Chapter 19
Bringing the Arts as Data to Visualize How Knowledge Works

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ABSTRACT

Professional audiences, scholars, and researchers bring varied experiences and expertise to the acquisition of new understandings and to problem solving in visual art and literary contexts. The same breadth of experience and learning capability was found for students at eighth grade, sampled from the national population of students in the United States who were queried in the National Assessment of Educational Progress (NAEP) about formal knowledge, technical skills, and abstract reasoning in visual art and in language arts. This chapter explores statistical data relating to the presence of art specialists in the sampled eighth grade classrooms. In particular, schools with specialists in place varied in density across the country as is demonstrated through geographic mapping. Secondary analysis of NAEP restricted data showed that students in schools with art specialists performed significantly better than students in schools with other types of teachers, or no teacher. The authors surmise that art specialists conveyed something fundamental to NAEP 2008 Response scores. An aspirational model of assessment assumes broad audience clarity through knowledge visualization technology, via thematic mapping. The authors explore through analog Deleuze and Guattari's double articulation of signs in natural and programming languages and demonstrate through knowledge representation the means by which complex primary and secondary statistical data can be understood in a discipline and articulated across disciplines. This chapter considers NAEP data that might substantiate a general model of aspirational learning and associates patterns in perception discussed by researchers and philosophers.

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INTRODUCTION

In 2008, the National Assessment of Educational Progress (NAEP) in visual art captured the very thought processes by which some students successfully approached visual analysis and interpretation of meaning. Though the process was verified through statistical analysis of restricted data from NAEP, vetted by the Institute of Educational Sciences (IES), and released for public scrutiny through peer reviewed channels at the American Educational Research Association (AERA) annual meetings and through the National Art Education Association (NAEA), it was apparent to us that a disconnect existed between end users understanding of the statistical path, the descriptive information about the sample, and the avowed achievement aims of stakeholders in the arts. Our team of Diket, Brewer, and Xu stayed with the problem of audience understanding, employing various visual aids and interactive discussions to draw in the audience at conferences and published widely in the field. A breakthrough was accomplished in communication to broader audiences in 2014 when the team began using data visualization techniques to explain NAEP statistical path analyses.

Assessment concerns an individual learner's or a population's ability to grapple with field specific and domain-centered batteries of tests which are intended to serve as indicators of achievement levels in knowledge and skill, especially stemming from school-based education or formal education, and from life experiences. At a theoretical level, fields of endeavor have the potential to inform one another by providing *cases* that contextualize and express complex information. Our work with NAEP data, presented through knowledge visualization techniques, falls at the current edges of secondary analysis. We are seeking common elements in learning that cross subject areas and transcend school-based achievement, while drawing upon specific cases from populations known to be capable of grappling with formal thinking, This chapter considers NAEP data that might substantiate a general model of *aspirational* learning, and associates patterns in perception discussed by researchers and philosophers.

BACKGROUND

Elizabeth Kowachuk (1996) considers the essentials of substantive thinking and dispositions for lifelong learning in art in her NAEA *Translations* publication "Promoting higher order teaching and understanding in art education", where she cites to a well thought out thorough list of references in the assessment development era. As Kowalchuk explains in her treatment of higher order thinking in art: to develop higher order understanding students must gather, process and apply information in settings that may be academic or personal. National achievement tests provide a "dipstick" for substantive thinking and dispositions for lifelong learning. The 2008 NAEP continued most of the test blocks designed for and used in the 1997 NAEP Arts assessment, exercises which were generated from national standards developed in the 1990s. NAEP subject area examinations have additionally queried student knowledge, aptitudes, and attitudes that include an array of facts, principles, and discipline concepts.

Engagement, continues Kowalchuk (1996) is essential in higher order processing; and generative topics in a content area likely connect to students' lives. *Generative* topics are pivotal, accessible, and connectable to other knowledge students bring to new learning. Kowalchuk anticipates the current national focus on a common core of expectation that links goals for education to generative topics. She concludes by asserting that to understand achievement/performance, we must discover what students do and how they understand their process.