Improving Art Education for High School Students:
A Design Study Proposal

Cognitive Design Project Study Proposal
for
ED 333A

Submitted to Dr. James Greeno and Dr. Deedee Perez-Granados

Eric Jason Bailey, Sandy Johnson, Hillary Thompson
Stanford University
School of Education
July 15, 2003
I. Introduction

A common misconception is that artistic ability is not related to academic ability. Because of this widely held belief, few students concerned with achieving high academic marks enroll in art classes, and instead tend to focus strictly on academic courses. Information given to our research team by the principal of North Central High School (NCHS) in Houston, Texas revealed that after one semester of art classes, very few of the students went on to enroll in additional art classes. The main concern of Principal Douglas McGee was that he wanted to know what could be done to keep his students well-rounded by increasing their interest in additional art classes. McGee surmised:

“There could be a variety of reasons that students are not continuing to study art, such as students wanting to pursue other electives, or placing greater value on academic courses.”

The majority of students who enroll in an elective art class at NCHS have had no previous art instruction, and they are taking the class to fulfill an elective requirement. The environment at NCHS is one of rigorous academic competition, and we have found through initial research that students do not see art classes as contributing to intellectual modes of thinking. However studies have shown art education as being linked to higher SAT scores, underscoring the need for more conceptual and comprehensive art education in schools.

Part of our initial research for this study proposal was to poll 125 NCHS students about how they felt regarding their school’s art classes. The most common statement was: “I can’t do art; I have no natural artistic talent.” Only 5 of the 125 students polled said they took and enjoyed additional art classes at NCHS. During these initial interviews, we identified some former art students who revealed an overwhelming frustration with the way the classes were taught. They felt that the focus on skills left them unable to succeed unless they had innate talent. In addition, they observed that what they learned was how to mimic the teacher’s style (i.e., following steps and procedures) without understanding why (i.e., underlying concepts).

II. Identifying the Learning Problem

With this in mind, we assume the learning problem lies in the current instructional model the school employs in its art curriculum. Our assumption is that the curriculum is based on skills
development as the goal of learning, and the teacher’s main focus is on drilling observable skills. Virtually no attention is given to the development of mental models in the building of a deeper “central conceptual structure” (Case, 1998) of the physical principles of the visual arts. The majority of art students at NCHS are unable to understand the core organizational structures of art.

We assume we will find that NCHS lacks an art education environment that takes full consideration of the underlying conceptual framework of the principles of visual literacy. Similar to some mathematics curricula, in which students are exposed to basic mathematical theories upon which new models of more complex thought can grow, we assume that a concept-based art curriculum will create not only better artists, but more visually literate and perceptive students. We assume that once a student has mastered the core conceptual understandings of a specific art domain, he or she will be able to take that knowledge and apply it to other domains within and even outside of the field of art. For instance, if a student learns the fundamental properties of composition as they relate to drawing, it would make sense in our model that the student would be able to apply that knowledge to sculpture and photography.

As well, if a student understands the function of perspective as it relates to painting, then we would expect that that student to be able to utilize that knowledge and apply the concepts to other domains such as architecture or engineering. One of our goals is to investigate the theory that artistic ability isn’t necessarily something that one is born with, rather that it can be learned. Much like mathematics can be “seen” conceptually when it is explained using mental models (Case and Moss, 1996) the physical world can be seen more critically with the knowledge of core art principles. For example, the moment one truly grasps the concept of “perspective” is a moment of seeing beyond the surface, a moment of clarity regarding the nature of physical space.

Additionally, art can be understood and created with relative ease once the underlying organizational principles are understood and have a framework within the mind of the student. It is not our goal to take the procedural (“how”) out of the art curriculum at NCHS, as we recognize the importance of skills and technique involved in creating art. We assume that our study reveals that the combination of the “how” instruction with a more cognitive approach to the “why” will not only increase students’ confidence and abilities and overall conceptual understanding of art, but will also create an increased interest in the art classes.
The learning goals for our proposal are as follows:

- Develop stronger visual literacy through a deeper conceptual understanding of art
- Improve artistic ability
- Increase interest in art and art classes

III. Design Principles

Informed by the work of Robbie Case (1998), our proposed study bridges two major cognitive learning theories: (1) that cognitive structures are assumed to be transferred from the context in which they are acquired to another similar context, and (2) that cognitive structures are abstracted gradually across a range of contexts. Case's model states that "...central conceptual structures are gradually abstracted from different contexts; however, even as they are being formed, they are also acting back on these different contexts and shaping the learning that is possible in them" (Case, 1998). We assume that we will see this type of reciprocal learning at NCHS, in that students will develop a deeper level of understanding in the fields of art and mathematics, as well as across these domains in which "the knowledge representation is multiply linked" (Spoehr, 1994).

Our proposal is based upon the following principles of cognitive learning theory, as presented by Greeno, et al. We will use these principles as a framework to identify the learning problem, to pursue inquiry that would clarify the problem, and to shape a solution that effectively satisfies our learning goals.

**Interactive learning environments for construction of understanding.** Artists build, paint, draw, reconfigure and assemble artifacts through which they express the nature of objects and ideas. Historically, public discourse has been integral to the critique and interpretation of art. Therefore, art can be understood through creation or examination. It occurs to us that it would be natural that a comprehensive study of art would take into account both materials and discourse as foundations to instruction. Furthermore, these methods have a strong relationship to the construction of conceptual understanding in learners.

**Explicit attention to generality and sequencing of conceptual development.** Our assumption is that art students at NCHS have mastered many basic organizational structures in other core subjects. We assume mathematical concepts are particularly useful to understanding art. For
example, many conceptual understandings gained through practice in geometry and rational numbers have strong relationships to those of perspective, and proportion. We believe it is within math concepts that we can find intuitive understandings with which to begin teaching principles in art. We should identify the principles that unify art and mathematics, and build upon them using sequences of practice that further challenge and expand the learner’s understanding.

**IV. Proposed Study**

An expert level of artistic ability is often referred to as "art skills," while an expert level of mathematical ability is often referred to as "knowledge of math." These phrases seem to imply that art is a physical realm (i.e., an ability to control the brush well), whereas math is a cognitive realm (i.e., an ability to easily abstract information from a deep understanding of a particular domain). In this proposed study, we intend to investigate the relationships that exist between the "conceptual knowledge (roughly, "understanding concepts") and procedural knowledge (roughly, "performing a skill successfully")" (Hiebert and Lefevre, 1986). According to studies conducted by Rochel Gelman, "implicit knowledge of principles precedes the acquisition of procedures.” Our study is based on this belief – that conceptual knowledge, in addition to procedural knowledge, is critical in helping students develop a better understanding of, proficiency in, and appreciation of art.

**Proposed method of study**

We plan to investigate whether NCHS’s mathematics curriculum provides opportunities for students to transfer their understanding of certain mathematical concepts to an understanding of art. Through our study we intend to gain insight on the following:

- What mathematical concepts are useful in teaching art?
- How visually literate are the students?
- What are the relationships existing between art and mathematics domains?
- Are students actively engaged in discourse, and critical analysis towards conceptual understanding in their art classes?
- Do art exercises communicate in terms of rationale and unifying principles or do they simply enforce practice and procedure?
- Can the structures for understanding, problem-solving abilities and domain knowledge gained from mathematics be useful as a foundation in art instruction?
- Do the students show an increasing understanding of art over time?
We intend to gather data over the course of the school year, through a two-part process: initial data gathering and analysis and an assessment to determine the effectiveness of the curriculum.

**Initial Data Gathering and Analysis**

This phase is intended to inform the curriculum design process, by identifying opportunities for improvement as well as the learning features and functions to be put in place. In order to determine students’ initial levels of visual literacy (i.e., their critical thinking skills with regard to art), we plan to interview the students. This will require their analysis of specific works of art, as well as challenge their problem-solving skills relating to art processes. We also want to determine whether students are engaged in discourse and critical analyses in art class by assessing the current art curriculum, as well as observing art classes. Furthermore, we intend to determine if the current art curriculum is based solely on a procedural methodology by analyzing the curriculum and observing art class. We also plan to determine the conceptual relationships between mathematics and art. In order to do so, we will draw from expert knowledge in the fields of mathematics and art, as well as current mathematics and art curriculum. Lastly, we plan to use a work session with the principal, art and math teachers to develop the experimental curriculum, based on the mathematical concepts they feel are essential for art curriculum.

**Assessment**

After a year-long program incorporating the experimental curriculum, we plan to assess its effectiveness based on the students’ improvement over time. In order to assess their improvement in visual literacy and critical thinking around art (i.e., their critical thinking skills with regard to art), we plan to conduct follow-up interviews using the same line of questioning as the initial interviews. During the course of the year, students will create and build a portfolio of their work. These will serve as another basis for assessing understanding and proficiency. We will be able to see if their abilities improve over time and if they grow in their overall conceptual understanding of art.

**V. Prospective Design Solution**

We expect the study to result in findings that are in line with our assumption that NCHS's art curriculum focuses on teaching art based on procedural methodology, in absence of the underlying concepts. Findings from this type of inquiry will help us understand how to design curriculum, tools and environments for more effective art instruction. Our proposed solution takes critical analysis and discourse into account as necessary aspects of art instruction. We
propose creating engaging and interactive exercises that foster critical analytical skills. In addition, our solution considers conceptual instruction in tandem with material practice to be essential to the design. Our proposed solution will include structures that explicitly present to learners the similarities between mathematics and art. It will entail activities derived from math instruction, but transition into processes native to art instruction. The instruction will build upon initial learning (i.e., moving from general to specific) through sequences of exercises, and progressively demand use of new skills. A proposed solution should afford opportunities to watch increased performance. This could entail long-term projects and multi-dimensional exercises.

VI. References


5. Norton-Smith, Thomas. (1994). *Mathematical Knowledge: Knowing that and Knowing How*. Kent State University Stark Campus Professional Activities Advisory Committee. (Antecedents of the paper were presented in colloquium at Kent State University and in conference at Interface '93, Atlanta, GA).