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Concept-Based Interdisciplinary Teaching:

Science and Social Studies Teacher Collaboration for the 21st Century

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Abstract

Social studies and science share some areas of natural content overlap which can aid interdisciplinary teaching. Other aspects of the state-mandated content, however, pose difficulties in finding common ground. In order to overcome this difficulty, this article suggests that social studies and science teachers link their disciplines through concepts. The authors apply Lynn Erikson's idea of macroconcepts to science and social studies teacher collaboration, explore the process of concept-based interdisciplinary teaching, and use example lesson plans to illustrate concept-based

interdisciplinary teaching for science and social studies teachers.

Introduction

The authors of this piece ascribe to interdisciplinary teaching. In our seventeen years of collective middle grades teaching experience, we have found that social studies and science possess a natural affinity for interdisciplinary instruction. Furthermore, the middle grades teaming concept affords great possibilities for interdisciplinary teaching (Crow & Pounder, 2000). Since time is dedicated each week to team meetings, this time could be used to develop interdisciplinary teaching and learning opportunities. Multiple middle level education scholars (Bolack, Bialach, & Dunphy, 2005; MacIver, 1990) note that interdisciplinary teaching enhances student learning. Additionally, interdisciplinary teaching has benefits for teachers such as helping teachers to learn more about what is being taught in other courses and to focus on larger themes (Crow & Pounder, 2000). Finally, 21st century skills include collaboration (Partnership for 21st Century Skills, 2007). We believe that in addition to encouraging their students to collaborate, teachers should model collaboration by working together whenever possible.

As social studies and science teachers, we have found that some content from the respective disciplines, derived from the North Carolina Standard Course of Study, easily lends itself to interdisciplinary teaching opportunities. Other content, however, has proven rather difficult to make connections between the disciplines. This conceptual paper was written in the hope of beginning to answer the question: In what ways can social studies and science teachers practice interdisciplinary teaching when their respective content standards diverge so drastically? Before we begin to offer a solution, however, it will be necessary to operationalize some terms for the purposes of this article. Though the following terms have many definitions and interpretations, here is how we are defining them in this article.

> *Interdisciplinary teaching*: Teachers from different disciplines jointly planning but independently teaching their courses.
>
> *Content:* Information detailed in the NC Standard course of study.
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> *Field-dependent students:* Students who have tendencies to dissociate from knowledge that lacks personal, contextual frameworks.
>
> *Concept:* According to Lynn Erikson (2007), there are two types of concepts. First are macroconcepts, which integrate many different examples across fields of study and include examples such as system, change, and relationships. Second are microconcepts, which reflect deeper factual and topical knowledge of specific disciplines and include examples such as elevation, democracy, and gravity. For this article, we use the term concepts to refer to macroconcepts.

Limitations of Traditional, Content-Based Interdisciplinary Teaching

The product of collaboration is not merely an intersection of common goals, but a determination to reach a common objective (Merriam-Webster, 2007). Fruitful collaboration between science and social studies teachers through interdisciplinary teaching does occur within educational settings. It is our experience that collaboration is typically limited to the realm of content-based activities that lend themselves well to a shared product or activity, often centered on a theme. For example, a lesson on the relationship between climate and farmers and agriculture includes both science and social studies content. While such lessons and their associated activities have educational value for students, the collaborations are usually more intensive for one subject area and loosely connected in others. Another typical enactment of interdisciplinary teacher collaboration is when one teacher will teach the lesson after drawing on content knowledge from a collaborative partner in a field that is not considered the teacher's expertise. In other instances, teachers independently claim interdisciplinary work by drawing on multiple fields within single courses. Social studies include economics, history, and many other fields, while science includes chemistry, physics, and other sciences. In effect, teachers can teach in an interdisciplinary manner, without collaborating with other content area teachers.

These types of traditional, interdisciplinary teaching are often critiqued in the middle school literature (Dickenson, 1993). Beane (1993) pejoratively states, "What [limited] interdisciplinary teaching does take place is usually simple correlation of subject areas" (p. 34). Beane calls for radical changes leading to a general education middle school curriculum, where teachers develop units based on content and skills, students' personal concerns, social concerns, and high-level concepts. Stevenson and Carr (1993) critique the "isolation of colleagues in different disciplines [which] . . . thwart or outright kill teacher's imagination and courage to innovate" (p. 2). Stephenson and Carr suggest an integrated studies approach where successful, integrated units beyond subject-area constraints begin with "our students and a selected topic or theme that was obviously or likely to be interesting to them" (p. 11). We applaud and admire the critical work of these authors. We also agree that these radical changes would probably lead to more effective teaching. However, most schools and many teachers are not ready to commit – at least fully - to these changes. Science and social studies teachers who do ascribe to the models described above may lack administrative and/or team member support. Thus, we position our concept-based teaching as more progressive and effective than the traditional, interdisciplinary teaching models, but not as radical as the models suggested by Beane and Stevenson and Carr.

In our view, the challenge of collaborative teaching for the 21st century requires a deliberate choice to think beyond traditional, content-driven constraints. Collaborative efforts between science and social studies teachers must move away from content-based interdisciplinary teaching that are limited to complimentary competency goals that mesh well. Rather than being governed by content areas that have traditionally been viewed as "too different" or lacking the right components for successful integration, collaboration between the two subject areas is needed to insure interdisciplinary teaching. We believe teacher collaboration should move into a realm best described as concept-based interdisciplinary teaching.

Concept-Based Interdisciplinary Teaching

While there is little doubt that content-based collaboration between science and social studies teachers is beneficial, we suggest that teachers collaborate via the use of *concept-based* rather than *content-based* interdisciplinary teaching practices. Our model builds upon Beane's (1993) focus on high-level concepts, and Stevenson and Carr's (1993) emphasis on student interest and cooperative learning, as well as Brodhagen's (2001) call for teaching and learning practices which are "challenging, integrative, and exploratory" (p. 69). Our concept-based teaching differs from these models because planning begins with the existing standard course of study, respects local pacing guides, and acknowledges the content expertise of subject-area teachers.

We apply Lynn Erickson's (2007) idea of macroconcepts to collaboration between social studies and science teachers in North Carolina. Concept-based interdisciplinary teaching is an exploration of concepts which create a variety of "bridges" across the social studies and science disciplines. In our application of Erickson's overarching idea to North Carolina middle grades science and social studies teachers, we delineate a few key characteristics of concept-based interdisciplinary teaching: (a) aligned with NC Standard Course of Study (NC SCOS) and respectful of local pacing guides; (b) the collaboration between teachers is emphasized during the initial planning and assessment phases of instruction, and (c) high level macroconcepts are used as the "bridge" between science and social studies.

We propose using concepts as the bridge between science and social studies for three main reasons: to promote higher level student thinking, to support field-dependent students, and to offer a greater number of collaborative opportunities. First, focusing on content often reflects the use of basic facts or topics. While teachers can and should scale-up to higher-level skills via the use of analysis or synthesis activities in the classroom, the nature of content-oriented goals, in taxonomic terms, is primarily centered upon knowledge, comprehension, and application skills (Erickson, 2007*)*. In contrast, concept-based practices require higher level thinking because the goals focus on transferable generalizations. The concepts and generalizations are meaningful because they are universal in application, have a "timeless" nature, and are supported by different examples (Erickson). The factual and topical knowledge associated with content-oriented goals poses limited opportunities for science and social studies teachers to collaborate, largely because facts and topics do not readily transfer and are locked in place, situation, or time.

Second, concept-based interdisciplinary teaching engages field-dependent students (Shade, 1994). Field-dependent students have tendencies to dissociate from knowledge that lacks personal, contextual frameworks. Concept-based approaches, because they are generalizable and thus applicable to multiple contexts, enable teachers to support students with field-dependent dispositions (Shade). Finally, a concept-based practice expands the potential for science and social studies teachers to practice interdisciplinary teaching in otherwise difficult portions of their respective subject areas.

In short, it is sometimes challenging to find links across social studies and science content, particularly if teachers strictly adhere to local pacing guides. Focusing on macroconcepts, rather than content, makes it easier to link the two disciplines.

Examples

To make this point clear, we will now provide two concrete examples. We draw these examples from the 7th grade North Carolina Standard Courses of Study (2007) for science and social studies. We also employ the Wilson County school district's pacing guide to align the course content chronologically, as advised by the pacing guide. We purposefully chose one example that lends itself easily to traditional, content-based interdisciplinary teaching. In our second choice, we selected an example that seemed very challenging to find content links between the two disciplines. We did so to illustrate that science and social studies teachers can practice interdisciplinary teaching through concept-based collaboration at *any* point in the NC SCOS, regardless of the disparate nature of the content.

For the first example we look at the Wilson County pacing guide. During the first six weeks of the school year, 7th grade science teachers should teach weather and the atmosphere (*Competency Goal 3, Content Objectives 3.01-3.06)* while the social studies teachers should teach the relationship between physical environment and cultural characteristics of selected regions (North Africa, for example), which is Competency Goal 2. While weather and the atmosphere are distinctly science content-based topics, the authors were able to consider many collaborative lessons by looking at climate in North Africa and how climate influenced agriculture, clothing, and many other practices of the people in this region. The authors were collaboratively able to brainstorm a multitude of interdisciplinary lessons in a short time. Without question, our discussion on interdisciplinary teaching and lesson planning posed little difficulty, despite the differences in the two subject areas. Traditional, content-based interdisciplinary teaching would work well in this example because the content and chronology conveniently overlapped in science and social studies. However, in our second example, a content-based interdisciplinary teaching approach was considerably more difficult.

Our second example was drawn from the second six weeks pacing guide. For science, the content area was the human body (*Competency Goal 4, Content Objectives 4.1-4.08*), and for social studies, an introduction to India: ancient, modern, and the region of South Asia (*Objectives 2.01, 3.02, 7.01, 7.02, 8.03, 11.01-.03*). While both authors are knowledgeable in their respective content areas, content-based interdisciplinary teaching comparing the human body and a social study of India seemed to be an overwhelming challenge. In order to overcome this challenge, we made a cognitive decision to focus on macroconcepts to provide a bridge between the courses and allow for interdisciplinary teaching. Before we introduce the lessons we developed, however, it will be helpful to explore first the process of developing concept-based interdisciplinary teaching.

Process of Concept-based Interdisciplinary Teaching

In developing this idea, our process involved the following steps: (a) recognition that content-based collaboration was insufficient for this particular content, (b) an investigation of two documents—NC SCOS and local pacing guides, (c)) a collaboration centered on meaningful concepts and agreement on the concepts of focus, and (d) lesson-planning. For North Carolina science and social studies teachers who are considering concept-based interdisciplinary teaching, we recommend the following steps:

- ✓ Step 1: Explore NC standard courses of study and local pacing guides
- ✓ Step 2: Identify macroconcepts which bridge the disciplines
- ✓ Step 3: Discuss macroconcepts and the ways in which each teacher could teach the concepts
- ✓ Step 4: Exchange lesson plan ideas
- ✓ Step 5: Collaboratively write common assessment questions specific to the macroconcepts
- ✓ Step 6: Stay in contact to determine students' progress in understanding the macroconcepts
- ✓ Step 7: After the summative assessment, meet again to compare student understandings of the macroconcepts to determine if students were able to apply understandings of the concepts across the disciplines.

We would like to note that the vast majority of teacher collaboration time is on the "front end" of concept-based collaboration. In our experience, many traditional, content-based interdisciplinary teaching practices require constant contact and revision. However, concept-based collaboration requires a good deal of advance planning, but afterwards, science and social studies teachers can largely work independently, with each teacher teaching the macroconcept by using the facts, skills, and microconcepts of each respective discipline. Teachers should feel free to practice whatever pedagogy most suits their teaching strengths and the needs of their students. Concept-based collaboration should not constrain teachers' creativity or force them to adapt their instruction. Rather, the focus should be students understanding large macroconcepts, which they can apply across different academic disciplines. Furthermore, concept-based interdisciplinary teaching should not be limited to large unit plans. Teachers should feel free to apply content-based interdisciplinary teaching to individual lessons, as we have done here.

Lesson Plans - Human Body and India

After looking through the content standards, we agreed that two important macroconcepts could provide the bridge between the human body and a social study of India: interaction and adaptation. Though the human body has little to do with India with regards to content-specific goals, by agreeing upon the meaningful macroconcepts of interaction and adaptation, we were immediately able to begin a discussion of how to collaborate across disciplines for the benefit of student achievement. The outline of our

lessons below illustrate that we could each teach the macroconcepts from vastly different content through different pedagogical approaches.

When focusing on content-based interdisciplinary collaboration, there are opportunities for interdisciplinary teaching, but these opportunities are limited by the content and the restrictions of the pacing guide. As the sample lessons demonstrate (See Table), by focusing on macroconcepts, social studies and science teachers can practice interdisciplinary teaching even when their respective content standards diverge drastically.

Table

Concepts Under Investigation: Interactions and Adaptations

	Science	Social Studies
NC SCOS Objectives	4.01-4.08; Competency Goal 4	7.01, 7.02, 8.03, 11.01-11.03
Topics	The human body system: Development and infection	Modern India: End of British colonialism and Indian independence
Essential Questions	How is the human body adapted to foreign bodies? How does the human body adapt?	How do formerly colonized people adapt to rebuild a nation?
Focus and Review	Malaria, interactions and adaptations in Africa and India: What's the difference?	YouTube clip: MLK speech "I have a dream"
Teacher Instruction	Teacher instruction and classroom discussion**:** What is adaptation? What is interaction? How do these occur within human body? Modeled practice: Simulation of a cholera outbreak – How do you find an infected source in a remote village?	Review British colonialism. Interactive lecture on Mahatma Ghandi and the work of Indian independence; his relationship to the work of other non-violent activists including MLK; influence of new media (TV and radio) and old media (print) on Indian independence
Guided Practice	Simulation where an illness is introduced to the class—one individual infected. Determine the	Simulation: Nation-building. Given the demographic information of India and

	cause before more die. Describe briefly the interactions that are occurring. How will the class adapt? Introduce a disease-fighting component represented by an individual—what happens? How is this addition an adaptation that is necessary for survival? What interactions are revealed?	what you know of its (previously taught) history – Work in pairs to design a flag, write a brief pledge of allegiance, name of currency, determine official language(s), type of government, and accommodations for minorities.
Independent Practice (Individual or partnered activity)	In class and for HW - Develop a webpage using Weebly (www.weebly.com) that gives historical and current information about an illness common to a geographic region and how local people (tribes or communities) have learned to survive by adaptation? Consider the role of the immune system and how interactions occur that insure survival? Describe these interactions and why they can be considered adaptations?	HW - Half of the class read an article about Selma-to-Montgomery March (US); half reads about the Salt March (India). Students will post reading responses to the Weebly account. Students discuss the relationships between the marches the next day.
Closure	Review the concept of adaptation. Briefly describe on your web page how the simulation represented the concept of adaptation and how it revealed that interactions do occur between people and their environment and within people? Consider the role of human body systems in interactions and the adaptations that occur.	Turn in nation-building activity. Think-Pair-Share Review: 1.Why was Ghandi's non-violent campaign effective? 2. What is nation-building? 3. Why did the people of India want independence from British rule?
Summative assessment essay questions	Review the concepts of adaptation and interaction. How has adaptation occurred to preserve life in the presence of harmful or foreign bodies? Explain your answer using your knowledge of the human body system.	What is the relationship between media (newspapers, radio, and TV) and Indian Independence? In what ways did the people on the Indian sub-continent cause

	independence and respond to independence? How is this evidence of adaptation and interaction?
Interdisciplinary Formal Assessment (common to both summative assessments)	Use five examples (total) from science and social studies to explain the concepts of adaptation.

Conclusion

In summary, we suggest that viewing the connections between science and social studies disciplines through macroconcepts rather than content expands the opportunities for interdisciplinary, collaborative teaching. This type of teaching is helpful to students and teachers. For students, we believe that this type of teaching will aid field-dependent learners because concept-based interdisciplinary teaching exposes students to macroconcepts in multiple contexts (Shade, 1994). Exploring the content at the conceptual level will lead to higher level thinking by students because concepts require them to process at a higher intellectual level (Erickson, 2007). The collaboration that occurs through the use of conceptual lenses invites students to bring their own thinking to learning, insuring the greater likelihood of personal understanding and meaning. Collaboratively planning a few assessment questions (see schematic) will lead to more deeply conceived assessments on the concept. Students benefit from observing their teachers model how to collaborate.

For teachers, concepts-based pedagogy introduces new ways to collaborate across disciplines such as science and social studies. Professional and committed educators can focus independently on content in their subject-specific courses, yet are also afforded the benefit of improved student understanding of high-level concepts. For science and social studies teachers who desire interdisciplinary teaching yet have the challenge of doing so with somewhat uncooperative objectives, the concept-based approach increases the likelihood of effective, professional collaboration.

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