Curriculum Integration Research: Re-examining Outcomes and Possibilities for the 21st Century Classroom

CONSIDER THE RESEARCH
This report provides an overview of the research results on curriculum integration.

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Exploring Integration as a Venue for Preparing Career- and College-Ready High School Graduates

Integrating content across subjects has been promoted as a productive educational reform across several decades. The knowledge base is extensive and conclusive regarding the benefits for student learning. Therefore, as educators in a new era that expects all students to graduate high school career- and college-ready, we have the opportunity to re-examine productive initiatives as an informational tool to use as we endeavor to support new 21st Century rigorous expectations and student learning. The current inquiry into integrated design will be guided by the following questions:

- **What opportunities and benefits are afforded by integrated instruction, according to research?**
- **What are some design features of integrated models of instruction?**
- **What implications can be identified for policy and practice?**

Why Integrated Curriculum?

Across definitions and varieties (See Appendix A), integration has had "ups and downs" in popularity as a reform tool based upon political contexts of given eras. Nevertheless, history has shown superior learning outcomes for well-designed and well-implemented integrated initiatives. This history and the current era of 21st Century learning and rigorous common academic standards places educators in a position to reimagine how integration might be used to make learning brain-compatible while enhancing cross-cutting delivery of Michigan's academic standards in today's educational settings.

Experts propose that more can be taught and learned in less time and at higher levels of learning if we connect the disciplines (Jacobs, 1989; Drake and Reid, 2010). Curriculum connections also eliminate duplication of teaching efforts while simultaneously providing opportunities for cooperative instructional planning for school faculty and staff. These environments are conducive to academic attainment (Erb and Stevenson, 1999) because teachers are constantly learning, planning, and applying findings from their joint inquiries into how to improve learning opportunities and instruction for students (Jacobs, 1989, 2010). Such environments lead to more differentiation in instruction and the deepening of disciplinary understanding, resulting in higher scores on achievement tests. Integration can be utilized as a venue to develop both complex-cognitive and career-related soft skills, preparing students of today to become college- and career-ready for tomorrow.

Benefits for using integration as a curricular model are listed below:

- Coherent Concept Development. Integrated studies lead to coherence in learning with the associated development of more elaborated concept development (Hartzler, 2000; Erickson, 2002). Integration is a way to teach holistically through interconnectedness at all levels of schooling.

Interdisciplinary approaches associated with curriculum integration open venues for applying multiple intelligences and higher-order thinking skills within a context of performance assessment and under the simultaneous assumption that knowledge cannot be boxed into "subjects" (Hartzler, 2000). The inclusion of all curricular areas is important to the education of students, e.g., integrating creative writing, music, and/or arts enhances student achievement in other subject areas rather than reducing learning to focus subjects in accountability systems (Jacobs, 1989; Drake 2007). Application of skills from process-oriented disciplines strengthens both the skill and content learning in the subject areas into which process is integrated (Hartzler, 2000).

- Depth of Knowledge. Integration results in teaching of depth versus breadth, encourages multiple intelligences, and allows for the infusion of literacy and/or thinking skills, amongst other enhancements (Hartzler, 2000; Drake, 2007) aligned to 21st Century academic abilities. Deeper learning and improved problem-solving can be expected, particularly on transfer problems where application of knowledge to novel contexts is required (Jacobs, 1989, Wiggins and McTighe, 2005). Interdisciplinary integration also enhances critical-thinking skills (Billig, 2010; Furco, 2010). The higher–order cognitive processing incorporated leads to longer-lasting achievement regardless of socioeconomic status by embedding skills, expanding content knowledge, and increasing understanding (Bransford, 2002; Hartzler, 2000).

- Opportunities for Individualization. Integrated programs reveal more individualized learning opportunities than traditional methods (Hartzler, 2000). Opportunities to differentiate instruction are more available in integrated studies (Drake and Reid, 2007).

- Motivational Improvements. Curriculum integration promotes student involvement/participation in school and enhanced motivation for academic learning. This results from engaging with a curriculum that focuses on higher-level problem-solving skills, content knowledge acquisition, and deeper understanding of connections across subjects (Catterall, Dumais, and Hampden-Thompson, 2012; Goldschmidt and Jung, 2010; Guthrie, Klauda, and Ho, 2013; Hughes, Bailey, and Karp, 2002; Mac Iver, 1990; Smithrim and Upitis, 2005; Upitis, 2011). Integrated models are heralded as an effective alternative to more traditional curriculum delivery models with the benefit that it heightens curricular relevance (Drake, 2007) and therefore, student engagement in learning across all levels of schooling (Erickson, 2002; Jacobs, 1989). Attendance, graduation, and college attainment rates are positively impacted (Catterall et al., 2012; Furco, 2010; Hughes et al., 2002) through integrated studies. Overall, students become more engaged and less prone to attendance and behavior problems (Atkin, 1942; Drake and Burns, 2004; Reeves, 2009).

- Enhanced Sense of Community. Collaboration is enhanced through processes of planning and revision of curriculum. These collaborative meetings bring teachers together, providing a ripe context for Professional Learning Communities and discussions that will improve pedagogy and accelerate professional growth, e.g., questions around philosophy, knowledge-connections skills, and ideas about assessment, amongst others (Drake and Reid, 2007). Research suggests that middle school interdisciplinary teaching teams can achieve more effective problem solving when meeting with other faculty and/or parents to discuss interventions and progress, can create a greater sense of community, and can lower feelings of isolation (Mac Iver, 1990). Integration increases feelings of connection among teachers as well as team spirit among students (Mac Iver, 1990; Smithrim and Upitis, 2005).

- Brain Development. Imaging technologies show that integration results in dendrite growth allowing for more and better brain connections. Since the brain works in an integrated fashion, integration is in sync with pedagogical "best practices" (Caine and Caine, 1994, 1997; Jensen, 2005). It is an economical way to incorporate multiple expectations for learning simultaneously, thus aligning to brain research and learning theories incorporating "connectedness" (Caine and Caine, 1991, 1997). To elaborate, Jensen (2005) suggests that the brain thrives in a context of personal meaning and variety, and processes best when making connections.

- Overall Achievement Effects. Hartzler's (2000) meta-analysis of 30 studies meeting high-level criteria reveals an overall effect size of +0.4761 for increasing achievement. The Hartzler-based results support studies of a decade earlier showing students in interdisciplinary programs perform as well or better than in traditional approaches (Vars, 1991). Multiple studies reveal similar achievement results (Barry, 2010; Blair, 2009; Borman, Hewes, Overman, and Brown, 2003; Catterall et al., 2012; Cervetti, Pearson, Barber, Hiebert, and Bravo, 2007; Furco and Root, 2010; Goldschmidt and Jung, 2010; Guthrie et al., 2013; Klemmer, Waliczek, and Zajicek, 2005; Nelson, 2001; Hendrickson and Oklahoma A+ Schools, 2010; Romance and Vitale, 2012,; Satchwell and Loepp, 2002; Smith and Motsenbocker, 2005; Smithrim and Upitis, 2005; Walker, McFadden, Tabone, and Finkelstein, 2011; WestEd). Academic performance equals or surpasses results of students in discipline-based programs (Drake and Reid, 2007). These integrated curricular programs are successful across all four core academic areas (Language Arts, Mathematics, Social Studies, and Science), and at all grade levels (Hartzler, 2000). Achievement escalates by a 1/2 standard deviation gain as computed through standardized measures as shown through effect sizes calculated from a meta-analysis of 30 integrated programs (Hartzler, 2000). Achievement results materialize across the variety of assessment instruments used in the studies to measure achievement (Hartzler, 2000).

Integrated Curriculum Models and Features

Moving beyond studies from the last decade, today's models increase learning and enhance accountability through designs or frameworks that allow alignment of standards, assessment, teaching strategies, content, and reporting. Ideally, students become situated as active learners involved in meaningful tasks set in authentic contexts wherein the integrated learning is purposefully designed with degrees of depth and complexity of connections varying across initiatives to accommodate school structures, teacher interest and expertise, and perceived requirements of accountability and course-taking. Students are at the heart of today's models. Contextual needs of students should be the centerpiece for a curriculum planning process. Historical designs can also be utilized in design efforts for today's initiatives. Many models and integration combinations achieve results. For example, Robin Fogarty (1991) provides a continuum of integration complexity designs that can be used to guide or differentiate curriculum development. Susan Drake adds to this work through her identification of larger scale categories for design (see Figure 1). Though focused differently, together these models provide ways to think about design options that work.

While most of the research on integrated models involve elementary and middle schools, it should be noted that high school programs will benefit as well, as can be seen in more current contexts, such as high schools using project based learning (Hartzler, 2000; Walker and Leary, 2009; New Tech High Network, online).

Figure 1: Drake's Categories of Integration Types (Adapted from Drake and Burns, 2004)

Approach	Definition or Description	Characteristics	Primary Assessment Concern	Features Equivalent Across All Inter-disciplinary Approaches
Fusion	Something is fused to an already existing curriculum. Infusion of a content area, thinking skills, arts techniques, etc., would mean these were taught within every class.	A focus that is embedded into all school life.	Subject specific	Mapping backwards design—using standards Exemplary teaching/ learning strategies
Multidisciplinary	*Multidisciplinary* approach is additive, not integrative. The disciplinary perspectives are not changed, only contrasted. Team-taught courses in which faculty provide serial lectures are often multidisciplinary.	A focus on the concepts and skills of each of the disciplines independent of the others.	Disciplinary concepts and skills	Set in student-relevant real-world context as much as possible Performance demonstrations as well as standardized assessment
Interdisciplinary	*Interdisciplinary* is when students and instructors come together to analyze differences in disciplinary approaches to a problem and to work toward a synthesis resulting in a new, more comprehensive view than allowed by the vision of any one field.	A focus on common concepts and skills across the disciplines	Common concepts and skills across the disciplines	
Transdisciplinary	*Transdisciplinary* approaches provide holistic schemes that subordinate disciplines, looking at the dynamics of whole systems (i.e., place-based education).	Real world context and student questions; life skills	Authentic assessment in a real life context	

Implications for Practice and Outcomes

Curriculum integration has potential to deliver for students and teachers, and for growth in the professional quality of school communities. Efforts to improve delivery of the next generation expectations for learning must be made to enable Michigan's competitive edge, and one very positive way of approaching increased student competency is through connected/integrated learning. Implementation of an integrated approach has the potential to accomplish our current career- and college-ready goals. The decision to adopt integration as a means of implementing standards for learning must be weighed and considered based upon factors of teacher knowledge, organizational constraints, and the status of policy.

1. Integrated curriculum should be relevant, standards-based, and meaningful (Drake and Reid, 2010; Drake and Burns, 2004; Vega, online). Standards should be used to ensure purpose and relevancy of integrated learning experiences. The literature reveals that synthesis of two or more disciplinary theories and/or methods is a key component to integration.

2. Instruction must explicitly make required connections to enable the connected learning within minds of learners. Intentional instructional practices will impact engagement and relevance within the integrated initiative, allowing students to connect ideas and transfer their knowledge across content areas.

3. Innovative and efficient scheduling of time should be in place to enable successful implementation of the integrated initiative. Minimizing scheduling obstacles will be a key to success at all levels of schooling, K-12. Historically, most significant gains were found at elementary and middle school levels where scheduling obstacles were minimized.

4. Teaching teams should remain stable for three years or more (Erb and Stevenson, 1999) for maximum results. According to Gunn and King (2003) teaching teams require time to build trust and work through differences and should be considered a long-term commitment.

5. At least a semester is needed for students and teachers to begin showing academic results (Hartzler, 2000).

6. Professional development should be in place to move teachers to consistent, standards-based implementation of learning progressions and 21st Century skills as well as effective implementation of options within the integrated framework. Opportunities for ongoing team planning and continuous review will impact sustainability of curriculum implementation.

7. Newer media requirements and repositories for storing curriculum units and tools will be necessary supports for collaboration. Newer technologically-based record-keeping systems and digital portfolio repositories will be necessary for maintaining records.

8. Because student content consumption, comprehension, and retention occur at a significantly greater rate in integrated classrooms/instruction than when content is delivered traditionally, there is a greater return on investment for the school and community due to increased teacher effectiveness and instructional output, and a reduced need for student remediation.

9. State, federal, and university sponsored programs have demonstrated greater success (Hartzler, 2000) than those initiated by single teachers or a partial school staff. These programs tend to be characterized by leaders who are highly engaged and knowledgeable about integration. Some include partnerships between groups who are working together to support teachers and their professional development as they implement an integrated curriculum within a school or group of schools.

10. At the state level, policies around teacher training, certification, and evaluation as well as traditional scheduling; grading and reporting; and current accreditation practices will need to be studied and revised to enable effective implementation, especially at the secondary level.

Next Steps

This synthesis of program outcomes highlights that the effects of implementing a well-designed integrated curriculum has a multitude of positive effects on student achievement and learning. As educators consider choosing a curriculum design that has the potential to deliver desired academic outcomes while readying students for future postsecondary endeavors, integrated approaches may offer a solution to meeting those goals.

Appendix A: Definitions of Integrated Curriculum

- Drake (1998) purports integration is inherently interdisciplinary involving design with “horizontal organizations that break down walls of traditional academic disciplines by providing learning experiences that explicitly link content, skills, and/or values of different areas with the same subject area, but more commonly, between two or more of the traditional academic disciplines.” The “integrated curriculum provides the context for learning, however, instructional practices must make these connections explicit.” (Hartzler, 2000, p. 155)

- “Integration incorporates the idea of unity between forms of knowledge and respective disciplines" (Pring and Loepp, 1999). Integration, with its many forms and designs, is often visualized through the marble versus layer cake metaphor where layer cake symbolizes curriculum design in which each discipline maintains an identity while marble cake is more problem-based with various disciplines contributing to the solution of the problem. In this, layer cake is more of an interdisciplinary approach to curriculum because the boundaries among the disciplines are maintained. This may be an important consideration as educators determine how to best develop disciplinary literacy per the Michigan K-12 ELA Standards.

- The Association for Supervision and Curriculum Development (ASCD) maintains that integrated curriculum encompasses different approaches but remains “a way of teaching and learning that does not depend on division of knowledge into separate subjects. Topics are studied because they are interesting and valued by teachers and students concerned, not because they appear in a required course of study. Both integrated and interdisciplinary curriculum help students see connections, but unlike an integrated curriculum, an interdisciplinary curriculum draws its content from two or more identifiable disciplines” (A Lexicon of Learning, ASCD online).

- Jacobs (1989) defined integration as "a knowledge view and curricular approach that consciously applies methodology and language from more than one discipline to examine a central theme, issue, problem, topic, or experience.”

- Good (1973) described interdisciplinary curriculum as "curriculum organization which cuts across subject matter lines to focus upon comprehensive life problems or broad based areas of study that brings together the various segments of the curriculum into meaningful association.”

- Erickson suggests “process integration applies complex performance and skills across areas of content study” and “content integration uses a conceptual focus to create an interdisciplinary perspective around a common theme, issue, or problem of study.” Interdisciplinary units add a focus concept to a specific topical theme of study. Disciplines work in an interdisciplinary manner to develop

understanding of the conceptual ideas that transcend the specific topic. The conceptual focus forces integrated thinking (2002, p. 165).

- Integrated studies involve the combination of two or more subjects in a lesson, project, classroom, or curriculum. Teachers can draw interdisciplinary connections by making relationships between different subjects explicit, and/or by working with other teachers in teams across subjects (Vega, online).

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