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Learning to Teach

Language Arts, Mathematics,
Science, and Social Studies
Through Research and Practice

Editors in Chief
Jenny Denyer, Ph.D.
Rebecca M. Schneider, Ph.D.

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Jenny Denyer, Ph.D., Chair | University of Toledo

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Learning to Teach

Language Arts, Mathematics, Science, and Social Studies *Through Research and Practice*

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Learning to Teach Language Arts, Mathematics, Science, and Social Studies Through Research and Practice publishes manuscripts that address curricular innovations, thought-ful discussion of current issues for practice, or essays that inform, advocate for a position or persuade. Manuscripts must address subject-matter specific interactions of teachers and learners.

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Jenny Denyer, Ph.D., Chair

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Language Arts, Mathematics, Science, and Social Studies
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Language Arts

Student Engagement and Academic Success in Urban Elementary School Classrooms

Erika Bailey

Abstract: This paper examines using student engagement to increase academic success and performance in urban elementary schools. Urban students often fall behind in the achievement gap for a variety of reasons. The goal of this paper is to explain how increasing student engagement in inner-city schools can help to increase academic success. It outlines the different facets of student engagement—cognitive, behavioral, and emotional engagement, and explains the cyclical nature in which these three pieces come together to comprise student engagement. Taking cognitive, behavioral, and emotional engagement into consideration while planning and implementing lessons increases overall student engagement. Research-based strategies and suggestions are provided on how to incorporate each of the areas of student engagement to maximize student success.

Introduction

Students who are invested in their own learning experience academic success. For students to learn, they need to be motivated to put in the effort. However, many students in urban elementary schools are not experiencing the level of academic success that their suburban counterparts are achieving. Farrington, Levenstein, and Nagaoka (2013), said that the poor educational outcomes of low-income students "suggest that there is a fundamental disconnect between contemporary schooling and the needs of students in urban schools" (p. 1). As teachers in urban settings, we are tasked with finding and fixing that disconnect and we do this by making learning more meaningful and relevant to the lives of our students. Although this disconnect between home and school makes it more difficult to motivate students, the first step in the process is for teachers to educate themselves on the various facets of student engagement. They can then utilize the information to develop relationships that allows them to learn about their students' interests and motivations.

Student Engagement and Academic Success

The term "student engagement" has had different definitions in various studies over the years. To ensure clarity throughout this paper, the following definition from Vicki Trowler (2010) will be used:

> Student engagement is concerned with the interaction between the time, effort and other relevant resources invested by both students and their institutions intended to optimize the student experience and enhance the learning outcomes and development of students and the performance, and reputation of the institution. (p. 2)

Many different factors contribute to the concept of student engagement. Student engagement does not only deal with students themselves putting forth the ef-

fort and concentrating on work, but also takes their feelings of belonging to school, the values and responsibilities of school, as well as individual motivation to be successful academically (Mustafa, 2016). Student engagement has several different main components: Behavioral, Emotional, and Cognitive (Trowler, 2010). For a student to be fully engaged in their learning experience, all three components must be present and building on each other in a cyclical nature (Trowler, 2010). For instance, for a student to have emotional engagement, they need to feel a sense of belonging in their school and classroom. Once a sense of belonging has been established, students must be taught in a way that motivates them to be cognitively invested in learning. Finally, if students are both cognitively and emotionally engaged, behavioral engagement will follow. When behavioral engagement is achieved, students have the opportunity to take part in what they are learning, thus achieving cognitive and emotional engagement.

Studies have shown that when students are not engaged, they are more likely to have behavioral problems, struggle academically, or even drop out of school (Fredricks, Blumenfeld, & Paris, 2004). Studies have also verified that the opposite is also true: student engagement is a significant predictor of academic success and performance (Lee, 2014). When students have all three pieces of engagement, it leads to greater chances of academic achievement, which is the over-arching goal of student engagement. Because student engagement increases chances of academic achievement, it can be argued that student engagement is one of the main goals of education. The issue remaining is how urban teachers can achieve this goal when there is a disconnect between traditional contemporary education and the needs of urban students (Farrington, et. al., 2013).

One of the most at-risk populations in education in the United States is our inner-city student population. There is a correlation between inner-city students and low achievement, higher dropout rates, and behavioral issues in the classroom (Ikpeze, 2013). Engaging students throughout the day, through incorporating their interests, may eliminate some of the behavioral issues urban educators face today.

Creating a Sense of Belonging

Urban students often feel a disconnect between school and their home lives, whether it be from a schedule, value, or cultural standpoint. Therefore, it is very important to develop a feeling of belonging when working with inner-city students. As educators, it is our job to bridge the gap between home and school so that students can feel that sense of belonging. Relationships and understandings between students and teachers are crucial to the success of any classroom. This need is even more crucial in urban classrooms where the bulk of teachers are coming from backgrounds outside of the environment that they are working in. Too many times, teachers assume that they know about the lives of their students based on the neighborhood they live in, and often do not get to know their students on an individual basis (Rhodes, 2019). Teachers can work on building relationships with students many ways. One way to building relationships is by getting to know students at the beginning of the school year and continuing throughout the school year. Interest Inventories, "family dinners" and personal storytelling are all ways that can help educators to achieve this.

There are many different strategies for cultivating a sense of belonging in the classroom and the school, one of the most important being building relationships. One way to begin building relationships between students and teachers is to adopt the well-studied concept of culturally responsive teaching. Geneva Gay (2010) refers to culturally responsive teaching as "using cultural knowledge, prior experiences, frames of reference, and performance styles of ethnically diverse students to make learning encounters more relevant and effective for them" (p. 31).

For teachers to become culturally responsive educators, they need to make cultivating relationships a priority before any real instruction can begin. Gay (2010) adds to this notion by giving concrete examples of what teachers can do to achieve these relationships. For instance, taking time for authentic conversation about life has an impact on relationships between urban students and their teachers (Gay, 2010). Rhodes (2019) suggests that using personal storytelling between students and teachers gets students involved in "class because they were able to create a space where their voices were heard and respected" (p. 2).

In taking the time aside from academics to learn about students, teachers create a safe emotional classroom climate (Reyes, 2012). Teachers can do this at the classroom level, but Ikpeze (2013) states that this effort to create community needs to take place at a school-wide level. Schools can build community by incorporating a school-wide morning meeting into their weekly schedule to build school-wide emotional engagement.

Student Engagement and Behavior

As mentioned, behavioral engagement is one of the pieces that makes up student engagement (Trowler, 2010). For students to be fully engaged, they need to be behaviorally compliant. Speaking to the cyclical nature of the components of engagement, the opposite is also true: students that are authentically engaged are behaviorally compliant. Studies have shown that students who are emotionally and cognitively engaged have increased on-task behavior and less disruptive behavior (Prykanowski, 2018). Prykanowski (2018) states that students can be either actively or passively engaged during lessons and the type of lesson, whether it is teacher directed or child-initiated, may have an impact (para. 53). Teacher directed activities are planned by the teacher and often involve listening to the teacher and following a specific set of directions set forth by the teacher. The teacher guides what the students are going to learn. Teacher directed activities require more passive engagement (Prykanowski, 2018). Many upper-elementary and middle school classrooms are set up this way. Child-initiated activities are chosen entirely by the child and are typically more active and independent. An example of this would be choosing a center in Kindergarten, or in upper elementary, choosing a topic of interest and designing a project around it. Child-initiated activities tend to have more active engagement associated with them (Prykanowski, 2018).

Active verses passive engagement depends on student motivation. A person's motivation drives their behavior (Alkaabi, et al., 2017), and behavior dictates choices, especially when it comes to the elementary school classroom. Students must either be internally or externally motivated (Saeed & Zyngier, 2012), and reasons for motivation are highly personal and vary vastly from one person to the next. Motiva-

tion is a very individual concept, and motives for behavior stem from a person's predispositions based on their environment (Alkaabi et al., 2017). According to Alkaabi (2017), there are four expressions of motivation including behavior, engagement, physiology, and self-report (p. 197). Thus, motivation plays a role in behavior and engagement.

Planning for Engagement

Taking students into consideration during planning also helps to build relationships and increase student engagement and motivation. Teachers need to aim for fewer teacher-directed activities or include one actively student-engaging element in each lesson. An easy way to include a student-initiated piece to any lesson is by incorporating choice. Teachers can plan to include choice into lessons with choice boards for assignments or assessments. Choice boards are usually papers that have multiple assignment or assessment options on them, usually in grid form. Choice boards have suggestions of projects or assignments students can do to show their knowledge on a certain topic. To add another layer of choice, educators can include a "free" space where students have the option to come up with their own creative assignment to show what they have learned.

In addition to choice boards, another way to give students autonomy in the classroom is through project-based (PBL) and inquiry-based learning. In PBL or inquiry-based learning, students work on a self-chosen real-world problem or question to answer. These are typically long-term problems that require students to use and develop critical thinking skills and creativity. At the end of a project, students communicate their results to their class. Students can engage in PBL individually or in a group. In a 2018 study about student motivation and engagement, researchers looked at project based learning and direct teaching and found that both motivation and student engagement levels were higher in project-based learning over direct instruction (Carrabba & Farmer, 2018).

When planning for direct instruction, teachers should consider their students' personal learning styles. An easy way to build emotional engagement at various points in the year is by giving learning style and interest surveys. These surveys can be teacher created or can be found online.

In-Lesson Engagement

"Red Robin!" announces Ms. Smith, signaling the beginning of the science lesson. "Yummmmmmm!" responds of Ms. Smith's 4th grade students, voices quieting to listen to directions. "Today we are going to reread the passage on fossils from yesterday. First, I would like everyone to skim their passages. You will have 45 seconds." After the allotted 45 seconds the teacher announces, "Time is up! Please turn to your elbow partner and tell them something interesting that you read. Be prepared to share with the class what your partner told you. You have 60 seconds." Ms. Smith walks around, listening to conversation, providing appropriate feedback. The timer goes off and Ms. Smith asks for partners to volunteer to share what was discussed. "My partner remembered reading about how there are there different types of fossils." Looking around the room, Ms. Smith notices that many students are giving that response the "me too" hand

signal. "It looks like this is a common fact that many other students discussed, thank you for sharing. Today you will each be assigned a group and a fossil type. Each group will be tasked with rereading the section of the passage about their fossil type, use the rubric to create a poster, and propose a Level 2 question for other group members to answer." Ms. Smith goes over the rubric and reviews Costa's Levels of Questioning and the assignment begins.

Keeping students cognitively engaged during lessons is as important as planning for the whole of student engagement. When planning instruction, teachers need to think about making their direct instruction as interactive as possible to increase behavioral, cognitive, and emotional engagement. Using appropriate questioning, productive praise, and varying levels of collaboration (groupings) are all imperative for keeping students engaged during lesson delivery (Gurses et al., 2015).

Ms. Smith's lesson is an example of what interactive direct instruction should look like. She uses her classroom management techniques to facilitate her lesson. There is no down time, and students understand exactly what is expected of them. Additionally, she utilizes different instructional groupings, provides productive praise, and actively engages her students in questioning—all strategies that promote all facets of student engagement in the classroom.

Productive praise is generally thought of as a classroom management tool. Praise can keep student behavior on-task and refocus off-task behavior. For praise to be productive, it needs to be specific and needs to reinforce the wanted behavior (Floress et al., 2017). Questioning and Inquiry is another necessary tool for keeping students engaged. A model used frequently in schools is Costa's Levels of Inquiry. Costa's model is a three-tiered approach. Level one focuses on answers that can be found through text evidence (i.e. Name a character in the story). Level two focuses on answers that can be inferred from the text (i.e. Compare and contrast Character A and Character B). Level three focuses on answers that require students to think beyond the text, such as evaluating a problem a character has or making a prediction (AVID Weekly, n.d.). Finally, utilizing effective groupings can increase peer collaboration, which aids in emotional, cognitive, and behavioral engagement. Collaborative learning is a situation where students work together to achieve a common goal (Case, et. al., 2007). When engaged in collaborative work, students bounce ideas off each other and practice group problem-solving skills, all skills necessary for student engagement.

Conclusion

Urban teachers need to ensure that their students stay emotionally, cognitively, and behaviorally engaged to have the best chance at academic success. Teachers can ensure students are emotionally, cognitively, and behaviorally engaged by building genuine relationships with students; creating a safe, collaborative, and respectful environment; varying instructional activities; and providing students with a sense of purpose and belonging in their classroom, school, and community.

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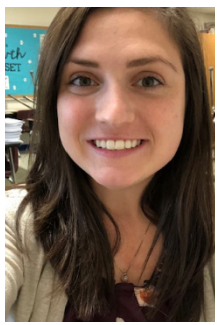

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Using Text Sets to Engage Students while Reading Canonical Literature in a Language Arts Classroom

Abigail L Barshel

Abstract: Presenting canonical literature in the classroom can result in little engagement with students. However, these texts can still be useful in classrooms today because of the themes often presented. For example the topics of greed, jealousy, love, death, and betrayal are still relevant today. Students are often bored or uninterested in canonical literature for three main reasons; they are unable to make connections with the material, the language can be difficult for students to understand, and because the same text are often used students don't see reading the texts as necessary. Text sets provide one solution to this issue by presenting students with multiple texts all centered around one theme or essential question which will be the focus of the unit. A text set includes both canonical literature as well as modern texts which are presented to the students in different medium to increase student engagement.

Introduction

In many classrooms across the country students are often told what to read, how to read and what is important in the text. Students often have little to no input. The texts teachers require students to read are commonly from the literary canon. Literary canon can be defined as "…a collection of classic literary texts that are distinguished by overall literary quality, lasting significance, and a distinctive style that is worthy of study" (Cole, 2008, as cited in Rybakova & Roccanti, 2016 p. 32). The collection of these texts was established in the 1930's by important literary critics and almost 100 years later students are still reading these texts (Rybakova & Roccanti, 2016). Despite the age of the texts teachers continue to teach literary cannon in today's Language Arts classrooms. "Teachers typically expect their secondary students to read texts from the English canon because these texts offer opportunities for meaningful reflections on essential questions" (Wold & Elish-Piper, 2009, p.88). However, students often look at these texts and see an old book written by someone who has no idea what their lives are like. The struggle many teachers are faced with is helping their students make connections between the text and their own lives.

While one could argue against teaching these texts all together, in Ohio and many other states these texts are part of the State Standards which teachers must cover in their classrooms. RL.11-12.9 states that students will "Demonstrate knowledge of eighteenth-, nineteenth-, and early-twentieth-century foundational works of American literature, including how two or more diverse texts from the same period treat similar themes and/or topics." and RL. 11-12.7 states that while reading drama students will read at least one play by Shakespeare (ODE, 2017). Also, RL.8.9 states that students will "Analyze how a modern work of fiction alludes to themes, patterns of events, or character types from myths, traditional stories, and religious literary texts…including describing how the material is rendered new"

(ODE, 2017). While these standards can provide a reason for including traditional texts in the classroom it does not specify how these texts should be taught. This allows teachers some flexibility in how they are presented to students. Explaining to students that we have to teach them canonical literature because it says so in the standards will only bore them and guarantee they will not want to read. They don't care about what the standards say. There are many ways to engage students during interaction with canonical literature one research supported method is the use of text sets.

Why do students typically dislike canonical literature?

Students often fail to make connections with literary canon for several reasons. The three most often discussed reasons include the age of the text, the language style that the text was written in and the repeated use of the same texts and lessons year after year.

Students believe that because a text is old, the stories are not relatable

According to Lupo et al. (2018) "Motivation theory suggests that connections between content and interests can secure the buy-in needed for adolescents to do challenging comprehension work (e.g. Gutherie & Wigfield, 1997)" (p. 435). Students fail to see these connections because texts taken from the canon were often written many years ago and include events, places, situations, ways of dressing, behaviors and mannerisms of characters which most students are unfamiliar with. An example from literary canon students may have difficulty connecting with is The Great Gatsby. A common theme examined in this text is the pursuit of the great American dream. This dream includes money and love between a man and a woman. However, the American dream today could look very different to many students. It becomes the difficult job of the teacher to help the students make connections between the American dream presented in canonical texts and what students envision the American dream to be.

Students believe that the language is difficult to understand

If students have a difficult time understanding the language of a text they become easily lost and confused. As a result they spend so much time trying to figure out the words themselves rather than focusing on what the words are actually saying. Stover (2003) discusses this using Romeo and Juliet as an example. The author states that "One obvious reason why even good readers struggle with any Shakespearean text is because, as speakers of modern English, it is hard for us to make sense of the Bard's vocabulary and syntax" (Stover, 2003, p.78). The language used in Shakespearean times is very different from the language our students understand and use to communicate today.

Students often do not feel that they have to read the texts to complete assignments in class

The texts included in the Language Arts classroom literary canon are often taught year after year and students can easily find summaries, "cliff notes", quiz answers and other information online which make it unnecessary for them to read the text. Students believe that all they need to know about the text they can discover on the internet. "…no matter how many lectures you deliver, vocabulary words students 'learn', elements of fiction students define, quizzes students take, essay answers students write, or films you show. Nothing important is happening because student development of reading and interpretive abilities requires engaged reading" (Broz, 2011, p. 15). Without engaging activities that encourage the students to read and discuss the material they become bored because they feel there is no need to read the material to learn from it when all they need to know they can learn from the internet.

Text Sets

What are text sets?

Text sets are groups of texts presented through different media which are all connected by a central theme or an essential question. As a way to engage students and prepare them to read literary canon modern texts are often used in these sets. Texts sets can include as few as four or as many as ten to fifteen different texts. Text sets can include print media, visual representations, songs or digital media. By using text sets we are encouraging students to make and examine connections between the texts and their own experiences. Helping them see connections between a text and their lives is important for engaging students. If students are able to relate the literary themes presented in class to their lives they are more likely to be interested in reading.

The idea of using text sets in the classroom has become more prevalent because of Common Core and State Standards. Text sets may be used in any classroom and can be used across different curriculum. Text sets include many different genres of literature and as well as other texts. When using text sets the focus of the unit is less on one specific text and more on the theme or essential question being examined which is evident across all of the texts. The reason for using text sets is not only to expose our students to the different genres they are required to read but also to engage all students in reading, even reluctant and struggling readers. Kamm Solutions (2015), a teaching resource, points out that for text sets to be effective teachers need to "Select texts that are authentic, rich and worthy of study and that connect to students' lives and experience" (p. 2). It is not enough to merely provide the text sets but we need to make sure that they will serve to engage students and aid in their understanding of the theme or essential question which is the focus of the unit. For example, when focusing on the theme of discrimination in To Kill a Mockingbird a teacher could include the poems Caged Bird by Maya Angelou and Freedom by Langston Hughes, an interview with Harper Lee, the song Emmett Till

by Bob Dylan, and photographs by Gordon Parks as part of the text set. This is just a short list as there are many texts which could be used in a unit on discrimination. In addition to the general guidelines, Kamm Solutions (2015) also provides detailed guidelines for text sets which include many links to websites and other resources teachers may find helpful when creating text sets.

Examples of Text Sets

Linked Text Sets

Wold & Elish-Piper (2009) propose using linked text sets. They state "Foremost, LTS engage students with a wide range of texts to help them understand themselves, those around them, and the universal issues facing humans" (p. 88). Linked text sets are simply a group of texts presented in different medium connected through a central theme or essential question. In the article, Wold & Elish-Piper (2009) provide three criteria they feel are important for choosing liked text sets: including texts with varied and diversified characters or events, different text types, and student choice when selecting texts. In this article the authors present a "classroom snapshot" where a linked text set is being used to emphasize identity development in The Scarlet Letter (Wold & Elish-Piper, 2009). All students examined some of the texts in the set, however, the teacher allowed freedom of choice for other texts in the unit (Wold & Elish-Piper, 2009). The teacher used whole group as well as literature circle activities to analyze the texts (Wold & Elish-Piper, 2009). When interacting with the teacher in the study, Wold & Elish-Piper (2009) stated that "Ruiz finds that by using LTS to support and engage her students they are able to read, comprehend, and connect with core texts from the literary canon" (p. 91).

When using text sets in the classroom teachers are often scaffolding these texts in order to provide students the correct support for understanding complex texts. Elish-Piper presented the findings of another study in which linked text sets were discussed. In this study Elish-Piper et al. (2014) presented a method for scaffolding texts. This method of scaffolding linked text sets included three stages; engagement, exploration and expansion (Elish-Piper et al., 2014). In the engagement stage the teacher proposed an essential question to the students and had them participate in activities in which they will connect personal experiences to the essential question and theme of the unit (Elish-Piper et al., 2014). In the exploration stage, the authors suggested the introduction of another text which the students would be using to investigate the essential question and the theme of the unit (Elish-Piper et al., 2014). The expansion phase of this model stated that the teacher use the closure of the investigation of one text as a way to connect this text to the next one the students will be exploring (Elish-Piper et al., 2014). The teacher then began the process again reintroducing the essential question or theme of the unit evident in another text. The teacher then had the students explore this text while keeping the essential question or theme the center of the exploration. Then the teacher once again concluded the investigation of that text. This process continued throughout the unit for each new text. While moving through the phases the canonical text remained at the center of the unit and the teacher helped guide the students in connecting the texts together.

A student in the study by Elish-Piper et al. (2014) claimed that his experiences with linked text sets in the classroom were "probably the most interesting and meaningful thing I've ever done in English class." when asked to further explain he added " I was really interested in the themes and questions about growing up because I could relate to them…" (p. 573).

Quad text set framework

Some models propose beginning with texts that will provide background information which will be essential for the unit. Lupo et al. (2017) propose a "Quad Text Set Framework", in which there is one target text and other texts which are used prior to and during the reading of the target text. The authors propose using "Visual or video text to activate background knowledge", "Informational texts to build additional knowledge" and "Accessible texts to ensure connections" (Lupo et al., 2017, p. 436). The initial visual image will serve to engage the students with the topic, the informational and accessible texts can be used during the reading or prior to reading the canonical text (Lupo et al., 2017). This method is supported by the schema theory which explains that teachers provide students with the knowledge that will be necessary for the student to build off of in order to make sense of the new information they will be presented with (Lupo et al., 2017). When students have more content knowledge, their understanding of the text is better and they are able to comprehend more difficult texts (Lupo et al., 2017).

Conclusion

There are many options to help make difficult texts easier for students to understand while still examining the important themes present in these texts. For example, there are texts that provide side by side translations of classic works in which the students are able to read and see the classic text on one page and on the next page is a translation in modern English designed to be easier for students to understand. No Fear Shakespeare is a commonly known source for both print texts and online resources to assist students in their understanding of these often difficult texts. Also, graphic novels can be useful in helping students understand traditional texts. Graphic novels rely heavily on visual images and require students to examine what the images represent (Wolfe and Kleijwegt, 2012). While there are words in these texts they act as a compliment to the images presented which really tell the story.

By making literary canon easier to understand we are giving students the ability to make connections to their lives and the world around them. Many of these classic texts contain themes such as betrayal, greed, power, loyalty, and honesty. All of these themes are relevant to our students' lives and the world around them either on the small scale with direct connections to their lives or the larger scale of the world and what students see going on outside their daily lives. By examining the themes evident in these texts students can look at the problems and solutions presented and apply them to their own experiences.

Though some students may not see the value in the traditional cannon, there is value and importance in these texts. It is our job as educators to help our students see the importance of these texts and make connections to their lives. By providing

students with the tools to make these connections we can foster their engagement with difficult texts. There are many different methods which are available for teachers to use in their classrooms. It is up to the teacher to decide what works best for their students; these may include a combination of many different methods. Most important is finding and applying these methods to engage our students with what they are assigned to read.

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Effective Practices to Balance Literacy Instruction in Early Childhood

Elysia Managhan

Abstract: What constitutes effective emergent literacy practices has been debated for decades between developmentally appropriate play-based instruction and direct instruction. Recently, accountability and more rigorous standards have placed pressure on early childhood educators to shift literacy instruction to direct teaching with less emphasis on developmentally appropriate play-based instruction. However, emergent literacy skills are multi-faceted, requiring flexible instructional practices. This manuscript addresses the benefits of implementing both play-based and direct instructional practices to balance literacy instruction. Educators should implement a balanced approach to literacy instruction to meet the developmental needs of children and the academic demands of the standards.

Introduction

What constitutes effective emergent literacy practices has been debated for decades. Up until the 1990s, the developmental-constructivist approach dominated early childhood programs supporting child development. In the 1990s, new preschool models and supplemental skills-based approaches began entering the educational community that supported some direct literacy instruction prior to formal education. After No Child Left Behind (NCLB) was enacted in 2002, accountability demands impacted educators' instructional practices. Husband's (2014) preliminary study on teachers' perceptions of how NCLB impacted their teaching practices found that educators perceived that NCLB narrowed the literacy instruction and increased the rigor of literacy curriculum. The change in standards and accountability in education caused early childhood educators to shift their instructional approach to more direct instruction to meet the increasing demands of standardized testing in formal grades. The shift in instructional approaches left literacy instruction unbalanced. The purpose of this manuscript is to address the need for a balanced approach to literacy in early childhood education to holistically support emergent literacy skills. Educators should implement a balanced approach to literacy instruction to meet the developmental needs of children and the academic demands of the standards. Educators must have a deep understanding of the components of emergent literacy and provide high-quality instruction to facilitate the learning of each component to successfully balance literacy instruction.

Emergent Literacy Components

Marie Clay (1966) introduced the concept of emergent literacy as the skills that refer to the reading and writing behaviors prior to entry into formal instruction at school. Emergent literacy skills begin at birth and are developed throughout early childhood through experiences with adults and their environments. There are four broad components of emergent literacy: language, print awareness, phonological awareness,

and writing. The components of emergent literacy are multi-faceted in the sense that each component has critical subskills to holistically develop reading and writing skills. Rohde (2015) advocates for a comprehensive emergent literacy model where "each EL component has its own developmental sequence and each component supports the development of other components as part of a holistic appreciation" (p. 4). The complex nature of emergent literacy requires flexible instructional practices to balance literacy instruction.

Oral Language

Oral language development is a critical component of emergent literacy. Oral language is the ability to communicate and express ideas as well as listen and understand language. Oral language is the foundation of developing print awareness, phonological awareness, and writing. Educators have a plethora of strategies to support oral language development. Intentionally creating a literacy-rich environment for children to actively interact with literacy materials, scaffold language through rich conversations, and explicitly support vocabulary through shared reading are a few strategies teachers can implement to balance learning through play and direct instruction. According to the National Reading Panel (2000), "almost all early reading is based on oral language" (p. 4-25). Creating literacy-rich classroom environments and educators intentionally supporting language is critical to young children's oral language development.

Print Awareness

Print awareness is evident in children long before they learn how to read. Print awareness consists of understanding the forms of print (alphabet/number knowledge), print conventions (print has an organizational scheme), and book conventions (how books are created, how they function, and are organize (Lovelace and Stewart, 2007). Print awareness can be supported through literacy-rich environments, print referencing, and explicit instruction. Children that enter kindergarten lacking competent alphabet knowledge need explicit instruction to close the achievement gap (Paige et al. 2018). Print awareness should be implemented with a balance of instructional practices to support all subskills.

Phonological Awareness

The National Reading Panel (2000) states, "phonemic awareness and letter knowledge are the two best school-entry predictors of how well children will learn to read during their first two years in school" (p.2-1), making phonological awareness a crucial component in the emergent literacy model. According to What Works Clearinghouse (2012), phonological awareness is "the ability to detect or manipulate the sounds in words independent of meaning" (p.1). Phonological tasks develop on a continuum beginning with less complex skills such as listening to rhyme in fingerplays, songs, and books and progressing to more complex tasks such as phoneme manipulation. Phonological awareness tasks are auditory and do not require symbols. According to Terrell and Watson (2018), "teaching strategies for phonological awareness tasks must include explicit descriptions of each task, include modeling,

and provide multiple cues as needed" (p. 156). Educators that implement phonological awareness tasks for five minutes per session can improve children's phonological awareness skills (Bowyer-Crane et al., 2008). Implementing brief phonological awareness tasks into the daily schedule will support children's literacy development.

Writing

Implementing writing instruction in early childhood classrooms is an important precursor to formal instruction. The U.S. Department of Health and Human Services defines early writing as, "the familiarity with writing implements, conventions, and emerging skills to communicate attitudes and ideas through written representations, symbols, and letters" (as cited in Hall et al., 2015, p. 115). Early writing not only involves children learning letter formations but also composing messages and spelling. Early writing skills support the development of language, print awareness, and phonological awareness; as children progress through the early writing stages they become more aware that print carries meaning and develops the alphabetic principle. Educators can support early writing development by incorporating student writing into daily schedules, providing writing materials and literacy props in centers, explicitly model writing, and scaffold children's writing efforts. The National Early Literacy Panel (2008) reported that name writing skills and spelling yield moderate to strong relationships with later reading abilities including decoding, reading comprehension, and spelling. Combining explicit writing instruction with writing experiences in the daily schedule balances teacher-led instruction and learning through play to develop early writing skills.

Instructional Practices

Learning Through Play

Learning through play is a vital component of child development. Socio-constructivists view learning as a social process. Children actively learn through social interactions. Through social interactions, children activate background knowledge and build connections to re-evaluate their understandings of ideas. Incorporating play into the classroom provides context for learning, has causal relationships to language and narrative development, and positive behaviors related to reading and writing (Cavanaugh et al., 2016). Play-based activities are a crucial component for emergent literacy skills as they provide authentic opportunities for children to develop social and language skills and a positive affect towards learning in formal education. Storytelling/story-acting, dramatic play, and guided play are evidence-based strategies that support play as a mode of learning that are described in more detail below.

Storytelling/Story-Acting

Storytelling and story-acting is a child-centered, play-based practice that provides opportunities for children to narrate and act out their own stories. As described by Nicolopoulou and colleagues (2015) the process involves a teacher or teacher aid writes down a story as a child dictates. Later that day, as a whole class,

the child/author acts out the story with a group of children as the teacher reads the story aloud. Nicolopoulou et al. (2015) conducted a two-year study that provided evidence that story-telling and story-acting practices foster narrative comprehension (oral language), print and word awareness and pretend abilities (emergent literacy, greater self-inhibition, and reduced play disruption (social competence) skills. The higher frequency of participation of students in story-telling was a significant predictor of higher post-test scores. Heppner (2016) also found promising results that storytelling and story acting fosters emergent literacy skills. She noted, "increased use of expression and more creative vocabulary, as well as more complex syntax and sentence patterns, knowledge of how print functions, and emerging knowledge of phonics and spelling" (Heppner, 2016, pp. 468-471). Storytelling and story-acting implemented as part of the curriculum supports language development and fosters print awareness and phonological awareness skills.

Pretend Play

Pretend play also provides opportunities for children to expand existing knowledge, skills, and the understanding of the world, through assimilation and accommodation (Park 2019). Engaging in pretend play with props, peers, adults, and literacy-rich environments promote literacy behaviors. Neumann and Roskos (1997) observed children in pretend play scenarios such as a post office or pizza shop, collaborating to solve problems, using domain-specific vocabulary, and reading and writing. More recently, Pyle, Prioletta, and Poliszczuk (2018) reaffirmed "reading and writing behaviors were observed with greater frequency in centers that integrated literacy materials, as children used the materials as part of their play" (p. 122). When engaged with literacy materials, children pretended to read menus, fill out order forms, and engaged in conversation with domain-specific vocabulary to the scenario. As evidenced in these studies, engaging in pretend play is an effective, engaging instructional practice for children to develop language, print awareness, and writing skills.

Guided Play

Another way educators can support language and literacy development is by taking an active role in children's play, referred to as guided play. Educators can engage in a variety of practices to embed or scaffold academic learning with children's play such as modeling, providing comments or questions, becoming an active co-player, or leading games and activities. In a study conducted by Cavanaugh and colleagues (2016), guided play was implemented in kindergarten classrooms, where students in the experimental groups participated in teacher-directed activity, then were given the opportunity to use the materials with the freedom to create their own games with the materials; teacher guidance was provided as needed. Children in the experimental group performed better on the DIBELS assessment of early literacy skills than the control group. Additionally, Pyle, Poliszczuk, and Danniels (2018) observed a higher frequency of literacy behaviors during guided play than free play. Literacy-rich guided play with an active teacher presence can support emergent literacy skills by incorporating academic learning in play-based activities.

Direct Instruction

Some emergent literacy skills are better supported through explicit, direct instruction from the teacher. Phonological awareness, alphabet knowledge, and vocabulary are components of emergent literacy where students have more positive outcomes with explicit, direct instruction. According to Paige et al. (2018), "research syntheses have found success in letter naming knowledge and phonological awareness requires explicit instruction" (pp. 1-2). With this information, it is clear that educators need to implement effective strategies to support children's development of foundational aspects in the reading process. Educators can employ developmentally appropriate instructional practices such as small groups and read-alouds to explicitly teach print awareness and phonological awareness skills.

Small groups

Small group instruction allows educators to differentiate instruction to meet children's individual needs in a setting that offers opportunities for higher-quality interactions. While children are playing in interest areas or centers, educators can pull small groups not exceeding five children, to work explicitly on certain skills. When implementing small groups, educators can utilize explicit instruction for print knowledge or phonological awareness tasks, such as rhymes or alphabet knowledge. These tasks can be modeled through co-teaching and coaching and supported with embedded practice during read-alouds and play, and literacy games throughout the day(Terrell and Watson, 2018; Cavanaugh et al., 2016). Explicit, direct instruction is effective in small groups due to the modeling cues and feedback teachers can provide that are in response to and specific to children's needs. In a study conducted by Hilbert and Eis (2015), small groups were implemented using the Read It Again Pre-K program to increase narrative, vocabulary, print knowledge and phonological awareness. Children participating in the experimental group exhibited a statistically significant increase in picture naming, vocabulary, and print knowledge. Small groups provided more opportunities for children to share their ideas and interact with their peers and teacher. Educators can differentiate instruction and design meaningful, developmentally appropriate activities based on children's needs on the continuum of phonological awareness and print awareness development.

Read-Alouds

Studies have shown that reading aloud to children promote emergent literacy skills. However, not all read-alouds are created equally. Educators need to intentionally plan for literacy experiences before, during, and after reading to unlock the full potential of reading aloud. Planning for a read-aloud experience should include a focus on language and print actively involving students in the experience. Lefebvre et al. (2011) found that using explicit facilitation strategies during shared reading improved scores for vocabulary and print awareness as well as phonological awareness. Vocabulary instruction can be supported in shared reading by intentionally and explicitly teaching target words before, during, and extension activities after reading. Loftus-Rattan et al. (2016) found that "children obtained higher scores on

words that received extended instruction over embedded instruction or incidental exposure" (p. 403).

Balancing Practices

Recent research has argued for play-based learning after NCLB shifted practices to more direct instruction. Through the medium of play, children develop cognitive, social, and self-regulation skills, as well as stimulate literacy development (Guirguis, 2018). However, the term play is difficult to define; it is abstract and has different meanings within different groups. Guirguis (2018) claims that play-based learning supports emergent literacy skills through scaffolding. Still, educators perceive play as difficult to plan, less structured, and are often confused about their role in facilitating play (Pyle, Poliszczuk, and Danniels, 2018). Yet, clearly there is a role for teachers if play is going to support emergent literacy skills, given, that "students primary focus during free play is not the development of their own literacy skills and of itself is not sufficient for the development of literacy skills" (Pyle, Poliszczuk, and Danniels, 2018, p. 229). Play-based learning alone is not sufficient to support emergent literacy skills.

Given the evidence of the benefits of play and direct instruction, educators should incorporate both practices to support emergent literacy skills. Chambers et al. (2016) found positive effects of comprehensive programs on language and literacy outcomes indicating that it is beneficial to provide some direct instruction in language and literacy skills along with child-initiated activities. Additionally, Pyle, Poliszczuk, and Danniels (2018) advocate for a balanced approach including free play, direct instruction, and guided play. They found that "free play provided the opportunity for some literacy development and direct instruction provided the opportunity for children to develop core literacy skills" (Pyle, Poliszczuk, and Danniels, 2018, p. 229). Educators can balance literacy instruction by implementing flexible instructional practices from play-based to direct instruction. These instructional practices provide developmentally appropriate activities, while simultaneously developing the complex components of emergent literacy.

By creating a literacy-rich environment and developing a daily schedule, educators can balance literacy instruction. Intentionally designing a literacy-rich environment by labeling objects, offering books and writing tools throughout the classroom, offering puppets and flannel boards and designing engaging learning experiences that support extended teacher-child and child-child interactions provides opportunities for educators to support the development of literacy. (Byington and Kim, 2017). To support literacy behaviors, educators should purposefully plan the materials they are exposing the children to and actively engage with the children during play scaffolding their knowledge and making connections to academic learning. Adding small group work to the daily routine provides children with the explicit instruction needed to meet children's individual needs. Educators can plan "instructional games to intentionally support the development of targeted literacy skills" (Pyle, Prioletta, and Poliszczuk, 2018, p. 122). Furthermore, educators can intentionally plan to embed literacy skills throughout their daily schedule during table time and music and movement to extend literacy instruction in meaningful, authentic activities. Literacy instruction can be balanced when teachers plan a daily

schedule that provides opportunities for play and teach-directed activities. A sample daily schedule can be found in the Appendix.

Conclusion

Balancing literacy instruction to have both open-ended play-based and more targeted explicit learning opportunities supports children's development of the multiple complex components of emergent literacy. Educators must have a deep understanding of the components of emergent literacy and how to effectively facilitate learning of each component. Employing a variety of play-based and direct instruction strategies supports developmentally appropriate practices while meeting the increasing academic demands placed on early childhood programs from NCLB. A balanced approach to literacy instruction holistically supports emergent literacy employing developmentally appropriate practices and evidence-based strategies.

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Reinvigorating Student Interest in Pleasure Reading
How to Build an Effective Sustained Silent Reading Program in the Classroom

David O'Brien

Abstract: Pleasure reading has undergone a drastic decline among students while time spent on electronic devices has soared. In order to promote literacy in an age of digital entertainment, educators must reinvigorate student interest in reading for fun. Sustained silent reading (SSR) is a promising tool to achieve that goal. SSR theorizes that students will experience reading as a pleasurable activity if provided the freedom to choose their own books and the ability to interact with those texts without summative assessments. Although there are many ways to structure SSR in the classroom, research shows that the most effective programs help students select books matching their ability level and interests, create opportunities for sharing with peers, integrate SSR with lesson planning, and promote teacher modeling of independent reading.

Introduction

Russian-born poet and essayist Joseph Brodsky (1991) once said, "There are worse crimes than burning books. One of them is not reading them." However, ask a student in almost any secondary classroom in the United States whether they ever pick up a book and read in their free time, and you are likely to find that we are living in a period of mass lawlessness. Students simply are not choosing to read as a leisure activity. In fact, nationwide statistics confirm a disturbing trend: pleasure reading is undergoing a drastic decline among children of all ages, and especially teenagers. According to a recent study by Twenge and Spitzberg (2018), only 16% of high school seniors read on a daily basis, a drop of 44% since the late 1970s. Indeed, nearly one out of three teenagers now report that they do not read a single book for pleasure over the course of a full year. At the same time, use of digital media is on the rise, with the average high school senior spending six hours a day plugged into electronic devices during free time. Liquid crystal display screens have replaced the written page as the dominant recreational activity of our age. This poses an existential problem for educators charged with helping students to meet literacy standards. In order to foster engagement with books, we must find a way to turn reading back into a practice that carries the same cultural currency and appeal for our students as the ubiquitous electronic forms of entertainment available to them before they ever set foot in a classroom.

The Theory of Sustained Silent Reading

Despite the relative recency of the digital dilemma, the solution to the decline in pleasure reading may be one that was developed decades before streaming services,

personal gaming systems, and the World Wide Web were even conceived. In the 1960's, Lyman Hunt, an educator from the State of Vermont, examined what he perceived to be a decline in student interest in reading. Hunt identified two overarching problems. First, he focused on the practice of forced book selection. Adults who read for pleasure do not choose books that they do not like, and if they happen to start a text that does not interest them, they quickly abandon it. Yet teachers frequently do not follow that blueprint in education. At every grade level, educators implement a curriculum that tells students exactly what they have to read, and we require our students to stay with those books no matter how disengaged they might be. Hunt theorized that this pedagogical technique turns reading into an unpleasant experience and believed that educators can help students develop internal motivation to read by allowing them to choose "high-interest book[s]" that they actually enjoy (Hunt, 1997, p. 279).

Hunt's second primary concern with traditional reading instruction was its emphasis on accountability. Teachers typically assess a student's mastery of any given skill, including those attendant to reading, by assigning tasks that require the student to demonstrate his or her ability to perform it. Yet this obsession with evaluation and appraisal does not exist outside the educational environment among people who read for pleasure. There are very few people beyond academia who, upon finishing a book, decide to write a five-paragraph expository essay analyzing its use of imagery, theme, or allegory. In fact, if adult readers were required to perform such tasks, they likely would not engage with a book in the first place because "the very knowledge that they have to do something with reading other than what they choose to do takes away from its magic. It keeps them from experiencing the enjoyment of just relaxing with a good book" (Pilgreen, 2000, p. 15). Accordingly, in order to instill a love of reading in their students, Hunt believed that teachers should foster reading experiences with no strings attached.

Out of these ideas, the practice of sustained silent reading (more commonly referred to as "SSR") was born. The idea underlying SSR is remarkably simple. In order to teach students to appreciate reading, educators must provide them, on a regular basis, with a defined period of time during the school day to read books of their own choosing without holding them accountable for the content. If this procedure sounds strangely obvious, it is because there is nothing novel or unique about it. As Stephen Krashen, an educator specializing in literacy research, has pointed out: "Free voluntary reading, or reading because you want to, is the kind of recreational reading that most mature readers do most every day" (Krashen, 2006, p. 43). SRR is simply a vehicle for transporting that activity from the living room to the classroom. It allows students to become better readers by practicing their reading skills, and it encourages them to commit to that practice by creating a set of conditions that will help them experience reading as a pleasurable endeavor.

The Key Elements of an Effective SSR Program

Unfortunately, while the theory behind SSR has intuitive appeal, its implementation in the classroom has seen mixed results. On the one hand, there are "literally hundreds of studies" that have found a positive relationship between SSR programs and advances in reading achievement (Garan & DeVoogd, 2008, p. 338). Similarly,

teachers with practical experience implementing SSR in their classrooms report exponential increases in reading interest among their students (Gardiner, 2001). Yet at the same time, others have cast doubt on the effectiveness of SSR. Some studies have found that the students who enjoy and succeed in SSR programs are those that are already motivated to read in the first place (Siah & Kwok, 2010). And not all teachers have had positive SSR experiences in their classrooms. Concerns range from student inability to pick books that match their ability level and interests, to increases in off-task behavior when accountability devices are removed, to difficulty evaluating the cognitive level at which students are interacting with their independent texts (Kelly & Clausen-Grace, 2006).

Part of the reason for these mixed results is that there is no single agreed-upon approach to the design and implementation of SSR. Many different variables can be manipulated when introducing students to an independent reading program, and thus researchers face a daunting task in attempting to analyze the effectiveness of SSR because there is no constant construct to measure. Yet all is not lost. Across the broad platform of SSR research, it is possible to isolate and identify several core curricular components that appear to be shared by those programs with a track record of success. They are: (1) providing students with structured support in book selection; (2) creating opportunities for students to share what they are reading with their peers; (3) integrating independent reading with lesson planning; and (4) modeling the practice of independent reading during the SSR period. Although none of these techniques is guaranteed to transform students into lifelong readers, any teacher seeking to use SSR in the classroom for the first time would be well-served to design his or her program with these strategies in mind.

Structured Support in Book Selection

SSR posits that students will develop intrinsic motivation to engage with a book when they find pleasure and personal meaning in the reading experience. Yet many young readers do not know how to select books to which they can connect either in terms of ability level or interest. French and Rumschlag (2004), for example, have found that the least able readers select the most difficult texts, significantly undermining their ability to understand what they read. Students also frequently lack the foundational skills needed to choose a book that excites them. All too often, a class trip to the school library results in students wandering aimlessly up and down the shelves, reading only the titles on the spines in front of them before ultimately making a selection based on the image from the book's cover. It is no wonder, then, that when students are asked to read these books in SSR, they engage in off-task behaviors. Independent reading with a mismatched book is no more stimulating for a burgeoning reader than having a canonical text thrust upon them.

The solution to this problem is a simple and obvious one: teachers need to show students how to select texts that correspond to their ability level and interests. On the ability side, the strategy can be as simple as teaching students the five finger rule: read a single page from a proposed book, hold up a finger for every word that is unrecognizable, and aim for a text that yields two to three raised fingers per page. With respect to book interest, teachers can engage students in conversations about features of books they have enjoyed in the past, show them how to locate reviews

of a proposed text, or ask them to read the back cover and a few sample pages. The key is not the specific strategy taught, but rather the provision of structured support in the selection process to find an appropriate match. Indeed, research shows that when teachers help students choose texts that they can navigate and are enjoyable to them, two things happen. First, student enthusiasm for independent reading increases (Parr & Maguiness, 2005). And equally important, off-task behaviors decrease (Williams et al., 2017). Thus, in order to hook students on independent reading, educators must first teach them to how to fish with the proper bait.

Creating Opportunities for Book Sharing

Another key feature of SSR success is providing students with regular opportunities to share their books with others. At one level, encouraging students to talk about their books may seem inimical to the concept of "silent" reading. However, just like adult readers are eager to discuss a book that appeals to them, social interaction is motivating for students. SSR time does not and cannot mean that students read their books in a completely solitary and noninteractive environment. Silence enables students to focus on their independent reading, but the most effective SSR programs also tap into student engagement by providing them with the opportunities for communion that they thrive upon.

There are many methods to build book sharing opportunities into an SSR program. Some teachers encourage their students to engage in short, regular think-pair-share sessions after reading to discuss aspects of their books that stood out to them (Dickerson, 2015). Others create opportunities for their students to give a book talk to the class, organize small group discussions to connect what they are reading to their own experiences, or set aside time for students to write a review for their peers (Lee, 2011). The one constant of SSR success is treating independent reading as a social activity by encouraging students to talk with each other about their books. Just like structured support in book selection, not only does this "immediately and dramatically" reduce off-task behavior (Bryan et al., 2003, p. 67), but it has the potential to generate so much excitement around reading that students will literally "beg" to have more SSR time (Lee, 2011, p. 216).

Integration of SSR with Lesson Planning

SSR programs should also be linked to the learning objectives that teachers develop for their classes. Too often, independent reading is criticized as having no connection to the content that educators impart to their students through more direct avenues of instruction. However, there is nothing inherent in the concept of SSR that requires it to be implemented as a standalone activity detached from all other learning that is happening in the classroom. Quite the contrary, a well-designed SSR program gives teachers the flexibility to integrate the concepts and skills that anchor their lesson plans with texts that actually resonate with their students. In this way, SSR does not take time away from classroom learning; it offers opportunities for students to apply course content in a meaningful way using books that are relevant to them.

There is no single way to achieve this integration. It varies widely based upon the knowledge and skills being developed in the classroom. For example, a series of lessons on literary devices used in narrative writing such as mood or tone might be integrated with SSR by creating short journal prompts requiring students to identify the words or phrases in their own books that illustrate those concepts and reflect on how those words make them feel (Morgan & Wagner, 2013). Alternatively, a teacher might reinforce a unit on metacognitive reading strategies such as predicting, questioning, or visualizing by asking students to practice those strategies during SSR time and then share their experience with a partner (Kelley & Clausen-Grace, 2006). Again, there is plenty of room for flexibility in the specific approach. The important point is to use SSR as a tool to reinforce classroom learning objectives by allowing students to implement the skills they are being asked to master through self-selected texts that they find personally engaging.

Teacher Modeling of Independent Reading

Finally, it is essential for teachers to model the behavior that they want their students to adopt during SSR. As tempting as it may be, SSR is not a time to catch up on email, grade papers, or take attendance. By engaging in these activities, teachers undermine their own cause by signaling that there are other more important activities than reading. If SSR is to be successful, teachers must stand up at the front of the class and read alongside their students. This practice fosters positive reading attitudes both by setting a clear example of classroom expectations and telegraphing nonverbally that reading is engaging and worthwhile.

Regrettably, while most teachers tend to believe in the motivational aspect of modeling, many of them fail to do it. Loh (2009), for example, conducted a ten-week study of fifty teachers in a primary school in Singapore, all of whom reported that they believed their role during SSR was to model reading for their students. Amazingly, less than five percent of them actually read during SSR time on any given day (Loh, 2009). This can be the death knell to an effective SSR program because studies have shown that modeling increases both the percentage of students who participate in SSR as well as the amount of time they devote to reading (Fisher, 2004; Meth & Hintze, 2003). As with any aspect of education, students learn and adopt new behaviors by watching other people perform them. SSR is no exception. Teachers demonstrate a conviction that reading is pleasurable and meaningful when they take the time to engage with a book while asking their students to do the same.

Conclusion

SSR is hardly a novel concept in education. However, it has taken on markedly new significance due to the unprecedented pace of technological achievement that has produced attention-grabbing devices designed to court students of all ages. Finding ways to get students invested in reading is critical due to the fierce competition amongst the unparalleled number of ways for them to spend their free time. If educators are to be successful in promoting reading in a digital environment, they must be able to show their students that getting wrapped up in a good book is not the historical equivalent of their parents walking to school barefoot five miles in the

snow. Instead, it can be just as pleasurable as seeking out that next like on Instagram or dropping into one more battle on Fortnight. An effectively structured SSR program – one that teaches students how to select appropriate texts, allows them to share what they are reading, encourages them to use their books as a platform to apply skills learned in the classroom, and models what it means to be an independent reader – is a large part of the solution. SSR promotes positive, lifelong reading habits by helping students to develop a love of books and appreciate the world beyond the constant beck and call of their digital screens.

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Five Alternative Assessment Styles for ELL Students' Vocabulary Development in a Mainstream Elementary Classroom

Abigail Vaez

Abstract: English Language Learners (ELL) are one of the fastest growing subgroups in the classroom today, and the knowledge gap between ELL students and native language speakers grows wider. Vocabulary comprehension is becoming a deep-rooted problem in many classrooms; therefore, it is important to identify ways to accurately assess an ELL student's vocabulary knowledge and retention. A variety of assessment styles and tools should be utilized in the classroom to better reflect an ELL student's vocabulary knowledge and growth. There are five alternative assessment styles teachers should consider when choosing tests in the classroom: formative, performance, quality reviews, badges and micro credentials, and multiple measures. Educators face challenges of learning what assessment will best suit a standard and a student's abilities. As future generations present educators with learning challenges, these five assessment styles can provide teachers with a richer understanding of their ELL students' capabilities and retention.

Five Alternative Assessment Styles for ELL Students Vocabulary Development in a Mainstream Elementary Classroom

Identifying ways to accurately assess an English Language Learner's (ELL) vocabulary knowledge and retention in mainstream K-5 classrooms is important because ELL vocabulary comprehension has become a deep-rooted problem in many classrooms. It is important to become familiar with traditional and alternative assessment materials in order to recognize an ELL student's growth in vocabulary. Traditional pencil and paper, multiple choice, or essay testing may not be the most beneficial way of gathering information on an ELL student's vocabulary knowledge. Nonconventional assessments can better help an ELL student portray their abilities, and five assessment styles and tools should be utilized in the classroom to better reflect an ELL student's vocabulary knowledge and growth (Silverman & Hines, 2009).

The Difficulties ELL Students Encounter

When entering a new school, an ELL student is required to take an English proficiency test. The results of this test place this student into one of two categories, Limited English Proficient (LEP) or Initially Fluent English Proficient (I-FEP). An ELL student who tests into the LEP category, requires additional support prior to entering an English only mainstream classroom, and an ELL student, who tests into the I-FEP category, enters an English only mainstream classroom and receives additional support while in the classroom (Dean, 2019). Unfortunately, many schools are not equipped with teachers qualified to work with ELL students, and only about 2.5% of teachers who work with ELL students are certified for this position. Many

ELL educators only participate in a few professional development courses, which leaves them underprepared for ELL instruction (McKeon, 2005).

ELL students make up 10% of the student population in schools (Sanchez, 2017). It is important for teachers to understand that ELL students are capable individuals that may need additional support from a young age. By the time fourth grade finishes, curriculum becomes more complex and difficult, which makes it harder for an ELL student to comprehend educational vocabulary. Accordingly, it is vital that classroom vocabulary assessments be created to help students learn, grow, and achieve throughout the school year. Results of vocabulary assessments are just as important as they help educators determine what needs to be revisited and how an ELL student could be pushed to higher level skills. At the end of the school year, ELL students take another English Proficiency test to determine if they can be re-classified to Fluent English Proficient. If an ELL student meets the required score for reclassification, the student will no longer require additional support (Dean, 2019). Sadly, only 63% of ELL students graduate compared to the 82% of their peers, and only 1.4% of those ELL students who graduate take college entrance exams (Sanchez, 2017).

Five Alternate Assessment Types

ELL students are one of the fastest growing subgroups in the classroom today, and the knowledge gap between ELL students and native language speakers grows wider. Educators continuously look for ways to accurately assess their students' knowledge, and becoming familiar with alternative assessment styles could benefit their ELL students (Gibson, 2016). Since students learn differently, incorporating different assessment techniques could highlight a student's strengths and weaknesses, which provide teachers with important education data (Rastegar & Safari, 2017).

Because of the data driven society, an educational assessment shift has been moving through school districts over the past few years, and educators are feeling the pressure to produce statistical results. Teachers try to find the best assessment techniques to measure student development and guide future learning directives. Outside the realm of traditional assessments, there are five alternative assessment styles that teachers should consider when choosing tests in the classroom: formative, performance, quality reviews, badges and micro-credentials, and multiple measures (Lash & Belfiore, n.d). These assessment strategies can help educators gather deeper understandings of a student's knowledge and can help students showcase their knowledge in opportunities that have not previously been available to them (Belfiore & Lash, 2017). Using these strategies in the mainstream classroom help all students, ELL and non-ELL alike; however, implementing alternative assessments throughout the year rather than solely traditional assessments will help more ELL students become reclassified as Fluent English Proficient (Belfiore & Lash, 2017; Grimes-Hillman et al., 2014; Sanchez, 2017; Dean, 2019). Understanding all five alternative assessment strategies and how best to apply them all can help general education teachers assess ELL students more effectively, increase all student achievement in the mainstream classroom, and improve scores on state tests for the mainstream classroom.

Formative Assessment

Educators commonly utilize formative assessments to evaluate their students' achievement. Formative assessments identify learning needs and academic progress and are a continuous analysis of a student's comprehension throughout a lesson, unit, or course (Great Schools Partnership, 2014). These low stakes non-graded assessments help teachers identify all students' strengths and weaknesses in order to prepare better lesson plans. Since formative assessments give instant feedback to a teacher, they are able to monitor the students learning abilities faster and adjust lessons accordingly (Belfiore & Lash, 2017).

A formative assessment is more of a learning technique rather than a test designed to gather detailed information on a student's understanding. These techniques are performed throughout the lesson and unit for a student's learning rather than a summative assessment which is typically given at the end of a lesson or unit and is of material learned (Great Schools Partnership, 2014). Exit slips, entrance tickets, concept maps, and highlighting are examples of effective formative assessment strategies. Exit slips or tickets consist of students writing down something they have learned from the lesson, but as an alternative, ELL students can verbally state to a teacher what they have learned. A concept map is a graphic organizer that webs how concepts are connected together. Highlighters can be used in a variety of ways to recognize words, answers, or definitions. A teacher can quickly ask the ELL student to highlight aspects in writing in order to determine if they have learned a specific skill (Guido, 2019).

Some educators believe that formative assessments are becoming overly used and not performed properly or that the assessment is not truly formative. In order for an assessment to be truly formative, it should not be graded. A formative assessment becomes a summative or performance assessment rather than formative when a grade is given. When a formative assessment is used to improve a student's understanding, it is being performed properly (Great Schools Partnership, 2014).

Performance Assessment

Performance assessments are authentic simulations of real-world experiences that assess a student's abilities and understanding of concepts. Students show their knowledge of a skill by producing an authentic creation. Authentically designed performance assessments are graded on specific criteria, have clear expectations, and can use simulations as long as they are true to real-world situations. These assessments allow ELL students and non-ELL students alternative opportunities to equally demonstrate their skills and enjoy displaying their abilities in the mainstream classroom. When students enjoy their work, it motivates them, gives them a sense of pride, and provides them a feeling of accomplishment (The Editors, 2019).

Performance assessments typically encompass multiple concepts a student acquires and asks the student to connect the skills; however, it is important to remember that the assessment should emphasize the skill that needs to be learned (Brockhart, 2016). Examples of performance assessments include poster presentations, producing poetry, creating a comic, and debating a topic. In presentations, ELL students will need to present information found clearly with the correct vocabulary

terms. Poster presentations should be written to incorporate a question, findings, and conclusions on the information found. Debates are verbal discussions between two students on a certain concept. ELL students should be proficient with the vocabulary terms associated in the debate effort to argue their side of an issue (Kelly, 2019).

Many performance assessments involve a higher level of thinking, and if not executed with clear instructions and expectations, they may overwhelm ELL students. This style of assessment is difficult to compare since teachers have different standards. Performance assessments could be considered a judgement assessment as teachers evaluate the results with preconceived notions of each student's work ethic and ability; therefore, the assessment could become biased. In order for performance assessments to be graded fairly, a rubric should be set in place. This style of assessment should be focused on and used to measure a student's abilities in the vocabulary standard being assessed (The Editors, 2019).

Quality Reviews

Quality reviews collect data from observing and analyzing a student's interactions and learning experience within authentic context. The quality reviews assessment tool is a unique method that educators use to determine a student's work ethic and understanding of content. Quality review assessments take on more of a holistic approach where students take ownership of their learning and a personal responsibly to learn and rise to their own potential. Educators recognize the wholeness of the learner and take into consideration what was learned and how the learner applies it in the community (Belfiore & Lash, 2017).

A teacher needs to be extremely observant and diligent in using this style of assessment because it does not follow a rubric, does not have an answer key, and does not follow a script. Many poor traditional test takers, who are able to interact with their peers, educators, and community proficiently, have difficulty retrieving learning information during tests. There are a few questions a teacher must ask themselves when using this technique: Is the student able to use new vocabulary words in everyday conversation? Do they incorporate these words in their writing, or can they read the vocabulary words? These assessment type questions can be asked of ELL students and their peers without the need of specialized ELL assessment (Belfiore & Lash, 2017).

Educators may find challenges implementing quality reviews in the classroom. It is difficult to assign a grade to measuring a student's knowledge based on their experiences because every student has a unique background (School Around Us, n.d.). An applicable example of quality review could be periodic one-on-one interviews between a student and their teacher. During the interview, the teacher can ask the student broad questions about their life using current vocabulary words and concepts. The teacher's assessment is of the student's ability to converse and answer questions and not of the student's answer correctness. This assessment is helpful for all students, but it is particularly beneficial for the ELL students, who are able to demonstrate their understanding of vocabulary use in language (Belfiore & Lash, 2017).

Badges and Micro Credentials

Badges and Micro Credentials method of assessment involves a student achieving certain goals then receiving a series of badges. A micro credential or targeted skill has been accomplished when all the badges have been collected. Once a student has received all the badges for the credential, he or she can move on to the next micro credential. For ELL vocabulary skills, this style of assessment can become rewarding and motivating. The student feels accomplished when receiving the badge and can physically see their growth. Educators can use this method of assessment to inspire all students to work hard for the next micro credential (Greene, 2019).

Badges and micro credentials can help teachers determine a wide range of skills and utilize the information to create lessons that address an ELL student's needs. This style of assessment could suit higher level students as it indicates a competency level where a student continues to move up in education as they collect their micro credentials. Teachers using this strategy can easily see how well their students are progressing (Alliance for Excellent Education, 2013). This style of assessment could be difficult to assimilate between classrooms and could result in discontinuity if educators are not in communication and share the same badges and micro credentials. Students will receive comparable scores amongst the classrooms if a set system has been carefully devised (National Education Association, 2018).

Multiple Measures

A vocabulary multiple measure assessment could incorporate saying the word, defining the word, using the word in a sentence or story, using it in a poem, or finding synonyms and antonyms. By considering different applications of the word, an educator can determine if a student truly knows how to use the word. If a student can say the word and give a dictionary definition but cannot provide a connotation definition, a teacher could indicate that the student still needs help understanding the vocabulary term. In using multiple measures, the teacher can then prepare alterations and additional support in future lessons to help the student gain more knowledge of the term (Belfiore & Lash, 2017).

Multiple measure assessments should not only incorporate pencil and paper but several aspects of learning, including writing, reading, and verbal evaluation. Many times ELL students are able to either speak well, write well, or read well in the second language but struggle to incorporate all three. In a multiple measure assessment, all three areas are tested in an effort to help ELL students demonstrate their knowledge. Providing multiple measure assessments for ELL students gives them opportunities to showcase their knowledge in varied ways. Teachers can accurately pinpoint a student's strengths and weaknesses in a concept when using this style of assessment. Multiple measure assessments give teachers more than one factor to grade in order to determine an ELL students' knowledge (Grimes-Hillman et al., 2014).

Multiple measures style of assessment indicates where students are most successful, and it provides teachers with the information needed to alter lesson plans and provide ELL students with future assessments that can help showcase their best work. When using multiple measure assessment, it is important to determine

the measures being assessed and best practices (Grimes-Hillman et al., 2014). It is important for educators to be able to analyze the data produced from these assessments and grade consistently (Farley, et al. 2018). Multiple measure assessment allows teachers to evaluate an ELL student's abilities in all areas of a concept rather than a single representation (Grimes-Hillman et al., 2014).

Conclusion

The education profession is ever evolving, and educators that are exposed to real-world data early will be prepared for the continuously changing classroom. It is important that teachers are familiar with these concepts in order to develop, implement, and grade these assessments (Farley et al., 2018). Learning what assessment will best suit a standard and a student's abilities presents another challenge educators face. It is the responsibility of educators to continue researching these and other alternative assessment methods. By including these assessments in the mainstream classroom, ELL students will be able to participate with non-ELL students without requiring additional or accommodating assessment strategies. As the future generations present educators with learning challenges, these five assessment styles can provide teachers with a richer understanding of their ELL students' capabilities and keep them integrated in the mainstream classroom (Belfiore & Lash, 2017).

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Mathematics

High School Career Technical Education and New Mathematics Graduation Pathways

Rachel Stevens

Abstract: Career Technical students in Ohio now have lowered graduation requirements. This has led to many questions about how this change can still create a worthwhile education. Teachers in Ohio Career Tech are worried that lowering the content expectations will lower students' ability to reason mathematically. Data collected leads to the conclusion there is no statistically significant relationship between level of courses taken in high school and mathematical reasoning. Therefore, lowered math course requirements do not hinder students' growth but instead open the door for new approaches to math education. New approaches and new curriculum may improve students' overall understanding. These new approaches should include re-evaluating graduation requirements in Career Technical Education. Requirements for mathematics should be individualized based on each student's intended career.

Introduction

The Ohio Department of Education has recently changed their graduation requirements for career technical high school students. Although they are still expected to take four units of mathematics, Algebra II or advanced computer science is no longer a requirement for students following a career-technical pathway (Ohio Department of Education, 2019a). Unlike their general education counterparts, career technical education (CTE) students can replace Algebra 2 with any career-based mathematics. A career-based mathematics course "addresses high school level mathematics standards relevant to a specific career pathway. This course should focus on the appropriate mathematical practices, fluencies, and content related to the career pathway" (Ohio Department of Education, 2019b). This description does not state what level or how many high school mathematics standards should be covered in this career-based course. Therefore, college bound students are required to take Algebra I and II, whereas a CTE student is not held to the same standard.

Most teachers feel very frustrated by the change in graduation requirements.

> *Imagine spending many years of your career teaching Algebra 2. You have mastered teaching it, you love the content, and you are comfortable. Then, your state decides your school's students no longer need to take Algebra 2. The content you love is no longer a necessity, so you're asked to teach a new class.*

Teaching a new course is difficult, stressful, and can cause burnout. Having recently experienced this at an Ohio career center, many teachers were outraged, confused, and worried about students' well-being.

Can a student who does not learn the skills within Algebra 2 or higher still do well in their future? Are they at a disadvantage because their mathematical skills are lower? In a quest to answer these questions and concerns, a comparison can be made between students' course selection and their mathematical reasoning. Mathematical reasoning can be quantified using test scores from college placement and

entrance exams. Findings from both Showalter (2017) and Bea, Gray, and Yeager (2007) show that there is no statistically significant relationship between level of courses taken in high school and level of ability on placement tests. This data will be presented throughout the evidence portion of this manuscript.

If there is no significant relationship, then teachers must accept the loss of their beloved higher-level course work and start seeing this change as an opportunity. Lowered math course requirements open the door for new approaches to math education that may improve students' overall understanding and mathematical reasoning. The past practice of placing the same expectations and requirements on all students was ineffective. Instead, students' ability and career interests should be taken into consideration. The CTE graduation requirements for mathematics should be individualized based on each student's intended career.

Course Work Compared to Test Scores

State graduation requirements expecting all students to take Algebra II or higher are not helping the entire population. Showalter (2017) argues that CTE mathematics is most effective when it takes students' abilities and interests into consideration by teaching math skills related to their technical field and embedding higher-level mathematics. Showalter (2017) completed research to determine the effect of higher level courses on students' placement out of remedial mathematics classes in postsecondary school. He also took into account factors that would affect a students' likelihood to choose courses like pre-calculus and calculus. Showalter (2017) created a propensity score for each student in order to study the students with the lowest propensity, or interest, to choose higher level course work (p. 675). Showalter (2017) then grouped students homogeneously to make all factors null, forcing the propensity score to be the sole factor in question. The data was plotted to show the estimated effect of propensity on placement out of postsecondary remedial mathematics (PRM). The effect sizes were below minimum effect size, meaning the comparison of propensity to placement scores had no statistical significance (Showalter, 2017, p. 682)

Showalter states (2017), "In other words, [data] provided no evidence that course taking in the algebra-calculus pipeline helped students to place out of postsecondary remedial mathematics classes. Thus, if two students had a similar propensity score, but one ended up taking precalculus and the other did not take any algebra-calculus courses higher than pre-algebra, the two students would have had roughly the same likelihood of placing out of PRM" (p. 682). From this quote, it is important to note Showalter (2017) compared a student who took coursework through precalculus to one that only took pre-algebra. He found that two similar students, with vastly different coursework in math, have the same likelihood of placing out of PRM. His argument is that the level of coursework does not matter, but instead the overall ability and interest of the student. Some of the many factors taken into consideration showing some effect on propensity include initial ability in math, previous test scores, teacher's evaluations, and course recommendations (Showalter, 2017, p. 681).

Bea, Gray, and Yeager (2007) mirror Showalter's (2017) discoveries by comparing CTE students to traditional high school students. They attempted to pre-

dict students' 11th-grade math achievement on the Pennsylvania System of School Assessment (PSSA). According to the data, there is no statistical significance in students who took CTE and their state test scores in 11th grade. Data was presented as a summary of the regression analysis which revealed that 8th-grade math achievement was statistically significant and positively associated with 11th-grade math achievement ($p < .05$). Years of math (algebra I or higher level) taken by grade 11 was statistically significant and positively related to 11th-grade math test scores ($p < .05$). n=55. (Bea, Gray, and Yeager, 2007, p. 16). Like Showalter's (2017) study, this shows a stronger relationship to achievement with their previous test scores and number of years of math taken (Bae et al., 2007, p. 17).

Collectively, Showalter's research and the research conducted by Bea, Gray, and Yeager showed that lowered graduation requirements do not harm CTE students' ability to achieve. The data shows a strong correlation between the students' overall interest in their course work, their mathematical ability, and their consistency of math course work over a four-year period. When developing student schedules, counselors should consider these factors. Instead of setting them on a generic path: Algebra 1, Geometry, Algebra 2, and Pre-calculus, new and unique paths are paved based on each student as an individual. Do they even like math? Will their career require it? Are they college bound? What did their previous math scores look like? These questions are now the center of discussion, and much more valuable than a singular pathway. A call for individualized course requirements calls for a reassessment of the goal of math education so that schools can properly redevelop graduation pathways and curriculum.

Rethinking Curriculum

Mathematics education in the CTE setting should be used to improve students' chances of obtaining and maintaining jobs. Steen (1999) argues that the goal of learning mathematics is "to teach basic skills; to help children learn to think logically; to prepare students for productive life and work; and to develop quantitatively literate citizens" (p. 1). When considering mathematics in the workforce, people may not use formal mathematics from the classroom. Employees may never write formal proofs after Geometry class in their lifetime, but they do need typically mathematical strategies throughout life (Steen, 1999, p. 2). Fitzsimons supports the argument that changing a CTE students' curriculum can sufficiently develop desired skills such as self-management, versatility, critical thinking, process improvement, and information literacy (2001, p. 262). Furthermore, according to the Standards of Mathematical Practice (2020), an in-demand employee can:

1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others
4. Model with mathematics
5. Use appropriate tools strategically

6. Attend to precision

7. Look for and make use of structure

8. Look for and express regularity in repeated reasoning

While it is unlikely these practices can be covered thoroughly in a traditional classroom, lowering the graduation requirements may allow educators to reevaluate curriculum and identify essential math skills. By taking away the concern to reach a certain amount of content within four years, teachers can focus on finding ways to teach mathematical reasoning and critical thought. This is possible by developing new classes and rich activities, especially using content students have already been exposed to.

Effects of New Approach

> *Imagine starting your first week of high school at a career center. Instead of being told what courses you must take, you sit down with a faculty member and use your career choice to determine individualized course requirements. Your classes move you toward a job, an income, and a successful adult life. You have a stronger sense of purpose and motivation because there is an obvious light at the end of the tunnel.*

Graduation requirements do not feel like a chore in this approach. Wouldn't you learn the content more actively, knowing it's meant for you as an individual? This approach may develop ownership in each student.

> *Now imagine being a high school math teacher, working at a career center. Students are in your traditional Algebra 2 class because they have all chosen a career path that requires Algebra 2, or requires college in the future. Later, you teach remedial Algebra, but you do not follow a textbook. It took you a lot of work to get your students used to less direct instruction and more student-led tasks, but all the hard work is worth it. Your students start out hating math but are motivated by their career path and the chance to do interesting projects. Students use mathematical reasoning, critical thinking, problem solving, and communication every day. It makes sense to teach these math classes differently because you are teaching two entirely different groups of students. Your focus is on preparing for their future instead of checking off a list of skills or standards.*

There is a nonprofit organization that has researched this topic and developed curriculum with the philosophy of individualization in mind.

The Southern Regional Education Board (SREB) realized the goals of remedial math courses described in the vignette above. This organization has developed a number of new courses, called Math Ready, for the remedial math setting. They have begun to master and implement courses that are student centered and focus on improving previously learned math skills. "SREB's Math Ready course was designed to help students who fall a few points below 19 points on the ACT mathematics readiness benchmarks improve their scores and avoid costly remediation at the postsecondary level" (SREB, 2019, p. 2). They have been developing curriculum for students who may not have always enjoyed or been successful in math classes. Curriculum includes re-learning content students have already been exposed to but

with more exploration and student-led decision making. This curriculum will help students learn to communicate, to analyze others' reasoning and to improve their own reasoning. It is developed with all of the State Standards of Mathematical Practice in mind, growing students' ability to reason mathematically, think critically, and become more employable. SREB's effectiveness in their Math Ready curriculum can be quantified (SREB, 2019, p. 2). SREB analyses of ACT scores of 366 students in 27 high schools who were enrolled in Math Ready and retook the ACT after completing the course showed a significant growth in ACT scores due to the newly developed curricula, proving its effectiveness (2019, p. 2).

Conclusion

Lowering graduation requirements for CTE students that focus less on math content and more on individuality allows educators to better prepare the next generation of workers. With this shift, counselors can meet with students and plan their individualized course work for the entirety of their high school career. Students will understand the courses in their plan of study are essential to enter the workforce within their intended career. This understanding will help students see the relevance in math, and all other subjects, they are required to learn throughout high school. If trained properly, teachers can develop opportunities for students to be more independent in the math classroom and move away from the I-do, You-do approach so frequently relied on. Teachers can embrace lowered graduation requirements as an opportunity to incorporate more relevant content and more unique approaches to learning. Administration can look for ways to have academics required in a career-minded map instead of a universal graduation pathway. By making CTE mathematics expectations individualized, both students and teachers will benefit.

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Science

Cultural Reactions: Reality Pedagogy in Science Education

Grant N. Heil

Abstract: The United States and its school systems are becoming increasingly diverse. Science educators are tasked with stimulating the minds of multiple ethnic and cultural groups during their pedagogical career. Some science educators may have the mission of cultivating students in a location where none of the students share the educator's cultural background. Culturally responsive pedagogy assists educators in bridging the cultural gaps between students and presents science content in a method that is relatable. Reality Pedagogy is a subset of culturally responsive education that can be implemented by educators in diverse settings. Reality Pedagogy consists of five foundational blocks: cogenerative dialogues, coteaching, cosmopolitanism, context, and content. Case studies have validated the effectiveness of Reality Pedagogy in diverse pedagogical science environments.

Introduction

Attending a high-needs, urban high school, Preston was a student who possessed an exuberantly inquisitive mind. Preston often asked my colleagues and I questions that were at the forefront of his mind, no matter what the time of day. In his spare time Preston took care of his snake zoo at home, as he owned 23 different snakes. A majority of the questions that Preston asked were about animals, in particular, about snakes. This behavior of strongly pursuing knowledge through questioning was consistently displayed by Preston in all his classes. Despite Preston's highly demonstrated enthusiasm for engaging in classroom discussions, several of his teachers expressed concern over Preston not completing any work that was assigned in their class.

These facts came as a surprise to myself and my mentor teacher. We initially had the same problem with Preston not completing any assigned work during the first few weeks of the school year. However, after discovering Preston's passion for animals, especially snakes, we consistently found ways to integrate relevant animal examples into the content being taught for the physical science class that Preston was in. Shortly after integrating these animal examples early in the school year, Preston rarely missed submitting an assignment, his work was high quality, and he exhibited mastery over a large percentage of the physical science content. My mentor teacher and I became advocates for Preston, sharing with our colleagues that Preston was full of potential and just needed additional scaffolding through linking content to his past experiences.

The concept of linking an individual's past experiences and surrounding environment to a pedagogical setting is one component of culturally responsive pedagogy (Ladson-Billings, 1995). To some students, science is a foreign ideology and way of life from which the student believes she or he are alienated because of her or his background. Presenting science by drawing on the rich history of students breaks down mental and cultural barriers that obstruct student belief in his or her own abil-

ity to utilize science in everyday life. The success of social reform is correlated to scientific development in a cultural group (Krugly-Smolska, 2013). Empowerment of students by incorporating a culturally responsive science curriculum shatters the chains of oppression, rehabilitates physical and mental famine, and spurs students toward achieving their goals.

Diversification of American Schools

The need for culturally responsive pedagogy in science classrooms in the United States has only been growing. Culturally responsive pedagogy benefits any classroom in which it is implemented, especially classrooms where the student demographic majority and educator are of differing cultural backgrounds (Le & Matias, 2018). Over the past two decades, American schools are becoming more and more diverse in student population.

From 2000 to 2017, the percentage of White students sunk from 61% to 48% (NCES, 2020). The percentage of Black students fell slightly while the percentage of Hispanic students rapidly increased from 16% to 27% (NCES, 2020). Incremental increases of students in various cultures or mixes also occurred over the same period (NCES, 2020). From censuses and demographic modeling, experts are predicting that over the next decade the trend of a balancing of racial diversity will continue to occur. While diversity of the student population is growing in the United States, the cultural construction of workers in the education field is predominately monoethnic. More than three-quarters of educators are White. A large percentage of science educators are teaching student demographics that differ from the educators own cultural background.

Borrowing from Le Chatelier's Principles (Ebbing, 2005), if the desired product is student achievement and social reform, then the reactants of teachers, curriculum standards, and students require a catalyst in the form of culturally responsive education to drive the reaction to create students that are active, productive members of the global society. The need for culturally responsive education in science is growing and, while the field is in a stage of infancy, several research-validated methods have been established.

Practicing Culturally Responsive Science Education: Reality Pedagogy

Reality Pedagogy is one research-validated practice of culturally responsive pedagogy that can be implemented in a classroom to legitimize what counts as science and how to assess the artifacts submitted (Emdin, 2016a). Assembling a Reality Pedagogy realm requires the formation of five foundational blocks. Each block supports all activities and artifacts implemented in science pedagogy. Emdin fondly refers to these five foundational blocks as the Five C's of Reality Pedagogy (Emdin, 2016b). The composition of the Five C's of Reality Pedagogy is: cogenerative dialogues, coteaching, cosmopolitanism, context, and content.

Cogenerative Dialogues

The first of the Five C's is cogenerative dialogues, or commonly abbreviated as cogens. "Cogens occur with the goal of reaching collective decisions about the rules, roles, and responsibilities that govern students' lives (Roth, Tobin & Zimmerman, 2002) and lend themselves to discussions with students about the inhibitors to their engagement in the classroom." (Emdin, 2016b). Removing inhibitors is critical to encouraging growth of all students in scientific knowledge, including those of minorities who are underrepresented in scientific fields. Minority groups in the United States such as Hispanics possess a lower percentage of employment in scientific fields than the corresponding percentage of Hispanics in the United States population demographic (Funk, 2019). Creating and infusing belief in minorities that science is an achievable field to craft a living in is one such barrier that can be broken down. While this barrier can be addressed in a cogen, cogens are more useful to the educator in order to formulate a classroom model that positions the students to best relate with scientific concepts (Emdin, 2016b).

By periodically meeting with a rotating group of students, the teacher receives honest, relevant feedback as to how the students are interacting with the material being presented in the class. Cogens create sounding board for future lesson plans, allowing the educator to maximize the time spent in the classroom with students (Emdin, 2016b). Understanding the culture of the students, how students best learn, receiving honest feedback on class structure, and planning for future lessons that engage the students' interest all are established benefits of implementing cogenerative dialogues in science.

Coteaching

The process of coteaching involves pairing a novice teacher with an experienced teacher from the culture in which the novice teacher is placed (Emdin, 2016b). Performing an understudy with an experienced teacher provides insights as to common misconceptions about science held by students. For example, some of the most challenging science topics to introduce are those where science terminology possesses alternate meanings in the surrounding community culture (Hayden, Singh & Baird, 2019). Expanding the vernacular definition of words such as compound, speed, energy, and classification to include a science-specific definition to pre-established applications of the word was accomplished with strategic lesson planning. The wealth of experience gained from the coteaching process greatly eases the growing pains of a novice science teacher.

From personal experience while teaching in a high-needs, urban school the past year, I was paired with an experienced teacher that was well-versed in the culture of my placement. The experienced teacher helped guide me to awareness of a myriad of nuances of the community I was working for and with. In one such instance, I had accidentally scuffed the side of one of my student's shoes, which was a new shoe, while walking past him in the classroom. After issuing a quick apology and proceeding on with the task at hand, I noticed that the student was still visibly distraught over the ordeal.

At the end of the day, I asked the experienced teacher that I was working with about the situation. She proceeded to inform me that shoe fashion was extremely important in the African American culture that we were working in. Not wanting to have the shoe scuff become an inhibitor to the student from being open to interact with science, I privately pulled the student aside the next day before class. After apologizing to the student again, I demonstrated interest to the student about shoe culture and gave him opportunity to share about the specific shoe he selected. While listening to the student, I was able to reciprocally share a link between the knowledge he was sharing about shoes and science. A relationship with a student was saved because of the insight of an experienced teacher through coteaching.

Cosmopolitanism

No matter what path in life an individual takes, at some point the individual must be able to function in a team setting. More than likely, students have already experienced a myriad of encounters in which they were required to work together. Utilizing the basic human desire to feel appreciated and possessing a need to belong, cosmopolitanism translates psychology to the classroom (Emdin, 2016b). Cosmopolitanism is an excellent tool for conveying worth and value to members of a classroom community through establishing roles for students in a classroom. By assigning essential classroom duties such as a Safety Specialist for labs to ensure all students receive a pair of safety glasses, Materials Experts to deliver lab equipment to and from storage locations and lab tables, or Data Analysts to chart class results, students are placed in positions of responsibility. Unique roles for group assignments and project-based learning activities can be designed for each group member, conveying the cardinal value of each student in the team (Elmesky & Tobin, 2005). Creating an atmosphere in which each student feels treasured and that the class cannot function without them generates strong engagement in science.

Context

Traditional science artifacts such as laboratory equipment, tools, charts and tables, or simulations while at first glance are sound pedagogical materials; however, these science artifacts may not be the most applicable or relatable to students' experiential knowledge. Context is the method of providing relevant artifacts to students from their culture that enhances students' pedagogical experiences in science (Emdin, 2016b). As science constructs and manipulates all that we can see or interact with, providing familiar context for students to interact with develops a deeper understanding of how their surrounding environment functions. Employing artifacts of familiar context confirms the usefulness of the content studied for students. Chemically analyzing hair styling products, experimentally calculating friction using dice and sporting equipment, or testing favorite snack foods for energy are just some examples of potential items found in students' lives that can be used to generate context. Finding artifacts from students' past experiences that provide relatable science context for the culture the educator is placed in may initially be challenging. However, this challenge helps grow the educator's perspective and expertise in their scientific field, resulting in engaging lessons for the students.

Content

Content is not strictly the science material but rather the creation of a classroom mindset. In this mindset, the teacher displays the fact of not possessing an infinite knowledge of science and the students are encouraged to explore and discover science material with the teacher together (Emdin, 2016b). Displaying a willingness to identify with and assist students in mastering science builds a setting where the student can witness the teacher's authenticity and genuine interest in their development. Demonstrating that science is not about one person holding all the answers and others absorbing and regurgitating the information, but rather a group discovery and validation of situational truths spurs on cognitive adventures for students. Through modeling, the educator shows that failure is part of the discovery process and that experimentation holds the key to unlocking new connections, inventions, and scientific principles.

Expressing openness and vulnerability as an educator while demonstrating qualification as a subject matter expert builds trust, excitement, and engagement in the classroom. While questions such as, "Do black holes have gravity?", or "How far down can you drill into the Earth's surface before overheating?" are not convenient to answer while guiding the class through a lesson about air resistance, quickly redirecting students permanently away from their questions conveys the aura that the students' thoughts do not matter. If the answer to the question is unknown at the present or if time is limited, one potential option is to utilize the research-proven technique of the Wonder Wall. The Wonder Wall captures the curiosities of students and encourages problem-solving collaboration in the classroom (Driscoll, 2007). Acknowledgement of the students' questions demonstrates the inherent value of each student and their thoughts. Ignoring or insensitively dismissing any form of scientific thought belittles the individual and propagates a negative disposition by the student toward the teacher and subject.

Conclusion

The Five C's of Reality Pedagogy are just one research-validated method for implementing a science pedagogy that is culturally responsive. Studies have shown the benefits of implementing Reality Pedagogy (Ramirez, 2018) and culturally responsive education (Goff, 2012) in science pedagogy. While no conclusive evidence has been provided yet that strongly correlates grade performance improvement with Reality Pedagogy, an increased understanding of the nature of science and a mastery of connecting science to everyday life has consistently been demonstrated in comparison to control groups (Borges, 2016). At a macroscopic level, the absence of culturally responsive science pedagogy can yield a loss of cultural identity resulting in students feeling alienated from their home culture and environment. Alternatively, the absence of one's home culture in science leads to the rejection of science by some ethnic groups (Lee, 2017). Scientific advancement is curtailed when culture is not included in formal or alternative assessments (Banks, 2004).

Much like the pyramid of Bloom's Taxonomy, if the base cultural needs of a student are not met, the foundation is missing on which to build the content and cognitive skills of a student. It is the students' surrounding environments, their

culture, that provide physical proof and building blocks for scientific concepts. Students are able to intrinsically recognize when science pedagogy is personalized to their experiences. After completing a Chemistry course that was culturally responsively designed, one student stated:

> It was kind of like looking at chemistry from a different angle, and it was looking at it like— we don't have to sit there with a textbook, we can think about how things were in the past, how it relates to now, and that there isn't just one way to look at chemistry. (Goff, 2012)

This is when science comes to life. Providing a culturally relevant, engaging science pedagogy may require additional time to construct, but will save the educator time in the long run by reducing the need for classroom management interventions.

As the student demographic continues to increase in diversity, so do the pedagogical content and artifacts needed to align with the demographic. Whether the student body and teacher are of the same ethnic or cultural background or not, culturally responsive education enhances the interaction of the student with science. For Preston, once he was stimulated through connecting science content to his love for animals, his enjoyment with science was a night and day difference to observe. Reality Pedagogy allows educators to meet students where they are at and help guide students to achieving their goals. Simply teaching content without considering culture is too low of a bar to set in science.

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The Effect of Project-based Learning on Student Motivation and Collaboration in Science

Brooke Heuerman

Abstract: Project-based learning (PBL) is a fairly new teaching strategy that is being used today. This strategy includes the use of projects to create an immersive environment for students to learn. Students are involved in the material and are required to use critical thinking skills to solve the problems given by the teacher. Students in the science classroom can often become disengaged in the material and project-based learning can be used to help increase motivation. This article discusses the positives to incorporate project-based learning in the classroom and how project-based learning increases student motivation and collaboration in the classroom.

Introduction

The science curriculum is full of opportunities for teachers to immerse students in the material through hands-on and interactive projects. So why are teachers so afraid to use projects in the classroom? As long as education has been around, the form of lecturing to students has been a standard way to teach material; but if you look around the classroom at students during a lecture in science, engagement in the material is the last thing you will notice. I have seen students use lecture time to work on other assignments for other classes, scroll through their Instagram feed, or catch up with their best friend about what their plans are for the weekend. I do not think lectures should be ruled out entirely, but there is so much more to learning than watching a teacher stand at the front of the room and talk while the students are forced to sit and listen especially in a junior high classroom, I noticed these activities because students had a hard time focusing on what the teacher was saying. Junior high students are at an age where they are still excited to come to school, until they get into a class where the teacher is lecturing every day, and then the boredom is written all over their faces. Project-based learning can be used to keep our junior high kids excited in the classroom, and ready to take on the day.

So, what exactly is project-based learning? Project-based learning is a type of immersive teaching style that involves students in their own learning. Students are encouraged to ask their own questions about the material and then find the answers through immersive activities that promote collaboration and deep-thinking skills. Through the use of labs in a science classroom, we as teachers can submerge the students into the material by allowing them to perform the labs themselves. Project-based learning fosters critical-thinking skills and uses group work to strengthen communication and collaboration skills between students. I have seen this teaching style work in my own classroom experience, and I encourage every science teacher I meet to use this type of learning in their own classroom. Through the use of project-based learning, students show more motivation to learn and become stronger in their collaboration skills in a junior high science classroom.

Project-based Learning and Motivation to Learn Science

Student motivation to learn is an important aspect of teaching. When students come to class prepared and excited about the material, their motivation to learn might increase. Teachers can incorporate activities that promote motivation in the classroom. Through the use of project-based learning, students show an increase in motivation to learn and engage in the material because they have a voice in how they work with the material and choose what questions they want to answer. There is an abundance of literature that supports this idea. In a study performed by Bartscher et al. (1995), the goal was to see how project-based learning impacted student motivation. They found that intervention positively impacted student motivation to complete homework (Bartscher et al., 1995). The students in the study were more willing to complete the homework because they enjoyed what they were doing in the classroom and took that enjoyment home when working on the homework assignments.

Looking forward, it is important to see whether students' motivation increases when they are having a higher sense of interest. Project-based learning gives students a higher sense of autonomy because they are the ones asking the critical-thinking questions and then answering them through the research they perform throughout the project. According to another study, PBL group's "sense of interest" median scores increased showing that PBL produces a more positive view of the subject matter" (Selcuk, n.d.). The researchers from this study looked at classrooms of teachers that were veteran teachers. These teachers had been teaching for a long time and as a veteran teacher, most times the teachers have tried various ways to increase motivation and student engagement. It is interesting that the students continued to increase their motivation to learn after trying this new learning style. This shows that project-based learning can be a positive source to increase student motivation.

How Student Motivation Changed When I Used PBL In My Student Teaching Classroom

In my student teaching experience, I worked with a student who was initially very quiet in the classroom. We can call this student Sally. Sally would typically sit in the back of the classroom and would become easily distracted while taking notes and during the lecture portion of classes. This case reminded me a lot of what I have seen in junior high science classrooms. Even though I was new to education and teaching in the classroom, I knew I wanted to try project-based learning to see if it would have a positive impact on Sally.

I used project-based learning to teach a unit in my student-teaching classroom, and after a few days of working in groups, I saw Sally really come out of her shell. She started working with the other students more, was more engaged in the material, and was participating more in class. Sally would come to class with questions about what we were learning about, and occasionally the questions were off topic, but I did not mind answering them because she was on topic more than before. She worked well in groups and was volunteering herself to help with certain aspects of the project. She would dive into the project without instruction from her other group members. I started to see Sally take initiative for her learning experience. I be-

lieve project-based learning helped Sally become more motivated in the classroom and helped her connect with the material. Before project-based learning, Sally would come into class quietly and take her seat, then get ready for the class. When we were doing project-days, she came into class excited and asking, "When can we start?" I saw project-based learning transform the learning experience for Sally. Lastly, not only did her motivation increase, her achievement scores increased as well.

Project-based Learning and Its Effect on Collaboration Among Students

A second aspect of teaching that is important is the fundamental idea of collaboration. Collaboration might not deal directly with the science curriculum, but it is a core principle that is important for students to learn and become familiar with. Students will use collaboration in their everyday lives and to teach this skill is very important. Project-based learning encourages group-work and therefore fosters an environment that is productive in teaching good collaboration skills. In a study by Tamim and Grant (2013) used PBL to teach their students how to function in a group setting, communicate, and resolve conflict effectively. The teachers invested in the knowledge building process and also spent time cultivating skills that helped their students become successful team members (Tamim & Grant, 2013). Teaching the curriculum is important, but also teaching students life skills is important. As teachers, we are helping students find themselves and learn how to work cooperatively with their peers. Project-based learning enforces this life skill by pressing students towards a group setting.

There is overwhelming support for collaboration through the use of project-based learning in the literature. Asghar et al. (2012) noted that PBL encourages collaborative problem-solving and interdependence in group work (Asghar et al., 2012). When students work in groups, they have to learn to rely on each other. Working together is imminent and if the students do not work as a group and come together to solve the problem together, they will have a hard time achieving the goal the teacher is wanting them to achieve. This study shows that project-based learning encourages the interdependence between the students and teaches the life skill that it is important that other students know they can count on you. As teachers, we can use project-based learning to achieve the higher-level of learning while also teaching the students very valuable life skills.

How Collaboration Among Students Changed When I Used PBL In My Student Teaching Classroom

During my experience student-teaching I encountered another time when project-based learning positively impacted a student. We can call this student Sam. Sam was another student I worked with that was quiet and did not interact with many other students. I noticed he tried to make friends with other students a few times, but he was often left out of the group. He was a very good student who worked hard and applied himself to class often, but when it came to group work, he was always coming to me saying he did not have a partner. Collaboration skills are important and the

ability to work effectively in a group setting will help students as productive citizens in their future careers.

When I decided to use project-based learning in the classroom, I put the students in groups and strategically placed Sam in a group that I felt was a good fit for him. Interacting with the other students was tough at first for Sam but he came around more towards the middle of the time they were working in groups. After assigning him to a group, I noticed that the students started to work really well together. I saw the students collaborating well, solving problems together, and Sam was becoming friends with the other students. Sam started to speak up more towards the end of the project and I saw the other students listening to his ideas. Sam learned how to communicate his ideas to the other students and his communication skills improved. I have seen first-hand project-based learning can influence a sense of community in the classroom and encourage collaboration among the students.

Reservations to Using Project-based Learning

Project-based learning is a great tool for teachers to use but it is important to note that it may not be the right tool for every classroom. There are many classrooms where project-based learning just does not work and is not the best way to engage and motivate students. There are also downfalls to project-based learning that I would like to discuss. The first downfall is that project-based learning takes a lot of time and effort for teachers to plan. This style is not a style I would suggest implementing halfway through the year. This style takes a lot of planning and outside-of-class time to prepare. The teacher must give themselves enough time to plan this style of learning.

A second downfall for project-based learning is that it takes a lot of support from other teachers, administrators, and parents. Teachers should be trained on project-based learning before they implement it in their own classroom (Sage, 1996). Project-based learning is a fairly new style of teaching and there can be hesitation from parents and administrators when using this style of learning. The teacher needs to be confident in their style of teaching and know that this is the best style for them to use with their students. It is important that teachers can back up their claim for the use of project-based learning, and they can do this by referring to the literature on the topic as well as assessment scores.

Conclusion

Although there are reservations against the use of project-based learning, there are far more positives to using this style of learning in the classroom. Although, I have only touched on two reasons to use project-based learning, there are many more. There is an abundance of literature to support project-based learning and the influence it has on student motivation and collaboration among students. Motivation increases when students have individual choice in their learning and can see why the material is important to them. When students are immersed in the material through hands-on learning instead of sitting and listening to a lecture, the students are more likely to remain engaged. Students want class to be "fun" while they learn, and project-based learning can make this happen. The influence project-based learning has

on collaboration is also important to remember. Collaboration and interdependence are life skills that will be important for students to learn for the future. These are skills that students will use in a future career and project-based learning addresses these skills by encouraging group work. Does project-based learning make sense for science? Yes, because students can work together to solve problems and find results through labs and activities. Junior high science classrooms should be full of project-based learning activities to promote motivation and collaboration.

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Problem-based Learning for Students with Learning Disabilities in Science Classrooms

Haley Meek

Abstract: Problem-based learning (PBL) methods are the standard in modern science education and provide hands-on, interactive learning experiences. Additionally, modern education practices encourage the inclusion of students with learning disabilities in general education classrooms. It is therefore important for science educators to understand the benefits of PBL and strategies for making these activities accessible to all students including those with learning disabilities. PBL methods have positive effects on academic achievement, student engagement and attitudes, classroom environments, self-efficacy, and social skills for both students with learning disabilities and general education students in the science classroom. When the proper supports and scaffolding are provided, students with learning disabilities are able to fully benefit from PBL approaches in the science classroom.

Introduction

Like the field of science itself, science education is ever changing to keep up with new discoveries and explanations of natural phenomena. In modern science classrooms instructional methods have shifted from lecture-dominated approaches to a focus on hands-on and interactive learning experiences (Treagust & Peterson, 1998; Gallagher et al., 1999; Slavin, 1999; Greenwald, 2000). Problem-based learning (PBL) methods perfectly encapsulate this idea of hands-on, interactive learning approaches and are often a central part of science education. This educational approach has become more and more popular in all content areas and is now considered the standard in science education (Treagust & Peterson, 1998; Gallagher et al., 1999; Slavin, 1999; Greenwald, 2000).

In science classes, PBL drives inquiry and critical thinking in addition to supporting a classroom community of science learners, which is emphasized in the Next Generation Science Standards (2013) created for science education. Additionally, there is a growing focus in modern science education on developing scientific literacy which involves gaining and using scientific knowledge in order to identify important questions, explain observations, and make conclusions about scientific issues based on evidence (OECD, 2006). Collaborative PBL approaches are useful in developing scientific literacy in students because they encourage students to engage with real-world issues to understand the nature of science and how it interacts with the world they live in (OECD, 2006).

Similar to the changes that science education has gone through over the years, the education of students with learning disabilities has also gone through major changes. Whereas once the common educational approach for students with learning disabilities was to separate them from general education classrooms, the Individuals with Disabilities Education Act (2004) encourages the education of students with learning disabilities in a least restrictive environment. This means that students with learning disabilities should be educated in general education classrooms

as much as possible in order to promote not only academic achievement but also positive social skill development (Individuals with Disabilities Education Act, 2004). It is therefore the duty of educators to ensure that all students in their classrooms, including those with learning disabilities, learn and master the content to the best of their ability. Due to the importance of ensuring a high-quality education in a least restrictive learning environment, it is of value for science educators to examine the relationship between PBL in science classrooms and students with learning disabilities. To examine such a relationship it must be asked: How can science educators ensure that students with learning disabilities benefit from PBL approaches in a science classroom?

Although PBL approaches are widely accepted in science education, is it possible that students with learning disabilities are somewhat excluded from the benefits of these techniques, and if so what kind of strategies can educators use to ensure this kind of exclusion does not happen in their classrooms? Is it possible that students with learning disabilities are not able to fully contribute to PBL activities and therefore do not fully benefit them? To avoid possible exclusion of students with learning disabilities, it is important for science educators frequently using PBL approaches to learn more about the relationship between these educational methods and these students so they can ensure all of their students fully benefit from this types of learning.

This article seeks to answer the previously mentioned questions on common science educational approaches and students with learning disabilities. It will examine what PBL is and explain the benefits of this technique to students with learning disabilities. It will also provide useful strategies for PBL activities for students with learning disabilities in science classrooms. By examining these aspects of PBL methods, this article will provide solutions for how science educators can ensure that all of their students, including those with learning disabilities, are able to benefit from these common learning approaches in a science classroom setting.

Problem-based Learning

Problem-based learning in science classrooms is described the National Research Council (2003) as: "activities of students in which they develop knowledge and understanding of scientific ideas, as well as an understanding of how scientists study the natural world." (para. 1). This instructional technique is thought to be extremely effective in developing critical thinking skills and is based off of the "5 E's" model of learning in which student engagement, exploration, explanation, elaboration, and evaluation are heavily stressed (Bybee, 2006). Additionally, PBL has been heavily influenced by the ideas of educational philosopher John Dewey. Dewey (1938) believed that learning how to problem solve is how to learn, and PBL is centered around this idea of learning by doing and experiencing.

Problem-based Learning and Students with Learning Disabilities

The learning disabilities present in special education students found in general education classrooms vary greatly in their presentations and needs (Elliot, 2000). Some of these students have language-based difficulties, difficulties with attention and

concentration, issues with knowledge organization or self-regulation, or problems using cognitive strategies for problem solving (Elliot, 2000). Additionally it has been noted that a lot of general education teachers have historically doubted the abilities of students with learning disabilities to meet the requirements of problem solving and inquiry learning that are central to science education (Sullivan-Palincsar et al., 2001). Therefore due to the challenges facing students with learning disabilities and the perception of the abilities of these students, it is important to determine whether or not PBL techniques are compatible with these students in the context of a science classroom.

Many studies have examined the association between PBL and academic achievement in students with learning disabilities. The majority suggest that PBL instructional approaches have a positive effect on academic achievement in students with learning disabilities (Scruggs et al., 1993; Barron et al., 1998; Fillippatou & Kaldi, 2010; Abels, 2014; Han et al., 2014). One such study by Scruggs et al. (1993) focused on the effectiveness of using PBL approaches compared to textbook-based approaches in science classrooms for students with learning disabilities. It was found that on average, the students with learning disabilities scored higher on content knowledge after being taught using the PBL method (Scruggs et al., 1993). Additionally, researchers documented that the students preferred the PBL method and wanted to do that type of learning again (Scruggs et al., 1993). A potential explanation for the positive effect of PBL on academic achievement in students with learning disabilities is that these approaches focus heavily on learning by doing and discussing rather than through reading, which is an area that many of these students struggle in (Scruggs et al., 1993; Elliot, 2000).

Another aspect of PBL that is often discussed is the effects on engagement and attitudes towards learning in students with learning disabilities. PBL is thought to be an effective way to engage students with learning disabilities (Filippatou & Kaldi, 2010). In fact, engagement in students with learning disabilities increases as a result of the implication of PBL activities and students have a more positive view of learning when these techniques are used (Barron et al., 1998; Wurdinger et al., 2007; Filippatou & Kaldi, 2010). It is often found that students with learning disabilities prefer a style of teaching using PBL and see a high value in the tasks they are assigned during these activities (Filippatou & Kaldi, 2010).

In addition to effects on academic achievement and engagement, the relationship between self-efficacy and PBL is important to consider regarding students with learning disabilities. It is widely stated that students with learning disabilities often exhibit lower self-efficacy in academics than students without these disabilities (Hampton & Mason, 2003). This is likely due to the fact that students with learning disabilities often have fewer successful academic experiences, less support from teachers, and less access to information or successful models of peers with learning disabilities (Hampton & Mason, 2003). There is a strong suggestion that PBL instructional approaches increase self-efficacy in students with learning disabilities (Barron et al., 1998; Wurdinger et al., 2007; Filippatou & Kaldi, 2010; Abraham et al., 2011; Abels, 2014).

It has also been observed that collaboration during PBL activities helps with the social acceptance of students with learning disabilities by their peers (Gillies & Ashman, 2000). Social skills can sometimes be additional obstacles to students with

certain learning disabilities and these students can often feel ostracized or unaccepted in general education classroom settings (Elliott, 2000). The use of collaborative PBL approaches can help mitigate social skill issues for students with learning disabilities (Morocco et al., 1990; Matlock et al., 1991; Gillies & Ashman, 2000; Filippatou & Kaldi, 2010). It is widely thought that the benefits of collaborative PBL in science classrooms on both academic achievement and social skill development is due to interactions between students with learning disabilities and general education peers that provide feedback and clarification to help build understanding (Gillies & Ashman, 2000). It is also suggested that non-learning disabled peers are sometimes better able to explain concepts or activities in language and terms that can easily be understood by students with learning disabilities better than their teachers (Filippatou & Kaldi, 2010).

Problem-based Learning Strategies for Students with Learning Disabilities

Once the question of whether or not problem-based learning strategies are truly beneficial to students with learning disabilities has been evaluated by science educators, it is important to examine different strategies for implementing these techniques. Research suggests that PBL approaches are effective ways to engage students with learning disabilities in the content but makes note of the importance of special strategies for students with learning disabilities, such as differentiation and scaffolding (Fillapitao & Kaldi, 2010). The implementation of such strategies should be beneficial not only for students with learning disabilities but for all students participating in these activities in the science classroom.

Many sources of literature on the topic stress the importance of the inclusion of special needs students in science classrooms and providing the proper supports in order to allow them to succeed in PBL activities (Barron et al., 1998; Häkkinen, 2003; Banchi & Bell, 2008; Abels, 2014). Due to the fact that inclusion is an important focus for making PBL activities accessible to students with disabilities, a lot of strategies are suggested to achieve proper inclusion and make these activities successful. One such strategy is the use of scaffolding. When scaffolding is used (along with proper teacher training), a positive learning environment is achieved and all students, including students with learning disabilities, are able to increase their scientific literacy and gain a deeper understanding of the content (Barron et al., 1998; Abels, 2014).

A common scaffolding strategy for PBL approaches in the science classroom is known as structured guided inquiry. This manner of scaffolding is used either before the PBL activity is implemented to prevent misunderstandings and confusion or during the activity when students appear to encounter difficulties to help avoid failure in the activity (Häkkinen, 2003). When using a structured guided inquiry approach, teachers provide the questions and procedures for the activity (Banchi & Bell, 2008). It is then up to the students to generate explanations that they support with evidence they collect during the activity itself (Banchi & Bell, 2008).

Another slightly more advanced way that structured guided inquiry can be used in the science classroom is with research questions. In this type of PBL activity, the students are given a specific research question by the teacher and asked to plan their

own methods and/or design their own experiments in order to answer the question (Banchi & Bell, 2008). This method of structured guided inquiry is slightly more difficult but provides students opportunities to act like real-world scientists and actively participate in the scientific method (Banchi & Bell, 2008). This type of scaffolding in PBL activities has benefits for both general education students and students with learning disabilities because it establishes clear goals and provides guides for students to follow during the activity (Häkkinen, 2003; Banchi & Bell, 2008).

Although scaffolding would appear to be one of the more important strategies in ensuring that PBL activities are effective for all students in a science classroom, there are a few other strategies that have been suggested in the literature. When specifically focusing on strategies for students with learning disabilities, there is an emphasis on varying instructional strategies through differentiation and employing consistent behavior management strategies in the classroom (Morocco et al., 1990). It is also suggested that heterogenous grouping of students during PBL activities is more beneficial for students with learning disabilities rather than homogenous grouping which tends to favor the learning success of already high-achieving students (Chen et al., 2008).

Finally, the literature implies that teacher attitudes can have an effect on the success of PBL activities (Lumpkin, 2007). Having a positive and supporting attitude can be an effective strategy for a teacher to use during these types of learning activities (Lumpkin, 2007). All students, especially students with learning disabilities, are more motivated, persistent, and put forth more effort when they view their teachers as not only supportive but also as caring (Lumpkin, 2007). These changes in effort, motivation, and persistence lead to an increase in the academic success of all students (Lumpkin, 2007).

Conclusion

Based on the information provided in this article, it would appear that problem-based learning approaches have a large number of benefits for not only students with learning disabilities, but all students in a science classroom. PBL methods have positive effects on academic achievement, student engagement and attitudes, classroom environments, self-efficacy, and social skills for both students with learning disabilities and general education students in the science classroom (Scruggs et al., 1993; Barron et al., 1998; Gillies & Ashman, 2000; Akinoğlu & Tandoğan, 2007; Wurdinger et al., 2007; Baran & Maskan, 2010; Chung, 2010; Fillippatou & Kaldi, 2010; Kaldi et al., 2011; Abels, 2014; Han et al., 2014; Hugerat, 2014; Khaddage et al., 2016; Huysken et al., 2019). It can therefore be concluded that students with learning disabilities are able to fully benefit from PBL approaches in the science classroom as much as, if not more than, their non-learning disabled peers when supports are provided. With this conclusion in mind, it is important for science educators to recognize the benefits of these learning approaches and to provide the proper supports, scaffolding, and differentiation to ensure that all of the students in their classrooms are able to achieve.

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Adaptive Primary Literature
Disciplinary Literacy in a Science Classroom

Mack Pidgeon

Abstract: Literacy is a fundamental part of a student's success and within the science classroom, yet science teachers do not take the time to teach content area literacy. Disciplinary literacy (DL) offers a meaningful way for science teachers to teach literacy instruction without sacrificing content instruction. One form of disciplinary literacy that is useful is Adaptive Primary Literature (APL). Textbooks in science classrooms often portray scientific phenomenon as absolute fact, without providing evidence to support the claims. This portrayal of information leads to a gap in the language of science used by professionals and the language of school science. Adaptive Primary Literature helps bridge the gap between the two. This paper reviews the need for DL and APL in science classrooms.

Introduction

Adaptive primary literature is a disciplinary literacy strategy that offers an effective way to incorporate meaningful literacy instruction into a content area classroom while also addressing the gap between the language of science and the language of school science. Reading and writing is not only beneficial in the classroom, but it also has implications beyond school as well. Yet so many students are not writing at grade level (Persky, Daane, & Jin 2003). Therefore, it is important that literacy is not just taught in English classrooms but throughout the school day. Content area teachers are not incorporating content area literacy practices, or instruction used to teach students general literacy skills, into their lessons because it takes away from subject specific teaching. Several disciplinary literacy strategies have emerged for use in the science classroom. One such strategy is adaptive primary literature. Adaptive primary literature involves rewriting primary source science journals to meet students' reading levels while maintaining the integrity of the language of science. Language of school science is often matter of fact without evidence, while the language of professional science is inquisitive and provides evidence. By rewriting science articles, adaptive primary literature is a strategy that closes the gap between the two science languages. This paper will review the difference between disciplinary literacy and content area literacy, answer why disciplinary literacy is important, and discuss adaptive primary literature as a means to incorporate disciplinary literacy into the science classroom.

Disciplinary Literacy and Content Area Literacy

When defining disciplinary literacy, an important distinction to make is the difference between disciplinary literacy and content area literacy. Content area literacy instruction has been around longer than disciplinary instruction to improve student reading and writing skills. When disciplinary literacy emerged as a strategy, the two meanings became confused (Shanahan and Shanahan, 2012). While both are a

means for teaching literacy the two are very different from one another. So, what are the primary differences?

Content area literacy focuses on the skills needed to learn from texts across all subjects. Content area literacy encompasses both vocabulary instruction and comprehension skills. Vocabulary instruction includes teaching students how to use mnemonic devices, and matching meanings to words. Comprehension instruction includes teachings students how to summarize, question, self-monitor, and visualize while reading (Shanahan & Shanahan, 2012). These comprehension and vocabulary strategies are effective for all subjects and, no matter the content, all subject area teachers should dedicate a portion of instruction to these strategies.

In contrast, disciplinary literacy instruction teaches the conventions of communication specific to that discipline. These are skills that cannot be used in all subjects. Comprehension and vocabulary instruction in disciplinary literacy varies subject to subject. In science, comprehension instruction includes teaching how to read and write the parts of a scientific paper, argumentation and sensemaking. While vocabulary instruction teaches students how to find relationships between vocab and analyze Latin and Greek roots to decipher meaning (Shanahan & Shanahan, 2012).

Content area literacy proved to be a successful teaching strategy however, it did not catch on in schools (O'brien et al. 1995). The biggest issue being that content area teachers did not adopt these practices into their teaching because it took away from content instruction. Content area literacy also falls short of teaching the true nature of communication within the discipline. Disciplinary literacy on the other hand, offers a more meaningful reason for content area teachers to incorporate literacy instruction into their everyday lessons (Shanahan and Shanahan, 2012).

Why Disciplinary Literacy?

Before we discuss the specific of adaptive primary literature and its usage, we need to answer why should science teachers adopt disciplinary literacy into their instruction? First, disciplinary literacy offers content area teachers a meaningful way to incorporate literacy instruction into their daily lesson plans. Second, disciplinary literacy, when compared to traditional science education, gives students a more authentic science learning experience that teaches the fundamental skills within science.

Even though teachers might see the value of content area instruction, teachers may not see the usefulness of it for meeting their instructional goals (O'Brien, 1995). Content area literacy is not addressed in the standards and therefore teachers are not motivated to teach them. The mindset then becomes, teaching reading skills is "not my responsibility" among content area teachers, despite the fact that these skills have been shown to increase literacy and helps students build skills to monitor their own learning. In contrast, disciplinary literacy addresses skills mentioned in content standards. For example, the Ohio Learning Standards and Model Curriculum (2018-19) states that for grades 5-8 students must use various scientific processes including, analyze and interpret data, recognize and analyze alternative explanations, and think critically and logically to connect evidence and explanations. These and others mentioned by the Ohio New Learning standards are all skills that

can be addressed through incorporation of disciplinary literacy practices into science instruction.

This inclusion of application and inquiry skills across several grade levels in the Ohio Standards is a long-term investment in helping students' science achievement levels. In science, teaching scientific literacy skills throughout the year, helps build students' literacy skills to be used in all eight science disciplines taught within the Next Generation Science Standards (NGSS) (Drew et al., 2017). Therefore, science teachers can be confident that teaching literacy skills during a physics unit will also include relevant skills that students need in a biology unit. This provides the additional motivation for science teachers to include literacy instruction into their daily lesson plans.

The need for the long-term investment in disciplinary literacy during a school year and across grade levels is because scientific literacy in its fundamental sense, includes being fluent in the language, discourse, and communication systems of science. However, as it is traditionally taught in the classroom, scientific literacy is about learning the known facts of science by using a textbook (Norris & Phillips, 2003). The largest problem with this is that it ignores the process of science that occurs within the unknown. In practiced science, researchers are not finding questions to known facts that could be read in a textbook. They are finding answers to the unknown and accepting the answer that science produces until future science proves something different. Disciplinary literacy strategies, such as the science writing heuristic discussed later in this paper, engages students in this process of science that requires them to develop the skills needed to discover the unknown.

The other aspect of scientific literacy that traditional science education fails to recognize is the social dimensions of science that play a role in why we research different topics (Sørvik, et al. 2015). To adequately teach students scientific literacy, we must allow students to explore socially relevant questions with unknown answers important to them. The use of such techniques has shown to increase student autonomy and take responsibility in their own science learning (Ippolito et al. 2018). If students are asking questions that are meaningful to them and discovering answers on their own, the learning becomes that much more important when compared to learning trivial textbook fact.

Adaptive Primary Literature

Reading literature is an important practice in the professional science community. However, the primary reading in a science classroom comes from a textbook. Linda Phillips (2009) demonstrated the stark contrast between the language of science and the language of school science by analyzing journal texts and school textbooks. Phillips (2009) concluded that textbooks present statements as fact and rarely present proof while scientific journals are primarily argumentative in nature. She then pointed out that this has led to weaknesses among high school and college level science students. Students tend to interpret journal articles with absolute certainty, misinterpret the role of some statements in scientific reasoning and wrongly explain the meaning of the evidence from what they read. How do we bridge the gap between the language of science and language of school science?

Adaptive primary literature (APL) keeps the argumentative format of scientific articles but can be understood to K-12 students (Phillips & Norris, 2009). Teachers take primary literature on topics they are teaching and adapt the reading level to meet students understanding (Koomen et al., 2016). Many science teachers are not skilled at reading and interpreting the argumentative style of scientific articles themselves, however, working with primary literature helped teachers improve literacy instruction (Koomen et al., 2016). While working to produce APL products can improve literacy instruction and bridge the gap between language of science and language of school science, but there may also be reasons for concern. The APL products produced during the Koomen (2016) study were not all proficient at maintaining the meaning and the proper language discourse. Before teachers attempt APL, they should go through professional development to ensure integrity of literature adaptation. Teachers can also refer to the design guidelines laid out by Elon Langbeheim (2013). He discusses two design strategies for APL. The first is to make explicit the connection between theory and experiment. The second is to restructure the text to connect the theory to students' prior knowledge.

How to Read a Scientific Article

Kooman et al. (2016) lays out the framework and standards for how teachers should first read an article and then the standards for evaluating the quality of adaptation. This section reviews the most vital parts for science teachers to understand so that they may participate in APL. In order for teachers to participate in APL they must first know how to properly read a scientific article.

Step 1 – Understand the Parts of the Journal

The first step to reading a scientific paper is understanding the parts of the journal. In order, any journal will have an abstract, introduction, methods, results, and discussion. The abstract is a summary of the whole paper. It provides an insight to the reader on the need to read it. This saves many researchers time because reading the abstract lets them decide if the whole paper is relevant to them. A teacher can read the abstract to know if this article is worth adapting for their unit. Next is the introduction. This section discusses what is already known on the topic and what question is being asked. An introduction on a plant hormone study might discuss what is already known about the hormone of interest. Next is the methods. This section gives insight into how the study was conducted. The primary purpose of reading the methods is to discover techniques that have worked in prior science. Scientists will use this to create methods for their future studies. Following methods is the results. The results report the raw data and statistics produced by the study. The results will then be used in the final portion of the paper, the discussion. In the discussion scientists make meaning of the results. They can lay out implications and discuss what future studies need to answer. The important part to understand in a discussion is it must report the results accurately.

Step 2 – Read the Paper to the Depth that is Important to you

The second step of reading a journal is reading it to the depth that is needed for you. This starts with reading the abstract. Once you know if this will be relevant to your needs you can read the introduction and discussion. To better understand the discussion, one must reference the results section when needed. Finally, if reproducing part of the study you can go back and read the methods section.

Step 3 – Look at the Graphs and Figures

One way to quickly get a feel for the article is step three. That's reviewing the pictures and figures. They are there to make quick meaning of the results.

Step 4 – Ask Questions

Step four, one should ask questions. Some important questions to ask are, What questions does the paper address? What are the conclusions of this paper? What evidence supports these conclusions? Do the results support these conclusions? To what level do the data support these conclusions? How can you evaluate evidence? Lastly, why are the conclusions important? These are questions readers ask to make meaning from the text. Teachers can make sure students ask these questions when they read the rewritten literature.

Step 5 – Discuss with Someone

After asking all these questions one should discuss with someone else. Discussion is important part of science discourse. Step five is part of the scientific disciplinary literacy that is important to teach students as well.

Conclusion

Disciplinary literacy is a tool that content area teachers can use to incorporate literacy instruction into their everyday lessons without feeling like they are wasting time or taking a way from content instruction. In science, one of the primary reasons to incorporate disciplinary literacy is to help bridge the gap between the language of science and the language of school science. Adaptive primary literature is one of the ways teachers can do that. Teachers can familiarize themselves with the scientific journals and then select journals that are on topic to their unit. Using Kooman's science behind the scenes standards teachers can be sure to create a grade level journal article that helps students engage in the true language of science.

Utilizing adaptive primary literature should be taught to both preservice and in-service teachers. I would also like to see a data base of APL where teachers can share what they have already written and peer review each other using the Kooman standards. This would lessen the weight put on teachers to create all their own literature pieces.

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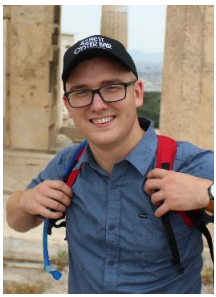

About the Author

Mack Pidgeon is certified to teach middle grades science and social studies. He believes that the most fundamental part to any classroom should be hands on learning that teaches skills necessary for adulthood. His future classrooms will consist of many simulations and literacy instruction.

Discussion of Disciplinary Literacy in the Science Classroom

Julie L. Szabo

Abstract: Disciplinary Literacy in the science classroom is often overlooked as part of a science curriculum. Instead, teachers focus on content area reading which is a generalized approach applied across all disciplines. This manuscript explores what disciplinary literacy is and provides a comparison to content area reading. It examines a supporting theory of disciplinary literacy and discusses science's distinction as a unique discipline. In addition, current implementations and recommendations for classroom utilization of the technique are addressed. We, as science educators, need to recognize the essentiality of science disciplinary literacy to appreciate why our profession may need guidelines regarding how to implement this method for the benefit of our students.

Introduction

The goal for science educators is for their students to attain complete comprehension in the material being taught. The discipline of science is vastly different from the others when considering vocabulary, sentence structure, syntax, and materials utilized. It is not enough that we simply teach the information in the science classroom with the same approach that it would be taught in English or social studies. For science students to understand the content, disciplinary discourse must not be neglected.

For some time now, content area reading has been the "hot topic" regarding how to tackle this conundrum. However, some educational experts claim that content area reading offers only generalized strategies across all disciplines. Herein may lie the downfall of content area reading. Students should not be learning social studies the same way they learn English or the same way they learn science. There are obvious differences. Yes, it is important to be able to read and comprehend information across content lines. However, thinking like a scientist is different than thinking like a historian. The techniques and approaches to texts and content are unique.

Enter disciplinary literacy. It is a teaching strategy tailored to the specific discourse required in each subject area. "The nature of the disciplines is something that must be communicated to adolescents, along with the ways in which experts approach the reading of text" (Shanahan & Shanahan, 2008, p. 51).

Initially, we, as educators, need to know what disciplinary literacy is and how it differs from content area reading. From this comparison, we can begin to decide if it is truly necessary to introduce yet another way to present, teach, and learn in science. Next, we must know if theory supports disciplinary literacy in science. Theory will help establish basal information in support of or against this push to a new means of teaching and learning. This is a way we, as educators, must complete our due diligence before implementation of new practices occurs in our classrooms.

Additionally, we need to determine what makes science education for children truly distinct. We must know what in the approach for science instruction differentiates it from other core disciplines. Finally, we must explore what fellow educators are doing to promote disciplinary literacy and how experts evaluate those practices.

Understanding Disciplinary Literacy in Science

Levels of Literacy

Considering three types of literacies in (Shanahan & Shanahan, 2008, p. 44) may help to understand what disciplinary literacy is. Sitting at the base is Basic Literacy which includes the building block of reading for elementary school students. It is where there is concentration on sight words and decoding. Next, Intermediate Literacy focuses on reading to learn instead of the learning to read while in upper elementary and middle school. Comprehension skills are taught and applied while different text types are introduced.

At the top level, Disciplinary Literacy emphasizes more specialized approaches to reading content within middle school and high school. The student no longer can apply how they read and use data in one subject area to the way they use it in another subject area. "In literacy development, progressing higher in the pyramid means learning more sophisticated but less generalizable skills and routines" (Shanahan & Shanahan, 2008, p. 45). Within this pyramid, we can see how disciplinary literacy in science would be more specialized based on its location in the pyramid. It builds on the other literacies, yet it must incorporate higher degrees of specific strategies than would be learned with Basic Literacy and Intermediate Literacy.

Comparison with Content Area Reading

There has been discussion by educational experts regarding disciplinary literacy in the science classroom. Why are they in support of this approach (sometimes overwhelmingly over content area reading)? Some experts believe that content area reading is a one-size-fits-all practice with no focus on the intricacies of the science discipline. If science has its own discourse, it should be approached differently than other core subjects. The Shanahans note that content area reading is just a general skill set that assists students in learning from any text. In fact, they contend that these methods would be utilized by a "novice" when looking into a text (Shanahan & Shanahan, 2012, p. 8).

When Shanahan & Shanahan compared disciplinary literacy to content area reading, there were two very telling phrases to distinguish the difference. Where disciplinary literacy is applied to "unique uses and implications of literacy," content area reading can "help someone to comprehend or to remember text better [with little regard to type of text]" (Shanahan & Shanahan, 2012, p. 8). Application across any text suggests that it is a method which does not concentrate on higher order thinking in a specific content area. There can be no expectation of student success in science if there is no definitive concentration on what makes science distinct.

Theory Supporting Disciplinary Literacy in Science

When considering the utilization of science disciplinary literacy methods, as educators we must determine whether they have a theoretical basis. Most of what we do in the classroom is backed by sound educational theories and disciplinary literacy should be no different. Because the heart of any content lies in its discourse, seeing if this theory can support the science disciplinary literacy approach is vital. But how can we define discourse? In James Paul Gee's text, Introduction to Discourse Analysis (2001), he holds the following view:

> "Discourses" with a capital "D," that is, different ways in which we humans integrate language with non-language "stuff," such as different ways of thinking, acting, interacting, valuing, feeling, believing, and using symbols, tools, and objects in the right places and at the right times so as to enact and recognize different identities and activities, give the material world certain meanings, distribute social goods in a certain way, make certain sorts of meaningful connections in our experience, and privilege certain symbol systems and ways of knowing over others (i.e. carry out all the building tasks above). (p. 13)

Aiming to prove the validity of disciplinary literacy with Discourse Theory, Spires et al. (2018) worked to expose the differences of disciplinary literacy in the four core areas: ELA, science, history/social studies, and math. Essentially, they wanted to reveal that each content area had its own special discourse which requires an approach specific to that subject. After assessing each of the four core subjects to determine the specific practices in each, they conducted focus groups with educators in each area. Their results endorsed the expansion of Discourse Theory to disciplinary literacies, helped develop comprehension of disciplinary literacy concepts, and added to existing data on disciplinary literacy. Discourse Theory "views literacy not as tools but as social practices within a community and analyzes how language is used differently in different contexts" (Spires et al., 2018, p. 1426).

Another finding from Spires et al. (2018) which further supports the Discourse Theory and exposes the differentiation between the disciplines revealed that disciplinary literacy includes three disciplinary literacies: source literacy, analytic literacy, and expressive literacy. Educators who shared a content area showed similarities within the literacies they employed (Spires et al., 2015, p. 1424). History/social studies teachers would primarily utilize source literacy, math teachers would use analytic literacy, and ELA teachers would use expressive literacy. Science educators would function using analytic and source literacies. This was explained by noting that scientists utilize source literacy when substantiating present outcomes with past outcomes. Regarding analytic literacy, "science experts also conduct analytical readings in ways similar to mathematicians" (Spires et al., 2015, p. 1425).

Distinction of Disciplines

In support of a unique method for literacy in the science discipline, consider the Next Generation of Science Standards (NGSS). These standards are a somewhat recent set of guidelines that have created an even wider breadth between science and other subjects, illuminating their differences. These standards, developed by practic-

ing scientists which include Nobel laureates, cognitive scientists, and science education researchers, implicitly call for the disciplinary approach in science. Introduced in 2013, NGSS not only furthered the differentiation between science and other core subjects, they made distinctions within the science field. A science educator must be cognizant of and incorporate the "Three Dimensions of Science Learning" which is comprised of practice, crosscutting concept, and disciplinary core ideas (Next Generation Science Standards, 2020). Each of the three dimensions plays an equal part in science instruction and comprehension.

We, as science educators, need to do more than only help students comprehend information and recall text better as is encouraged in content area reading. We must carefully plan to incorporate the Three Dimensions of Science Learning: "Crosscutting Concepts" which investigate relationships within the four science domains; "Practices" which focus on science and engineering, concentrating on inquiry and practices essential within the fields; and "Core Ideas" which are the main ideas through science and engineering (Physical Science, Life science, Earth and Space Science, and Engineering) that build as students progress through grades (Next Generation Science Standards, 2020). This sets science apart from other disciplines and fosters the need for science educators to focus on thinking like a scientist. The specific discourse in science further justifies the need for the disciplinary literacy approach.

Research and Recommendations

Research

Studies which examine the current use of disciplinary literacy in science show a variance from one classroom to another. While teachers are attempting implementation and there are standards which provide guidance (such as NGSS and State of Ohio Science Standards), having guidelines regarding what is expected to be taught is a stark contrast to guidance to how it should be taught. Some research suggests close reading, adaptive primary literature, or even apps for science disciplinary literacy. However, incorrect interpretation, adaptation, and/or implementation of these techniques may alter the intended outcomes for students. In fact, studies have been conducted which demonstrate this point.

Kok-Sing Tang's (2016) study found that although disciplinary literacy was being utilized, it was observed implicitly as part of another method instead of as a purposeful intention. Specifically, results revealed that mainly the Initiate-Response-Evaluate (IRE) model (a teacher centered and directed discussion) and implicit techniques for vocabulary were employed by educators. Unfortunately, the IRE "puts the thinking process too much on the teacher and less so on the students" (Tang, 2016, p. 227). This detracts from the disciplinary literacy the students should be experiencing which is so vital in science.

Another study examining current disciplinary literacy in the classroom was Casey Medlock Paul's (2017) study of close reading strategies. It examined teachers' approaches in pre- and post-professional development. Prior to the professional development "educators in all disciplines were primarily using intermediate literacy

strategies" (Shanahan and Shanahan, 2008, as cited in Paul, 2017, p. 165) which, as discussed in "Levels of Literacy" above, is insufficient for understanding specialized text because of its general approach to cover all subjects. In fact, they used content area reading versus disciplinary literacy. They were "not fully engaging in the deeper understanding made possible by disciplinary literacy" (Paul, 2017, p. 165). Additionally, the research revealed that even when teachers had exhaustive professional development, science teachers utilized techniques used by experts in other fields. They incorrectly implemented the disciplinary literacy practices best suited for their content for the benefit of their students.

Recommendations

Because of these studies, both Tang and Paul had recommendations regarding science disciplinary literacy. Contrary to the implicit teaching in Tang's (2016) observations, Paul (2017) proposed that "teachers to also explain why precise terms must be used in science or how some words have different meanings in different contexts" (p. 230). This recommendation offers a move to higher level thinking regarding vocabulary teaching as opposed to utilizing I-R-E.

Paul (2017), as many educational experts have, circled back to the topic of discourse knowledge in a discipline and "being disciplinarily literate" (p. 168). She quotes Moje (2008) that "disciplinary literacy 'builds an understanding of how knowledge is produced in the disciplines, rather just building knowledge in the disciplines'" (as cited by Paul, 2017, p. 169). Paul's (2017) final thought "that teachers ought to strive to know and use the reading strategies used by experts in their discipline" (p. 168) is yet another statement which endorses the utilization of science disciplinary literacy.

There are no set guidelines specifying recommendations for implementation of disciplinary literacy in the science classroom. Research has shown that some science teachers are not explicitly utilizing disciplinary literacy as exemplified in Tang's (2016) study. Additionally, methods have not necessarily resulted in successful and correct utilization after professional development as witnessed in Paul's (2017) study. Obviously, every educator does not and will not teach the same way. However, if standards and guidelines are established regarding how to apply science disciplinary literacy to pre-service teachers, the chance of correct and continued implementation may be greater than what we currently observe. It is certainly possible that the establishment of standards would have a positive effect on veteran educators' instructional methods, as well, if they have a set of guidelines to follow.

Conclusion

"Science is a form of culture with its own language" (Gee, 2004; Roth & Lawless, 2002, as cited by Fang, 2006, p. 492). Therefore, the rationale for disciplinary literacy in the science classroom is a worthy discussion. With the little time we have as teachers, we need to optimize every minute we have with worthwhile methods and strategies. Because disciplinary literacy concentrates on scientific discourse (which proponents view as an important piece to learning science) and it is theoretically sound, then it is a method on which we should focus in the science classroom.

Current outcomes in the field show varied ways science disciplinary literacy is being taught. There is no standard among science educators. However, I believe experts in education and science have the knowledge and investment necessary to develop recommendations (and possibly standards) for implementation. Additionally, it would be beneficial to teach the disciplinary literacy approach to preservice teachers as they complete their methods classes. Including it as part of a curriculum may make correct implementation in the classroom more effective and more likely to occur.

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Julie L. Szabo holds degrees of M.Ed. in Middle Childhood Education from the University of Toledo and M.S. and B.S. in Kinesiology from Indiana University. Julie finds differentiation and UDL to be keys to student success in the classroom. She is an advocate for implementing disciplinary literacy in science.

Social Studies

Path to Empowerment
A Feminist Pedagogical Approach to Critical Civic Education in Early Childhood

Rebecca Stanwick

Abstract: School is often the first institutional experience where children learn to work collaboratively across social and cultural differences. However, civic education in the early childhood classroom often focuses on preparing students for future participation in society. By not allowing young children to critically engage with the reality of the world in which they live, many educators are creating a learning environment where children are not active in their knowledge making but rather are subjects that have knowledge placed upon them. Using a feminist pedagogical approach to critical civic education, this paper explores how defying the normative white patriarchal classroom structure can create a civic consciousness that empowers young people, especially girls, to active citizenship. With an emphasis on cooperative learning, student voice, critical engagement, and democratic education a feminist approach to critical civic education creates a learning environment that promotes collaboration rather than competition while fostering an activist spirit that transforms students into change-makers.

Introduction

Swalwell and Payne (2019) suggest that it is important to teach children about the unfairness and oppressive nature of the society in which they live. That "rather than introduce students to a set of civic strategies that presume formal structures and institutions will work as promised or in ways that are just, we must acknowledge that democratic traditions and institutions are deeply oppressive in a myriad ways" (Swalwell & Payne, 2019, p. 128). A feminist approach to civic education identifies and disrupts these oppressions and injustices making them central to civic education. In centering gender in their critical approach to education, feminist educators are disrupting the hidden curriculum of gender bias that perpetuates the systemic oppression of girls and women. By providing an examination of feminist pedagogy and critical civic education, this paper will help early childhood educators understand how defying the normative white patriarchal classroom structure can create a critical civic consciousness that empowers young girls and other historically marginalized people to be active citizens and change-makers.

A Note on the Definition of Feminism

This paper subscribes to a broad definition of feminism. It understands feminism as a theoretical and political position that affirms the equality and humanity of all people. Feminism offers a theoretical and activist lens through which we can analyze the politics of knowledge that are "critical to understanding the practice and outcomes of democratic teaching, the roles of educational institutions in maintaining

social order, and the complex power and identity dynamics in any given classroom " under patriarchy (Crabtree, Sapp, and Licona, 2009, p. 1).

What is Feminist Pedagogy?

Feminist pedagogy is a critical pedagogy and as such owes much of its philosophical and theoretical foundations to the larger umbrella of critical theory. Critical theory offers a distinct political analysis that alerts us to the ways power operates in personal, cultural, historical, social, and educational systems (Kincheloe, 2004). Feminist pedagogy, like all critical pedagogies, investigates power and through the cultivation of critical consciousness, praxis, and engagement turns students into change-makers (Villaverde, 2008). However, feminist pedagogy is not a toolbox, a collection of strategies, a list of practices, or a specific classroom arrangement. It is an overarching philosophy—a theory of teaching and learning that integrates feminist values with related theories and research.

The Feminist Classroom

Although there is not a collection of strategies or a copy/paste curriculum that defines what it is to do feminist pedagogy, there are a few key concepts that make a classroom feminist. A feminist classroom centers student voices, supports democratic and collaborative learning, seeks to transform teacher/student relationships, and centers a concern for gender injustice and social change. However, at the heart of the feminist pedagogical experience are the fundamentals of political education and direct action: becoming aware of the issues at stake, developing a perspective, problem-solving, and engaging in change thus actively participating in political society (hooks, 1984; Fisher, 2001; Tong, 2009).

Centering Student Voice

Feminist pedagogy is concerned with the validity of "experiential knowledge, or the knowledge produced through the actual lived experience of students, and privileging students' voice over the teacher's voice, which is no longer viewed as the ultimate authority" (Accardi, 2013, p. 37). Feminist pedagogy values student voices, and as such feminist teachers must find ways to facilitate this value. Fisher (1981) argues that "being a woman in a patriarchal society means being someone whose experiences of the world are systemically discounted as trivial or irrelevant, unless they relate to specifically feminine concerns or unless they relate to the experiences of 'exceptional' women" (p. 21). This is especially true within traditional curriculum structures that often emphasize and privilege the experiences of white men – both through their reliance on the "great men" curriculum and the traditional classroom structure.

Shrewsbury (1987) notes that feminist pedagogical "strategies must be developed to counteract unequal power arrangements. Such strategies recognize the potentiality for changing traditional unequal relationships [and that] empowering strategies allow students to find their own voice, to discover the power of authenticity" (p. 8-9). A feminist teacher can value female student voices by intervening when

male students dominate or interrupt. Asking male students to remain quite or wait their turn so that female students can speak is not privileging the female voice over the male but is instead creating and safeguarding a space where all voices and experiences are given equal value.

Cooperative and Democratic

The feminist classroom is designed to be inherently democratic and cooperative. The learning community is participatory and egalitarian, and it serves as a corrective and a critique of patriarchal educational beliefs and practices (Fisher, 2001). Pushing against the patriarchal hierarchy that perpetuates and reinforces sexism, a feminist cooperative community fosters a nurturing environment where all learners, their knowledge and their experiences, are valued. Feminist teachers make use of activities that encourage all students to make their voices heard and support teamwork and collaborative problem solving.

Basic communication skills for expressing feelings, providing helpful feedback and participating in group processes and knowledge building are strategies for fostering this type of classroom environment. In the nurturing environment favored by feminist approaches to teaching and learning, learners are supported when they express uncertainty and witness models for effective communication through the teacher's example. Any activity that requires group discussion can change the energy of the classroom from a passive environment to an active one. It can be something as simple as asking student input on classroom rules, what book they want to read during circle time, or having students guide each other during a presentation or demonstration. Group activity and discussion allows individual students to form learning communities and participate in creating shared knowledge.

Teacher-Student Relationship

Feminist pedagogy seeks to transform the teacher/student relationship and disrupt tradition notions of classroom power and authority. Typically, the teacher is perceived to have the ultimate authority in the classroom while students have limited authority or none at all. Feminist teaching strategies are anti-authoritarian and student-centered. Shrewsbury (1987) notes that feminist pedagogy "includes a recognition of the power implication of traditional schooling and the limitations of traditional meanings of concepts of power that embody relations of domination" (p. 8). Feminist teaching techniques critique and challenge patriarchal power relations that traditionally govern classrooms, therefore encouraging a democratic, cooperative classroom. In such a classroom students are expected to be leaders and to make decisions as a group. The teacher shares rather than demands authority, asks more questions than they answer, and encourages students to problem solve collectively when problems arise.

Gender injustice, Sexism, and Social Change

Perhaps the most frequently cited characteristic of feminist pedagogy is a concern for gender injustice, sexism, and the oppression of women, and how this concern affects what happens in a classroom. Giroux (1989) notes that "a feminist classroom

must instruct students in a way that makes them attentive to patriarchy as an ideology that is historically and socially constructed as part of an institutional discourse and material force designed to oppress women" (p. 7). Therefore, feminism in the classroom should take as its primary subject matter issues of patriarchal oppression and sexism, and how these things construct what happens in a classroom and what material is taught.

Consciousness-raising, which has roots in the early feminist movement, is a key method of helping students learn about and become aware of a sexist and unjust society. Freedman (1990) describes consciousness-raising as the "the sharing of personal-experience with others in order to understand the larger social context for the experience and to transform one's intellectual or political understanding" (p. 603). This emphasis on taking action is a critical component to feminist pedagogical theory because feminist pedagogy is a form of education meant to effect social change. Feminist pedagogy seeks to make visible patriarchal structures of oppression while also equipping students with the skills to challenge and transform those oppressive structures.

Issues in Non-Critical and Non-Feminist Civic Education

According to Parker (2003), school is often the first institutional experience that brings children from the home and family into society-at-large where people must learn to work collaboratively across all differences. Schools, therefore, are the ideal space for civic engagement and democratic education. However, the emphasis on civics in Early Childhood Education (ECE) has primarily been through a preparatory lens and thus views children as humans who, through education, will become "real" citizens one day (Swalwell & Payne, 2019). This form of preparatory civic education continues a long tradition of seeing young children as egocentric and not capable of acting for the good of the community (Levsitz, 2013; Phillips, 2011). This illiberal view of the capabilities of young children often coincides with civic education content standards that are limited to themes of nationalistic patriotism, compliance with rules and laws, and the recognition of great historical figures (i.e. white men with the "exceptional" women or person of color added when necessary). For example, Ohio Social Studies Standards for Kindergarten focus on knowing how to say the Pledge of Allegiance and understanding rules and authority figures, while 1st and 2nd grade standards expand on rules and laws as governing good and bad behavior within in communities and groups, and recognition of political/historical figures (Ohio Department of Education, 2018, p.11-17).

This approach to civic education "narrows the civic possibilities that schools offer to children and positions them as the recipients of knowledge rather than as creators" of knowledge (Swalwell & Payne, 2019, p.127). This type of education famously described by Freire (1970/2018) as the "banking" model of education views knowledge as "a gift bestowed by those who consider themselves knowledgeable upon those whom they consider to know nothing" (p. 72). Teachers in this model are the dominate source of knowledge in the classroom and the experiences and histories of the children are of no consequence. Neither are the issues of gender, race or other identity markers that function as part of the discourse of schooling thus perpetuating traditional oppressive educational structures (Brady, 1995).

The lack of critical examination in the banking model results in pedagogy being frozen in forms that deny the "historically and socially constructed nature of all knowledge, discourse and practice" (Brady, 1995, p. 11). Therefore, instead of expanding on notions of democracy, ethics, and social justice, banking education reflects the logic of capitalism and the marketplace; creating students who are meant to conform, to follow authority, and acquiesce to being dominated by systems of oppression. Children in this pedagogical model are not supported in becoming active citizens who engage in active decision making about issues that are of consequence to themselves and broader society (Levsitk, 2013).

Feminist Pedagogy and Critical Civic Education

Teachers informed by a feminist pedagogy reject the banking model view of teaching and learning in favor of a more complex and social process of knowledge-making through interaction, collaboration, and negotiation (Barkley et al., 2014). They strive to join students in becoming members within, not above or outside of, a knowledge community. bell hooks (1994) notes that a classroom should be "a place where difference could be acknowledged, where we could finally understand, accept, and affirm that our ways of knowing are forged in history and relations of power (p. 30). Traditional civic education in the ECE classroom, as discussed above, does not leave room for an investigation of systemic power. In fact, by way of replicating power as masculine in its investigation of history/historical figures and authority, and its reliance on a non-democratic authoritative classroom structure, traditional civic education reinforces an oppressive white male patriarchy.

A way to push back against this type of civic education is by moving traditional civic education into the realm of critical civic education through the lens of feminist pedagogy. According to Wheeler-Bell (2014), critical civic education creates children who are "knowledgeable about current injustices" and are capable of participating in social transformation (p. 464). Critical civic education hinges on the ability to turn children from empty receptacles (as the banking model believes them to be) into active citizens capable of recognizing systems of oppression and complex social thinking. Active citizenship refers to the values, norms, and skills related to being a good citizen, and are negotiated among children themselves. This process requires that children participate through active engagement in critical reflection and also social action to reduce oppression and inequality which reflects a focus on democratic values of participation (Sigauke, 2011).

Active citizenship is fundamental to critical civic education because it insists children must "understand the current and undesirable world they . . . inhabit. While also having the skills and dispositions to consciously produce the desired society" (Wheeler-Bell, 2014, p. 469). Active citizenship is also incredibly important to feminist pedagogy and is characterized by the feminist concept of direct action. Direct action is the challenging of the oppressive status quo in an effort to make a more equal society through feminist activism. In terms of feminist critical civic education in ECE, that more equal society comes in the form of cooperative democratic learning in which students deliberate to collectively decide how to allocate classroom resources in ways that promote equality and human prosperity. It also allows for the decentering of the white male point of view which allows for girls to succeed and

affirms them as worthy contributors to the classroom community (DiGiovanni & Liston, 2005).

Conclusion

On the very first day of a child's academic journey, the hidden curriculum of gender bias starts to negatively affect girls. However, there is hope. This hope comes in the form of feminist pedagogy that promotes a critical civic engagement and encourages students to work together in cooperative instead of competitive ways. It is my hope that this article has not only provided educators with the tools to begin exploring feminist pedagogy and critical civic education in their classrooms, but to look deeper at how they can use feminist pedagogical principles to center student voices, support democratic and collaborative learning, to transform the teacher/student relationships, and to center a concern for gender injustice and social change. The techniques used in feminist pedagogy can and do enhance the education of not just girls. Historically marginalized communities and communities silenced by oppressive patriarchal structures can benefit from the liberatory principles of feminist pedagogy. Using feminist pedagogy as a lens through which to examine the benefits of critical civic engagement provides clarity to critique the status quo of oppressive inequalities, thus empowering all students to achieve their potential and ultimately transform society into a more equal place for all.

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About the Author

Rebecca Stanwick is currently a public librarian at a large urban public library. She received her bachelor's and master's in English Literature from the University of Toledo and her master's in library science from Indiana University- Bloomington. She is currently a doctoratoral student in Social and Philosophical Foundations of Education- History of Education at the University of Toledo.

About Learning to Teach

Teachers, Students, and Subject Matter

Rebecca Schneider

Lenna Black and Jenny Denyer

Learning to Teach is a journal we initiated in 2012 to give voice to our graduate students who were learning and writing about teaching. As we thought about the type of articles our students would write and that others would find valuable to read, we were inspired by Hawkins' (1974) triangle of I (teacher), Thou (student), and It (subject matter). As students of teaching, it is valuable for our teacher candidates to explore ideas that will prepare them to think about how teachers and students interact with subject matter. Hawkins proposed thinking about I, Thou, and It as a way to respect students as learners in their interactions with teachers. As graduate students, it is valuable for our authors to have a framework to ground their ideas within the profession. Ball and Forzani (2007) use the instructional triangle to argue that the study of interactions among teachers, students, and subject matter is at the core of educational scholarship. These are powerful and compelling ideas. As teacher educators and editors, we are guided by these ideas as we focus our future teachers and authors to think and write about subject-matter specific interactions of teachers and their students.

Learning to Teach seeks to publish articles that are situated *inside* education (Ball & Forzani, 2007). Hawkins used I, Thou, and It to emphasize that it is the purposeful engagement in a subject to be learned that defines the teacher-student relationship. Ball and Forzani build upon this idea to emphasize the dynamic nature of the interactions within the instructional triangle. They use the instructional triangle to emphasize that it is these transactions that define what is *in* education. On occasion we are asked why we do not publish articles about general issues such as school organizational structures or philosophical ideas about education that transcend any specific subject matter. Surely, these issues are important for teachers. We agree; these are important matters. But these issues are *related* to education and not *inside* the educational transactions between teachers, students, and subject matter. Similarly, we may be asked why not publish strategy ideas such as management hints, activity ideas, or lesson ideas. Again, we agree these can be useful. We remain focused, however, on the goal of uniting theoretical and research grounded ideas with the practice of interacting with students as they are learning subject matter. This means authors are asked to ground their essays within the scholarship that informs the interactions of teachers and students with subject matter within environments for learning.

Learning to Teach is a platform for new teachers to share their thinking – thinking that explains, enhances and deepens understanding, and prompts development of engaging and effective practice. Although the journal targets teachers as authors, its intended audience is anyone concerned with matters *in* education. Work *in* education seeks to improve and unites practice and scholarship (Ball & Forzani, 2007). It is to this end, that this journal exists.

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Learning to Teach

Language Arts, Mathematics, Science, and Social Studies
Through Research and Practice

Editors in Chief Jenny Denyer, Ph.D.
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Learning to Teach Language Arts, Mathematics, Science, and Social Studies Through Research and Practice publishes manuscripts that address curricular innovations, thoughtful discussion of current issues for practice, or essays that inform, advocate for a position or persuade. Manuscripts must address subject-matter specific interactions of teachers and learners.

Guidelines for Authors

Aims — The aims of this journal are to provide an outlet for the initial publication by preservice and beginning teachers and to disseminate these works to current and future colleagues.

Audience — The primary audience is current and future licensure candidates in all subject areas, grades PK to 12. This journal is also of interest to local teachers and school administrators, program and university faculty, and college administration.

Submission Guidelines — Manuscript style is APA. Abstracts are 120 words. Manuscript length is 2000 to 2500 words, excluding abstract, tables, figures, and references. Figures must be in jpg format. Tables and figures must represent original work of the author. Photographs that include people other than the author will not be published.

Frequency — Published yearly each August; distributed electronically with limited print copies.

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For questions contact: Jenny.Denyer@utoledo.edu or Rebecca.Schneider@utoledo.edu

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