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Curricular integration in the elementary classroom

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Curricular integration in the elementary classroom

Abstract

The No Child Left Behind Act and how it narrows the elementary curriculum is an important educational issue. Integration is a valuable teaching practice that is becoming more wide spread in today's classrooms because of the pressures placed on teachers by NCLB. Integration is used to relieve some of the pressures of NCLB by helping teachers create more time to teach all subject areas. Integration allows teachers to connect learning standards across the curriculum and make lessons more meaningful for the students. This paper describes what integration is and why teachers need to implement integration into their daily instruction. In addition, this paper provides research-based evidence of the benefits of integration and how teachers can begin to effectively use integration in their classrooms.

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A Graduate Review

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Department of Curriculum and Instruction

In Partial Fulfillment

Of the Requirements for the Degree

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Abstract

The No Child Left Behind Act and how it narrows the elementary curriculum is an important educational issue. Integration is a valuable teaching practice that is becoming more wide spread in today's classrooms because of the pressures placed on teachers by NCLB. Integration is use to relieve some of the pressures of NCLB by helping teachers create more time to teach all subject areas. Integration allows teachers to connect learning standards across the curriculum and make lessons more meaningful for the students. This paper describes what integration is and why teachers need to implement integration into their daily instruction. In addition, this paper provides research-based evidence of the benefits of integration and how teachers can begin to effectively use integration in their classrooms.

Introduction

Imagine observing a science class in an elementary school where the students are not only learning science, but are also learning reading, writing, and even math skills at the same time. The teacher is incorporating multiple standards from all disciplines instead of focusing on only science standards. The students are engaged in their learning by asking higher level questions and finding multiple ways to answer their own questions. Even the struggling students seem to be able to find ways to be involved and meet their learning goals. During the hypothetical science lessons, the students may be listening to the teacher read aloud while modeling reading strategies. Then the students may try the strategies on their own while they read books about their science topics. The students use writing skills to report on their findings and present the information to the class. The observer may be confused on where the science lesson ends and a new subject area begins because the students seem to be doing science, reading, writing, and math throughout the whole day and not only for one set time period. This type of teaching is called integration and can have many benefits for teachers and students.

Background on Integration

Definition of integration. To understand the benefits of using integration one must first know what integration is and the different approaches to use. Integrated curriculum is an old concept developed by John Dewey and Francis Parker in the 1890s and early 1900s (Hinde, 2005, p. 106). Since then, there have been many forms of integration developed throughout time. There is not one standard definition of the word integration because it can be used in various ways. Parker (2005, p. 452-453) defined integration as “A curriculum approach that purposefully draws together knowledge, perspectives, and methods of inquiry from more than one discipline to develop a more powerful understanding of a central idea, issue, person, or

event” (as cited in Hinde, 2005, p. 106). To better understand what integration is, one should examine the different approaches used. There are many forms of curricular integration developed, but research has found three main types of integration: multidisciplinary, interdisciplinary, and transdisciplinary.

Multidisciplinary integration. Multidisciplinary integration is when teachers organize standards from the disciplines around a theme and combine skills, knowledge, or even attitudes into the lessons (Drake & Burns, 2004, p. 8-9). This approach can be better explained by thinking of a classroom using theme-based units. The teacher may choose farms as a theme for the month. Then during every subject area the students will learn something about farms. See Appendix A for an example chart of using farms as a multidisciplinary approach. This is just one example of multidisciplinary integration. This type of integration can be used in any grade level and can also be used in various ways. Another way teachers may use multidisciplinary integration is by using technology or literacy across the curriculum. Most teachers already use a form of the multidisciplinary approach just by integrating subdisciplines into one subject area. For example, teaching reading, writing, and oral communication during language arts is an intradisciplinary approach of using multidisciplinary integration (p. 8). Lastly, service learning can be a form of multidisciplinary integration if the students are working on a community service project during school hours.

Interdisciplinary integration. Interdisciplinary integration is when teachers organize the curriculum around common learning skills across disciplines and can “chunk together the common learnings embedded in the disciplines to emphasize interdisciplinary skills and concepts” (Drake & Burns, 2004, p. 8). This type of integration would be like when students are learning different skills through the learning of one topic. Students learning about landforms

while learning literacy, map reading, research, and problem solving skills would be an example of interdisciplinary integration. See Appendix B for an example chart of using this approach. One can identify the subject areas, but they are combined together and not taught separately like in the multidisciplinary approach. Interdisciplinary integration really allows for teachers to teach concepts from other disciplines in one subject area. This is beneficial for saving time and being able to teach more math and reading skills during other subject areas, such as in science and social studies class.

Transdisciplinary integration. The transdisciplinary approach is when “teachers organize curriculum around student questions and concerns” and “students develop life skills as they apply interdisciplinary and disciplinary skills in a real-life context” (Drake & Burns, 2004, p. 13). This approach uses student inquiry to develop the curriculum. This approach may be the most challenging for the teachers because they are giving the students more control of what they are learning. Also the lessons are not all planned out before the unit, but instead the lessons are developed while the learning is occurring and is based on the students’ inquiries. The teacher needs to be flexible and willing to make changes in the lessons to help the students answer their questions.

Project-based learning is the most common form of transdisciplinary integration. Project-based learning involves three steps: developing a topic, generating questions, and sharing of work. First, teachers and students must work together to find a topic that is interesting to the students, will meet the learning standards, and will address a local problem. Then, the teachers and students generate questions and come up with ways to answer these questions. Lastly, the students create a project to share their learning with others (Drake & Burns, 2004, p. 13-14). This

type of learning really allows for students to become involved in the topic and allows them to learn about real world problems.

Multidisciplinary, interdisciplinary, and transdisciplinary are three types of integration identified by research. Teachers do not have to choose just one approach, but instead can use a variety of these approaches and find the ones that best meet the student's needs. Parker (2005, p. 452-453) reminds teachers to remember when using integration "The purpose is not to eliminate the individual disciplines but to use them in combination" (as cited in Hinde, 2005, p. 106). Also, the purpose of using integration is to have a clear outcome and not just use integration to say that you are using it. Using any type of integration takes careful planning to make sure it is rigorous and relevant to the learning of the students.

Why Curricular Integration?

As previously stated, integration is not a new concept. However, it is becoming more popular in today's education world because of the No Child Left Behind Act of 2001 (NCLB). With NCLB there are state and federal academic goals for reading and math. These goals are tested through standardized tests and the outcome of the school is based on these tests. Schools that do not meet the goals are considered to be unsuccessful and will have negative consequences for not meeting the goals. This places pressure on schools and causes more teachers to have an emphasis on reading and math instruction which might have a negative impact on other curriculum areas.

NCLB causes a distortion in the education curriculum. Kathleen Kennedy Manzo from *Education Week* states, "Schools allocate more time and attention to reading and math instruction to meet state and federal goals for student achievement" (Manzo, 2005, ¶ 2). Teachers are

finding themselves planning more lessons around reading and math in order to meet the NCLB Act. This reduces the instructional time teachers spend on other curriculum areas.

President Obama even agrees that NCLB has a negative effect on the curriculum. In an article from *Education Week*, it talks about President Obama's view of NCLB and how he feels that NCLB purpose was to raise standards. However, he believes that standardized tests pressures schools to teach to the test. The article states, "In many districts, Mr. Obama maintained, teachers and principals have decided that if they are to bring their students up to the proficient level, "all they can do is just study math and reading every day, all day long. They've eliminated recess, they've eliminated art and music" (Rothstein, 2009, ¶ 6).

Mindy Kornhaber, an associate professor in the Department of Education Policy Studies at the Pennsylvania State University, shares her research on NCLB and the curriculum. She stated, "About 25 percent of schools report reducing social studies, science, arts, and music in response to the NCLB" (Sunderman, 2008, p. 46). Kornhaber believes that narrowing the curriculum may raise test scores, but does not mean that students are mastering and applying knowledge across tests. In addition, she believes that by narrowing the curriculum, students are not learning how to solve complex problems needed in the everyday world. This shows how the accountability of standardized tests is negatively impacting the curriculum and hindering the learning of students.

Most supporters of NCLB believe because of this act "students' test scores have been going up, and that the achievement-gaps between minority and majority students have been going down" (Popham, 2005, p. xi). This would mean that NCLB is doing exactly what it was intended to do. However, the opposing side believes that NCLB is narrowing the curriculum and creating a greater achievement gap between minority and majority students. Schools with more

minority students are spending more time teaching to the test and not exposing their students to higher level thinking. People believe this is causing a larger achievement gap within minority and majority students in other educational areas not tested through NCLB.

Many teachers feel pressured to teach to the test and are taking instructional time away from other curriculum areas. However, some supporters of NCLB believe that teachers need to be more creative by incorporating reading and math into other subject areas so they are not narrowing the curriculum. These supporters believe that just by “addressing reading comprehension within science instruction would become an attractive alternative to support high-stakes testing outcomes” (Douglas, Klentschy, Worth, & Binder, 2006, p. 402). Some people believe that teachers need to be taught ways that they can include reading and math into other curriculum areas so they are able to teach more reading and math, but still have a balanced curriculum.

Dianne Piché, the executive director of the Citizen’s Commission on Civil Rights, believes that NCLB is basically a good model. Piché supports the regular assessment in reading and math and thinks it is a good idea for schools to be held accountable for these assessments. She understands that not everything is running smoothly with the NCLB, but does not think abandoning NCLB would be beneficial. Instead Piché believes that we need “creative thinking, committed education leaders, and informed involved parents-all united in our belief in the worth and value of every young life and each child’s potential to learn and do great things” (Noll, 2010, p. 413). So if teachers are having problems with NCLB negatively effecting the curriculum, then they should work together to find creative ways to solve this problem while still meeting the goals of NCLB. One way for teachers to be innovative and help solve the problem of NCLB

narrowing the curriculum is to use integration. Integration will allow teachers to emphasize reading and math skills through the teaching of other subject areas.

Significance of the Review

With the pressures of NCLB and the time constraints it places on teachers, it is vital that teachers learn how to use integration in their classrooms as an effective tool to meet state standards without narrowing the curriculum. Some educators may believe it is easier just to eliminate teaching subject areas like science and social studies and only to teach math and reading all day in order for their students to pass the state mandated tests. However, educators who only focus on teaching to the tests are often creating a curriculum that concentrates on using worksheets, drilling activities, and other meaningless tasks that take away the joy of learning to help students only learn what they need to for increasing tests scores (Noll, 2010, p. 404). However, this type of curriculum does not create well rounded students and does not provide them with the skills they will need to acquire to solve real world problems. Since, the pressures of NCLB are not diminishing, teachers need to find a way to ensure accountability and yet at the same time provide curriculum that is relevant to their students' lives. "Integrated curriculum—done thoughtfully—can address both accountability and relevance needs" (Drake & Burns, 2004, 146). This review will help teachers understand how they can start using integration in their classrooms. Additionally, this review will present to teachers ways to successfully use integration and the benefits it provides to both students and teachers.

Methodology

Finding reliable and relevant resources about curricular integration was an easy task since the topic of NCLB makes integration a more popular teaching approach in today's educational classroom. The Internet was a valuable resource for finding pertinent information about

curricular integration. The Rod Library and Keystone Area Education Agency offered access to EBSCOhost and ERIC databases to find online peer-reviewed journal articles about integration in the elementary classroom. The Rod Library and the Carnegie Stout Library supplied access to several books discussing the topic of curricular integration. Also, textbooks from graduate classes taken at the University of Northern Iowa provided a wealth of knowledge about using integration in the classroom. All the articles and books used in this review were carefully analyzed and chosen because they were relevant, up-to-date, accurate, and reliable resources.

Literature Review

Steps to Implement Integration

Gaining support. The first attempt at implementing integration may not be a simple process. Teachers may be unwilling to step out of their comfort zone and plan new activities that they never tried before. This is why it is important for teachers who want to use integration to first seek support from their teaching partners and principal. Drake and Burns (2004) discuss how working collaboratively is one of the greatest rewards of using integration and can really inspire teachers to stay in the profession (p. 27). Administrators should plan more professional development where teachers can learn about ways to successfully implement integration and have time with their colleagues to plan ways they can use integration in their classrooms. Furthermore, teachers should also obtain support from parents. Some parents may not understand why their children might be doing math during science class and may need an explanation of why this is taking place. Teachers need to explain to parents how beneficial integration is for their children and how they will be learning more by taking part in the process. Implementing integration may be challenging at first, but support and collaboration will make it a positive experience for both the teachers and students.

Using backward design process. After gaining support, teachers should work together and use the backwards design process to plan how to implement integration into their curriculum. The backwards design process was explained by Wiggins and McTighe in their book, *Understanding by Design* (1998), but was adapted by Drake and Burns in their book, *Meeting Standards through Integrated Curriculum* (2004). Drake and Burns made changes to the original three backwards design steps to include a fourth step that involves finding meaningful ways to organize the standards to use them in the integrated curriculum. Following are the four backward design steps and questions for curriculum planners listed by Drake and Burns (2004):

1. “Identify the purpose and desired results: What is worthy of and required for understanding? How will students be different at the end of the unit?;
2. “Review the standards to determine how to use them in an interdisciplinary framework: Can standards be organized in meaningful ways that cut across the curriculum?;
3. “Determine acceptable evidence: What is evidence of understanding?;
4. “Plan learning experiences that lead to desired results: What learning experiences promote understanding and lead to desired results?” (p. 33)

When planning for an integrated curriculum, teachers should use these four steps of the backward design process and ask the corresponding questions. Usually, teachers begin with using activities they previously used and save planning the assessment until the end which can cause the assessment not to align with the standards and the purpose of the lesson (p. 32).

However, using the backwards design process will allow for teachers to first think about the purpose of the lessons, align standards and assessments to the learning, and lastly plan the activities for the lesson that will meet the desired results. This process will allow for teachers to

logically align content, assessment, and teaching all together to create more significant activities for the students.

Creating KNOW/DO/BE bridge. Drake and Burns (2004) suggest that in order to complete the first step of the backward design process teachers should create a KNOW/DO/BE bridge to decide what is most important for your students to KNOW, what is most important for your students to DO, and what kind of person you want your students to BE (p. 33). Drake and Burns state, “The KNOW/DO/BE bridge enables us to design integrated curriculum that is both relevant and rigorous” (p. 50). See Appendix C for example of the KNOW/DO/BE bridge that uses solids and liquids for a second grade classroom as the unit topic.

At the top of the bridge is the BE. This is where teachers identifies the characteristics they want the students to develop throughout the unit. It is important for teachers to add character education into their curriculum. Elkind & Sweet (2004) state:

Whether you are a teacher, administrator, custodian, or school bus driver, you are helping to shape the character of the kids you come in contact with. It’s in the way you talk, the behaviors you model, the conduct you tolerate, the deeds you encourage, the expectations you transmit. (¶ 1)

Furthermore, the U.S Department of Education (2005) gives a description of what character education should look like schools by stating, “In school, character education must be approached comprehensively to include the emotional, intellectual and moral qualities of a person or group. It must offer multiple opportunities for students to learn about, discuss and enact positive social behaviors (¶ 6). Creating the KNOW/DO/BE bridge will help teachers to plan more ways to integrate character education into their curriculum.

The left side is the KNOW triangle where the teachers list the enduring understandings, interdisciplinary and disciplinary concepts, topics, and all the facts the teachers want the student to KNOW by the end of the unit. The basic facts, which are the lowest level of knowledge, are

listed at the bottom of the triangle along with the topics of the unit. In the middle are the disciplinary and interdisciplinary concepts for the topic. These are the concepts for the specific subject area and the concepts that can be integrated from other subject areas into the unit. The enduring understandings are listed at the top of the triangle because these are the higher level of knowledge or big ideas the teacher wants the students to gain throughout the unit (Drake & Burns, 2004, p. 36-39).

On the other side of the bridge is the DO triangle where the teacher lists the interdisciplinary, disciplinary, and lower-order skills the students should be able to DO throughout the unit. The lower-order skills are listed at the bottom of the triangle because these are the lower level skills that will be easiest for the students to perform. The disciplinary skills are listed in the middle of the triangle and are the skills that the students will be able to complete from the specific subject area of the topic. At the top of the triangle are the interdisciplinary skills, which are the more challenging integrated skills from other subject areas that the students should be able to do throughout the unit. The interdisciplinary skills often useful in real-life situations and require higher level of knowledge for students to perform (Drake & Burns, p. 45-46).

Aligning standards. Before creating the KNOW/DO/BE bridge teachers need to be aligning the standards with the curriculum and is where educators should be thinking about step two of the backward design process. Without integration, teachers often try to teachers try to cover each standard one at a time. “Through integration, teachers can bundle the standard in a thoughtful manner to cover them” (Drake & Burns, 2004, p. 25). In order to successfully align the standards, teachers should scan and cluster their standards. To do this, teachers should take a look at all of the learning standards for their grade level and decide which ones can be

successfully clustered together to teach the unit through an integrated curriculum (p.59). See Appendix D for an example of how to cluster standards for second grade unit on solids and liquids. After the teacher has identified the standards, they can use them to help them create the KNOW/DO/BE bridge.

Creating assessments. Creating the assessments should come before developing the lesson activities and is the third step of the backward design process. Assessments in an integrated curriculum unit should include performance-based culminating assessments, which allow for students to show they have learned the information listed in the KNOW/DO/BE bridge (Drake & Burns, p. 67). In addition, the assessments should align with the lesson activities for the unit. For example, for the second grade unit on solids and liquids a performance-based assessment could be where the students create an experiment with solids and liquids and have to make a display about their experiment to share with students. The teacher could then even have a day where the students invite their parents to come and see the displays. In order to grade the performance-based assessments, Drake and Burns (2004) suggest designing rubrics that will show the students meet the standards and criteria on the KNOW/DO/BE bridge (p. 70).

Even though the teacher will have a culminating performance-based assessment, it is also important to include daily assessments in the lesson plans. “Assessment incorporated into daily instruction is the foundation of the backward design approach” (Drake & Burns, p. 68). The performance-based assessments will really address the higher-level skills and knowledge on the KNOW/DO/BE bridge. Other daily assessments should be included to address the other skills and knowledge on the bridge. Smaller group projects, anecdotal notes, and observing students’ daily journals could be other assessments teachers use on daily basis. Paper-and-pencil tests are often required, but usually do not show higher level of understanding (p. 67).

Developing lessons. After creating the KNOW/DO/BE bridge, aligning the standards, and creating the assessments, teachers are ready to develop the lessons, which is the fourth step of the backward design process. Before creating the lessons, teachers should develop guiding questions that consist of both topic questions and broader essential questions to help focus the learning (Drake & Burns, p. 84). Some guiding questions for the second grade unit on solids and liquids are:

1. What are the properties of solids and liquids?
2. How do you use solids and liquids every day and why do we need them?
3. What happens when you mix solids and liquids?
4. How can you separate solids and liquids?
5. What are some global problems with solids and liquids?
6. What are experiments I can do with mixing solids and liquids?

The guiding questions and lesson activities should relate to the KNOW/DO/BE bridge, standards, and planned assessments. In addition, the lessons should allow room for student inquiry, be motivating, and integrate skills from other subject areas (p.75). Teachers can make a web to help them plan out activities that will involve learning from other curriculum areas. See Appendix E for an example of a web of lesson ideas for a second grade unit on solids and liquids. After making the web, teachers then can carefully plan out activities and remember to be flexible to include student inquiry.

Ways to Integrate Subject Areas

It is known that the NCLB Act narrows the curriculum by pressuring teachers spend more instructional time during reading and math classes. However, teachers can teach more math and reading skills without narrowing the curriculum by using integration. Integration allows for

educators to teach skills from various disciplines and to incorporate real life problem solving activities. “As you know from your own experiences in life, rarely are you confronted with a problem that requires accessing only one discipline to reach a solution” (Nagel, 1996, p. 1). We should not limit student learning to just using one discipline to solve problems in class. There are many ways teachers can integrate reading and math into other subject areas like science and social studies. In addition, with technology becoming more prevalent in today’s classrooms, teachers should be aware of the reasons to effectively integrate technology into the classroom.

Reading integration. Research has identified many benefits of using books to teach other subject areas. Since there are books written on just about any topic, it makes it easy for teachers to find books to teach concepts in other subject areas. A lot of teachers are using trade books to teach students concepts in science and social studies because the textbooks are too difficult for students to read and understand. Rice (2002) states, “Science texts can be daunting for many children, particularly those who have reading problems” (§ 7). On the other hand, trade books are more interesting to read, come in different levels to meet students’ needs, and are generally easier for students to comprehend. However, there are some concerns about teachers using trade books to teach concepts in other subject areas. “The first is a concern with accuracy of content in trade books that are used in teaching science. There is also the question of how content, whether accurate or not, affects the development of children's science concepts” (§ 23). Teachers need to be careful when selecting trade books to teach concepts because some books are not accurate and can leave students with misconceptions about the concept.

Read-alouds during other subject areas can also be valuable to students’ comprehension skills. “Read-alouds give students the opportunity to engage with ideas in texts above their reading level and can expose them to important ideas and themes of consequence, such as

scientific inquiry” (Heisy & Kuncan, 2010, p. 666). The teacher’s role during the read-aloud is more than just reading the book to the students. The teacher needs to plan out how to engage the students before, during, and after the book. Kletzien and Dreher (2004) suggest teachers engage students in read-alouds by “allowing them to make interpretations, offer suggestions, and ask questions to support their active involvement in the meaning-making process” (as cited in Heisy & Kuncan, 2010, p. 666). Not only can teachers use read-alouds to help students understand concepts in other subject areas, but they can also use the time to teach reading skills. While reading aloud to students, teachers are modeling what oral reading should sound like and can stop and model how they comprehend the text (Weaver, 2002, p. 280-281).

Another simple way to integrate reading and other subject areas is to use books during literature circles and guided reading groups from other subject areas. During the literature circles the students often have roles where they perform activities to help them better understand the text, make connections, and find answers to questions. Using books from other subject areas during the literature circles will allow students to better understand those concepts and ask questions about the topics from other curriculum areas. Devick-Fry and LeSage (2010) discuss the importance of using science books during literacy circles:

The purpose of science literacy circles is to help students grasp big ideas about science concepts within both an independent and social learning community. The role each student carries out provides opportunities to view the science investigation from an individual point of view that ultimately is shared with the entire circle. (p. 40)

Similar to literature circles, the guided reading groups would help the students to be able to better understand the concepts from other subject areas. Not only would the students be learning about other curriculum areas during the guided reading groups, but the students would learn other reading skills such as concepts of print, decoding, vocabulary, and comprehension

strategies (Weaver, 2002, p. 282). This allows for the teacher to cover more standards across the curriculum during one guided reading group.

When integrating books to teach other concepts, it is also important to incorporate student inquiry into the lessons so the students can discuss more about the concepts. Roser and Keehn (2002) conducted a study where they integrate literature with social studies. The study focused on promoting more student inquiry through thought, talk, and asking questions by using different types of literature (biography, historical fiction, informational texts, and novels) to learn about the Texas Revolution in two fourth grade classes. The students engaged in conversations about the texts in book clubs, participated in whole group activities, and the teachers incorporated read-alouds to help teach concepts. The students were encouraged to raise questions about what they were reading and find answers to their questions. They also took field trips and wrote about what they were reading. Roser and Keehn (2002) discovered that the students were able to think, talk, inquire, and learn from this integration process. In addition, the students' misconceptions about the time period during the Texas Revolution were reduced by half, the students worked together, were able to support ideas with evidence, and able to compare information from multiple resources (p. 424).

Math integration. Using literature to teach math concepts is also a great way to teach more math and reading skills at the same time. "Literature motivates students to learn, provides a meaningful context for math, celebrates math as a language, demonstrates that math develops out of human experience, fosters the development of number sense, and integrates math into other curriculum areas (Whiten & Wilde, 1992, 1995 as cited in Shatzer, 2008, p. 649). There are many books available to teach various math concepts. The teacher's role is to select appropriate books and to create hands-on extension activities that will connect literature with math concepts

(p. 652). Also, teacher use of connecting math and literature has been reported to lead students to making their own math connections while reading self-selected books (p. 651).

Another great way to teach more daily math instruction is to integrate it with science class. Furner and Kumar (2007) report, “Problem solving is an area where frequently math and science are integrated, and problem-based learning might be a successful instructional strategy for integration (p. 187). It is true that both science and math require problem solving skills and this is a useful way to integrate the two subject areas. However, the concern arises when discussing the confidence level of educators when teaching science, math, or integrating the two subject areas. Teachers may not feel as confident teaching math and science and therefore, they may need more professional development on how to integrate the two subject areas (p. 187).

Zemelman, Daniels, and Hyde (2005) offer some tips on teaching math and science:

(a) use manipulatives/hands-on (make learning concrete and active); (b) use cooperative group work; (c) use discussion and inquiry; (d) use questioning and making conjectures; (e) use justification of thinking; (f) use writing for thinking, feelings, and problem solving; (g) use problem-solving approach to instruction, making content integration a part of instruction; (h) use technologies such as calculators and personal computers; (i) promote the role of the teacher to that of a facilitator of learning; and (j) use assessment as a part of instruction. (as cited in Furner & Kumar, 2007, p. 187)

Teachers should also look at their grade level standards and find all the possible ways they can productively integrate math and science standards. Furner and Kumar believe, “If schools do more in terms of integrating mathematics and the sciences they may impact the lives of their students forever” (p. 188).

Technology integration. In the 21st century, technology is becoming a more popular teaching tool. It is important for educators to find ways to incorporate technology across the curriculum. Solomon (2009) states, “Today’s kids are digital kids with digital lives bombarded by digital messages. If I don’t incorporate the digital into my classroom, I am also in danger of

presenting a curriculum that is incomplete” (p. 37). It is also known that using technology in school helps motivate students to learn and gives them more confidence in their academic abilities. “In today's high-tech world, it is important that our young people grow to become confident in their ability to do mathematics and science in an ever-increasingly high-tech globally competitive society” (Furner & Kumar, 2007, p. 188).

There are many ways teachers can incorporate more technology into their lessons. The key is to find various ways that work for your classroom and meet the needs of your students. One of the best ways to use technology as part of an integrated curriculum is to focus on it as a tool for solving problems. A key component of integration is to involve student inquiry and for students to learn through real-world problem solving (Nagel, 1996, p. 2). With technology students can find answers for many of their questions and also easily communicate their results with others. However, it is important for teachers to educate students on how to properly find information on the Internet and how to appropriately use technology to share their information with others (Frey, Fisher, Gonzalez, 2010 p. 8-9). In addition, classroom teachers should collaborate with the technology teachers to discuss how they can integrate more technology into the classroom environment.

Benefits of Integration

Time. The greatest barrier teachers often face is time. It is known, “Even experienced teachers juggle and push their way through the curriculum” (Saul & Reardon, 1996, p. 4). Teachers often believe that it takes too much time to plan integrated curriculum and to develop lessons around student questions. However, using integration correctly can actually save teachers time. Teachers often plan individual lessons because they need to teach a specific skill and struggle with finding time to teach the skill. Using integration can allow teachers to easily teach

skills in any curriculum area. For example, teachers may find it difficult to fit teaching vocabulary skills during language arts time, but it can be easily taught during science. In fact, research shows that “Firsthand experiences in which students observe or manipulate some object or event are a critical ingredient of science learning and can enhance vocabulary learning” (Spencer & Guillaume, 2006, p. 208). Therefore, teaching vocabulary during science can be more beneficial for the students and even save time for the teachers.

Student engagement. Teachers also wonder how they can use integration if their principal and school district is pressuring them to teach straight from the teacher guides because they feel it creates identical classrooms and is a way to make sure the standards are being taught. What people do not understand is how the teacher guides often are not relevant and not interesting to the students. The school district might argue on the fact that they spent a lot of money on buying kits that claim to engage students in science. Controversially, “If a kit or textbook does not invite children and teachers to connect what they know and have available to them, their science studies will be less robust and meaningful than they could and should be” (Saul & Reardon, 1996, p. 8-9). Teachers need to show the principals and the school district how they can use the textbooks and kits as guides to help them plan for integration and student inquiry to make learning more meaningful.

Meeting standards. Teachers can also show principals how they can simply meet the standards by using integration appropriately and do not need to teach straight from the textbooks to do this. Research shows, “Creating interdisciplinary curriculum with a standards-based approach leads to a curriculum that is highly rigorous, yet readily adaptable to different contexts” (Drake & Burns, 2004, p. 21). Most lessons in textbooks are lower-level skills and the students often do not make connections to the standards being taught. Teachers who use integration

appropriately use the backward design process or similar processes to first find the purpose of the lesson, create assessments, decided how to meet the standards, and plan learning experiences that will involve student inquiry and lead to the desired results (p. 32). This allows teachers to plan higher-order skills and even include standards from other disciplines. This may sound like a lot of work for teachers to do when they already have limited time. Although, it only takes one time for teachers to sit down and look at the curriculum guides to decide the assessments and to identify the important standards the students need to meet. The students actually create the lessons through their questions and ideas on how to explore them. The teachers just need to provide them with the resources and guide them to stay on track to meet the standards in meaningful ways.

Teachers frequently comment on how their principals like them to plan and teach similar activities throughout their grade level and believe teacher guides are the perfect way to do this. This should not really matter as long as the teachers are using activities that meet the standards. Often teachers plan the same activities and use the generic lessons in the teacher guides because it is convenient for them. However, students' needs and interests may be different in each classroom. Teachers should be working together to review the curriculum and to identify the standards they need to meet, but then they should create the lessons based on the questions and needs of their students. Using activities just because they are fun or worked well in the past is not ensuring the activities to be meaningful and rigorous for the current students. One the other hand, "To ensure rigor, teachers must avoid the trap of superficiality" (Drake & Burns, 2004, p. 21). Teachers who have moved beyond the use of textbooks and superficiality are those who "encourage connections between students' questions and the mandated curriculum, and would

now find it impossible to simply plod or gallop along lesson by lesson, ignoring children's responses and queries" (Saul & Reardon, 1996, p. 7).

Teacher knowledge. Teachers may not be using integration in their classrooms because they are unaware of how they can use it effectively. With a little professional development and confidence, teachers can gain the knowledge needed to develop a teaching environment where integration and inquiry-based learning will benefit both them and their students. Parker (2005, p. 453) states, "When teachers are knowledgeable about content areas and integrate them effectively, students' achievement increases" (as cited in Hinde, 2005, p. 108). Teachers need to understand the reasoning for using integration. They should not choose to teach a topic just because it can be easily integrated with other curriculum areas because this can lead to meaningless activities and may be irrelevant to the learning standards (p. 107). In addition, it is important to remember that not all topics can be integrated and some skills need to be taught individually. Researchers believe, "Knowing how and when to separate topics to clarify them and knowing, on the other hand, when to integrate them is a major achievement of skillful teaching" (Hinde, p. 108). Once teachers are educated on how to use integration effectively, they can easily use it in their classrooms.

Student behavior and achievement. Another benefit of using integration is that student behavior and achievement can improve just by using student inquiry. In fact, "Students report being motivated when the curriculum is personally meaningful and they construct new meanings about themselves and their world" (Drake & Burns, 2004, p. 24). What teacher would not want to motivate students and help them to be more engaged in their own learning? Furthermore, with integration you can incorporate character development and students can make real connections within their communities. Even in at-risk schools there is evidence of how using integration

approaches can lead to higher achievement in test scores and student attendance, with a decrease in behavior problems and special education referrals (p. 24).

Conclusions and Recommendations

Research has shown integration to be a valuable teaching practice. Teachers should be encouraged to learn more about integration and try to find out how they can effectively use it in their classrooms. “Teachers who choose to implement integrated approaches are teachers who also reach out to engage every student” (p. 22). Integration can help inspire students to be more involved and help with discipline issues. It is also a great way to incorporate higher-level skills and help students to become better problem solvers. With integration, teachers are capable to meet the learning standards without reading directly from scripted teacher manuals, but instead use them as a guide to find the purpose of the lessons. Furthermore, integration allows teachers to be able to cover various standards from multiple subject areas.

Implementing integration into the classroom may be challenging at first, but with support from administrators and colleagues teachers should be able to find ways to make integration work in their own classrooms. Allowing teachers to collaborate on way to use integration in their classrooms helps teachers to use their creative abilities and has been reported to help keep teachers in the profession (Drake & Burns, 2004, p. 27). Support and carefully planning are vital components of implementing integration. Research conducted for this paper shows how teachers can successfully begin to use integration in their classroom. One valuable resource for that explains to teachers how to begin to use integration is the book, *Meeting Standards Through Integrated Curriculum*, by Susan M. Drake and Rebecca C. Burns. This book clearly explains the backward design process in more detail and gives teachers many ideas of how to align

assessments, learning standards, and teaching activities to enhance learning through an integrated curriculum.

Teachers who are still skeptical should know that “Integration is the only way you can teach everything that is required” (Drake & Burns, 2004, p. 118). The NCLB Act has left teachers with limited options for expanding learning opportunities in other subject areas. Hinde (2005) states:

Elementary teachers report being overwhelmed by pressures to have their students achieve on standardized assessments and complain that there is not enough time in the day to teach reading and math, the areas for which they are held most accountable, and also teach social studies. (p. 109)

It is true that teachers are feeling more overwhelmed now than ever before because of the increased accountabilities placed on teachers because of standardized testing and is leading to eliminating teaching subjects like social studies. However, integration allows teachers to combine learning standards across the curriculum and can even help increase academic learning. Ultimately, effectively using integration can help teachers with the time barrier, allow them to create meaningful lessons, and give students the skills they will need to succeed in everyday life.

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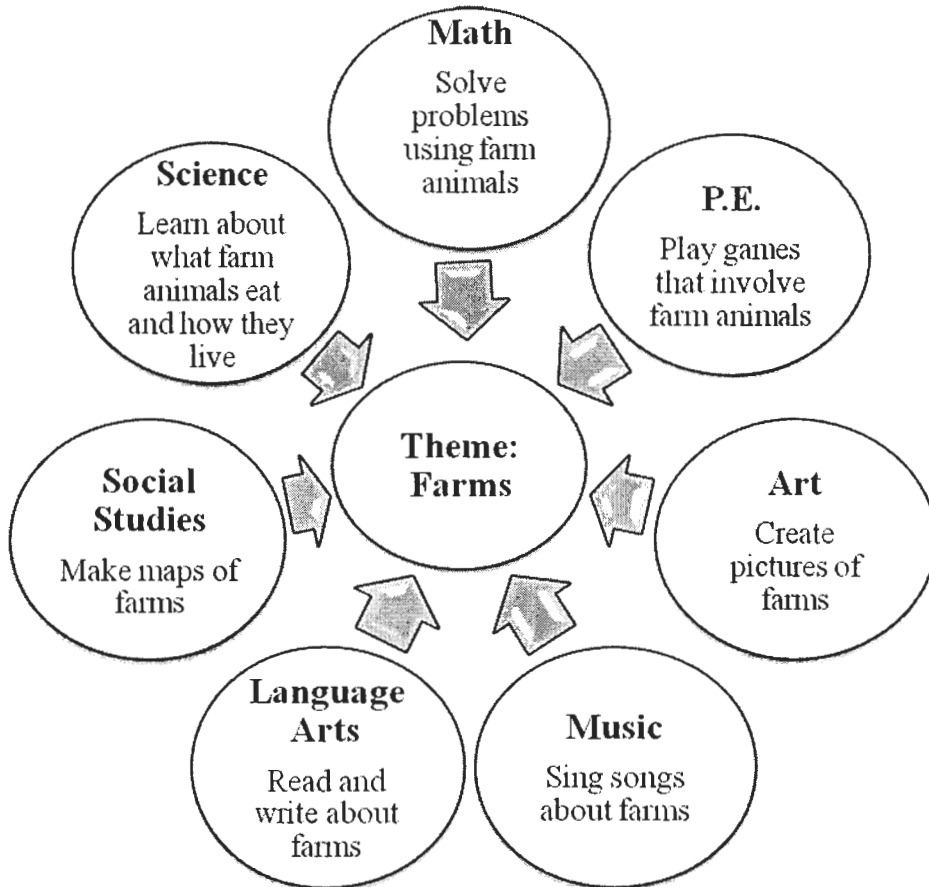
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Appendix A

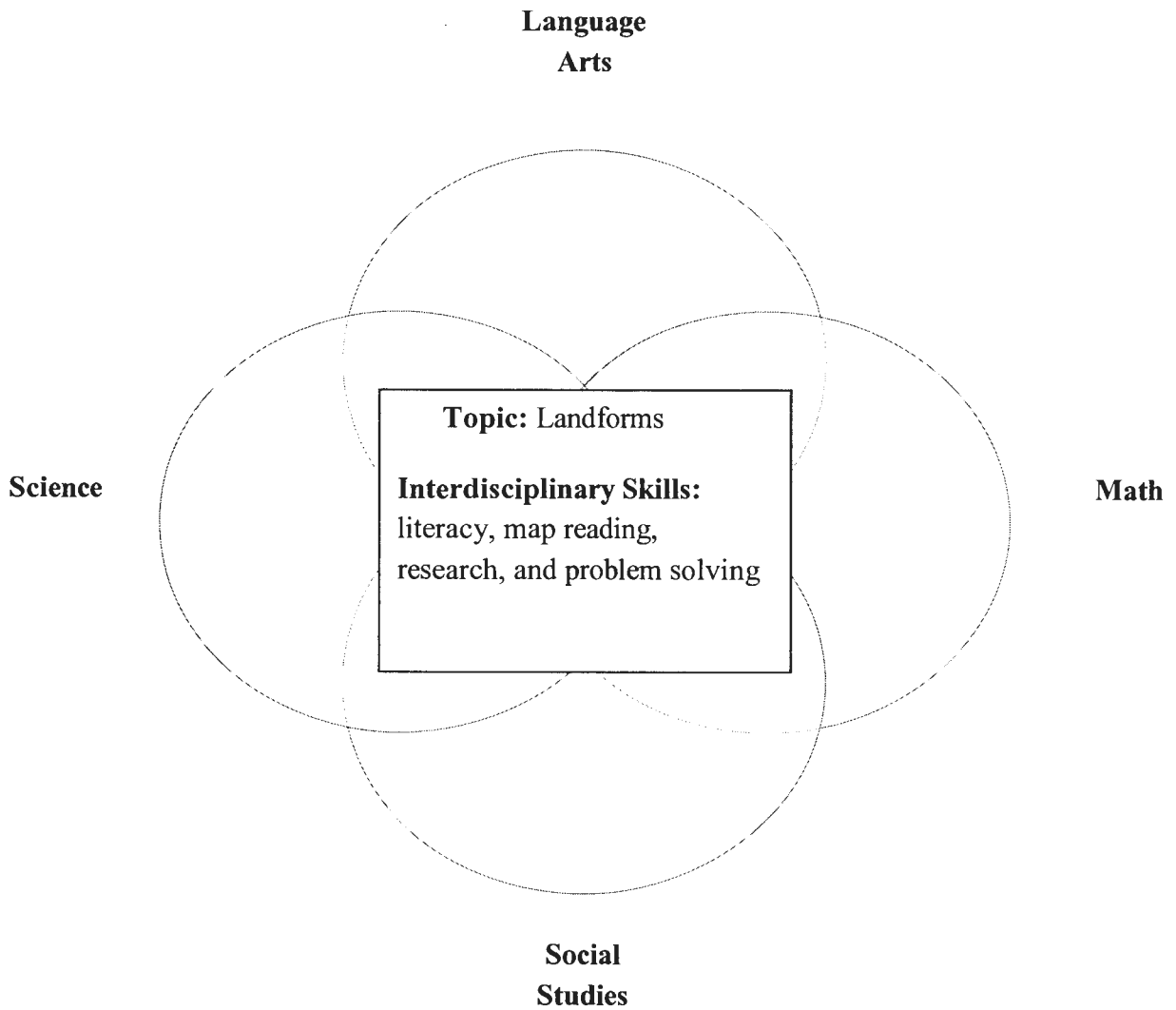
Multidisciplinary Integration Example



By Drake & Burns (2004, p. 9), adapted by Jill Leibold

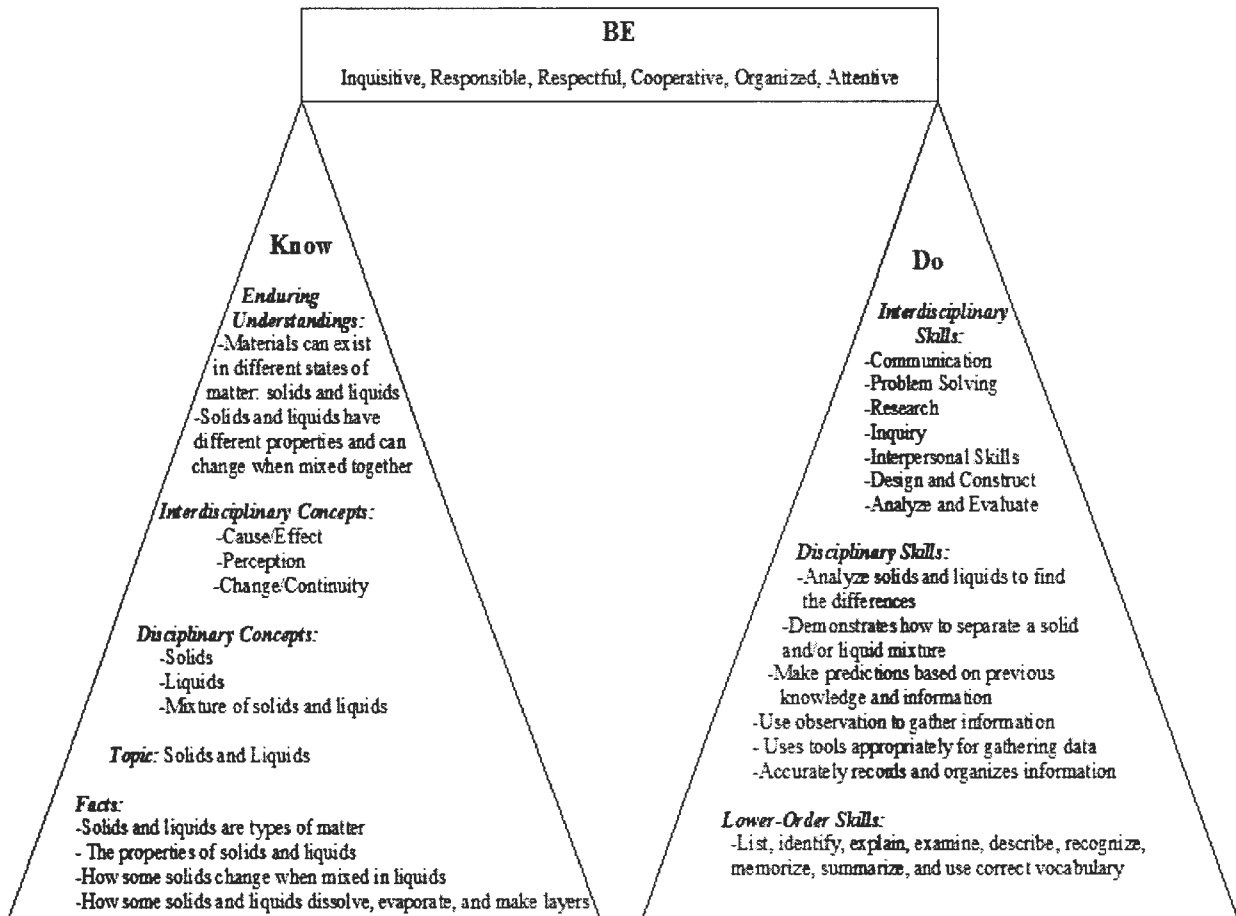
Appendix B

Interdisciplinary Integration Example



By Drake & Burns (2004, p. 12), adapted by Jill Leibold

Appendix C

KNOW/DO/BE BRIDGE for 2nd Grade Solids and Liquids Unit

By Drake and Burns (2004, p. 50), adapted by Jill Leibold

Appendix D

Cluster of Standard for 2nd Grade Solids and Liquids Unit**Science Standards:**

- Describe properties of solids and liquids
- Analyze differences between solids and liquids
- Demonstrates how to separate a solid and/or liquid mixture
- Uses tools appropriately for gathering data
- Apply previous knowledge and information to make predictions
- Understands observations and uses it to gather information
- Accurately records and organizes information
- Orally and in writing communicates experimental findings

Math Standards:

- Use tables and graphs to locate, read, and interpret information
- Explore the concept of area, length, width, volume, and mass
- Demonstrate knowledge of simple measuring concepts

Reading:

- Read a variety of literary and informational texts for understanding and enjoyment
- Use a variety of comprehension strategies to understand fiction and nonfiction texts
- Reads, understands, and responds to a wide variety of fiction and non-fiction texts

Writing:

- Use informal writing skills, such as note taking, listing and mapping, to record information or observations
- Use new vocabulary
- Use table of contents, index and glossaries
- Generate questions and seek answers

Listening and Speaking:

- Apply active listening skills
- Ask questions through ideas or paraphrase to enhance the understanding of what is being said
- Communicates effectively through speaking

Social Studies:

- Identify local examples of global concerns

Appendix E

Example of Lesson Activities for 2nd Grade Solids and Liquids Unit