extensive interviews to generate a better understanding of AIL experiences. The stories they told gave tremendous insight into the AIL process from the student perspective. The central theme I generated from the data was that participants enjoyed and gained a lot from their time in AIL. Whether they enjoyed spending time with their friends or enjoyed including the arts in their science work, five of the participants enjoyed their time doing AIL activities. The participants believed that AIL helped them learn deeply and gave them new ways to absorb the information. They may have gotten nervous performing for their peers, but the participants gained much from the AIL lesson itself as well as observing other students sharing their understanding. When teaching with AIL, teachers should make every effort to create as positive and welcoming of an environment as they can to minimize students' nerves during performances. Teachers can also teach students stress-relieving techniques

to deal with the pressure of the performance. Teachers could allow for alternative AIL products to be made, like a visual art comic or a creative writing poem, instead of a pressure-filled dramatic performance or song.

Another issue that participants shared was that AIL lessons may not focus enough on the science or the art to a level at which students are really challenged to learn. Teachers should be sure to engage with their students more in the collaborative process to maintain the rigor of the lesson so that all students are being challenged and working together effectively. College was a topic raised a lot in the data, and participants recognized the importance of traditional instruction to prepare for college. However, four participants agreed that if more teachers used AIL to teach their high school classes, then college would be easier because they would understand the material more.

The vignettes created for this study can be very helpful to teachers or administrators who are looking for a better understanding of what students go through when engaged in AIL. Knowing what students are thinking during AIL lessons has already made me a better teacher this year. I understand that students feel nervous and vulnerable doing these lessons, but I also understand that students see the effort AIL teachers put into their lessons. According to five of the participants, students see that effort, and they know that their teachers care. So, the students rise to match that effort. AIL helped these participants be more successful in their science classes, and it helped them develop their interest in science. That is all any science teacher could ask. I am so grateful for the opportunity to conduct this study. I will forever cherish the chance to interview six wonderful and kind people and learn what they made of their time in their science classes.

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Appendix A

AIL Glossary

Glossary of Arts-Integrated Learning Terms Presented as a Spectrum

Arts-Integrated Learning Styles Spectrum		
Focused on Art	Arts as Curriculum	"Students develop knowledge and skills in a particular art form. Often referred to as "arts learning" or "art for art's sake," the programs are guided by national, state, or local standards for each of the art forms. For example, in visual arts, students learn the content, processes, and techniques for two- or three-dimensional work" -Kennedy Center (2022)
Mostly focused on Art	Teaching Artistic Behavior (TAB)	The focus is on viewing the child as an artist and providing choice for that artist in terms of their presentation and representation of their learning. Children choose how to do the lesson as well as how long to spend on it. The focus is on choice and the arts. -Purtee (2015)
Equal Focus on Art and Science	Arts Integration	"In Arts-Integrated Curriculum, the arts become the approach to teaching and the vehicle for learning. Students meet dual learning objectives when they engage in the creative process to explore connections between an art form and another subject area to gain greater understanding in both. For example, students meet objectives in theater (characterization, stage composition, action, expression) and in social studies. The experience is mutually reinforcing—creating a dramatization provides an authentic context for students to learn more about the social studies content and as students delve deeper into the social studies content their growing understandings impact their dramatizations" -Kennedy Center (2022)

Mostly Focused on Science	Arts-Enhanced Curriculum Arts-Based Instruction STEAM Arts-Infused Learning	"When the arts are used as a device or strategy to support other curriculum areas, but no objectives in the art form are explicit, then the approach is called Arts-Enhanced Curriculum. For example, students sing the ABCs as a means to other ends—remembering the letters and sequence of the alphabet. However, students are not usually expected to learn about melody, song structure, or develop specific singing skills." -Kennedy Center (2022)
Focused on Science	Traditional Instruction	"Traditional instruction usually starts by introducing scientific concepts and vocabulary, and the subsequent activities aim for verification of the concepts—for example, through hands-on activities and investigations. The lesson is highly teacher centered, with the teacher assuming most of the responsibility for providing explanations." -Hanuscin and van Garderen (2020)

Appendix B

IRB Approval Form

Institutional Review Board (IRB)
For the Protection of Human Research Participants

PROTOCOL EXEMPTION REPORT

Protocol Number: 04322-2022 **Responsible Researcher(s):** Oliver Ellis

Supervising Faculty: Dr. Lorraine Schmertzing

Project Title: *A Qualitative Analysis of High School Graduate Art and Science Integration Narratives.*

INSTITUTIONAL REVIEW BOARD DETERMINATION:

This research protocol is **exempt** from Institutional Review Board (IRB) oversight under 45 CFR 46.101(b) of the federal regulations **category 2**. If the nature of the research changes such that exemption criteria no longer apply, please consult with the IRB Administrator (irb@valdosta.edu) before continuing your research study.

ADDITIONAL COMMENTS:

- *Researcher submitted an Expedited application rather than the Exempt application/ OSPRA is approving the submitted application via the Protocol Exemption Report.*
- *Upon completion of the research study, all collected data (e.g. data set, name lists, email lists, transcripts, etc.) must be securely maintained and accessible only by the researcher(s) for a minimum of 3 years. At the end of the required time, collected data must be permanently destroyed.*
- *Qualtrics platform settings must allow participants to skip questions and/or not provide answers. The settings must prohibit the collection of IP addresses.*
- *Exempt guidelines **permit** recording interviews for the purpose of creating an accurate transcript. Recordings must be deleted immediately upon creation of the transcript. Participant recorded testimonies, must be deleted upon creation of the transcript.*
- *Exempt guidelines **prohibit** the collection, storage, and/or sharing of recordings.*
- *The interview consent statement must be read aloud to participants at the start of each interview session, and documented in the final transcript.*

☒ ***If this box is checked, please submit any documents you revise to the IRB Administrator at irb@valdosta.edu to ensure an updated record of your exemption.***

Elizabeth Ann Olphie *08.15.2022*
Elizabeth Ann Olphie, IRB Administrator

Thank you for submitting an IRB application.
Please direct questions to irb@valdosta.edu or 229-253-2947.

Revised: 05.02.16

Appendix C:

Interview Guide Example Questions

Interview 1:

- Tell me about yourself! What is your story? You can talk about you and your interests, your family, your upbringing. Just tell me YOUR story!
- How did you come to choose the fine arts school for your high school experience?
- Tell me about your experiences in art as a student growing up.
- Tell me about your experiences in science as a child growing up.
- Tell me about your time and experiences with art and science after graduating high school.

Interview 2:

(Before questioning begins, interviewer will begin with a short discussion of what AIL is as well as what a traditional science classroom experience is. This discussion will help the participant fix in their mind the kind of experiences this interview is designed to explore.)

- The focus of this study is to explore student experiences when science and art are integrated into the classroom. In these kinds of science classes, the teacher makes a point of instructing students in both the art and the science. The goal of the lesson goes beyond just learning science, and it extends to improving students' skills in the arts as well. Lessons like these go beyond just "modeling the cell" and extend into real efforts to teach proper technique. Often, the science concepts are taught THRU the art lesson.
- A dance standard about intentional movement may be used to explain the motion of atoms or a drama standard about character study could be used to teach about the actions of electrons exposed to a charge. Arts-integrated lessons are being

compared to traditional science classes and traditional science lessons where students take a series of notes on the material and complete labs to reinforce the learning.

- At this school, students experience both types of instruction. I was curious about your experiences in these classrooms. So, if I was sitting in the classroom observing an arts-integrated lesson in your science class, what would I see?
- Tell me about other experiences in school when your teachers combined art and science in the classroom. What would I see you and your partners doing?
- How would you describe your interest in science both before and in the years after these AIL science lessons?
- If I were to walk into a class at your school that performs traditional science instruction, what would I see there. Take me through a typical lesson or a specific one that you remember.

Interview 3:

(These questions will depend on the experiences described in interview 2)

- Reflect on _____ experience. What did that MEAN to you?
- How has it affected you in the years since?
- What are your thoughts on AIL in the classroom?
- What are your thoughts on more traditional science instruction in the classroom?
- What can be improved to make science instruction more effective in your opinion based on your experiences in the real world or in college?