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Play with Data

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Camp Open Data is a piloted informal learning opportunity designed to address recognized data science education challenges that administrators can easily implement into their school's curricula or after school programs. The piloted program recruited college-bound girls from Philadelphia's promise zone, a high poverty community in Philadelphia in which the government has partnered to improve educational opportunities (Housing and Urban Development, 2018). Students were recruited from this area with the intention to introduce participants to the open data movement, the idea that some data should be available to everyone to use as they wish, and some basics of data driven science. Through a series of scripted lesson plans and individual student projects, students had the opportunity to explore open data platforms and to demonstrate their overall understanding of big data, or large data sets, through a final capstone project. The findings from the Camp Open Data program show that the Camp presents a promising gateway for administrators and teachers wanting to implement more programs with big data and gain an understanding of it and its role in STEM fields.

Over the last decade both federal and international funding agencies (e.g., National Science Foundation, National Institutes of Health, and UNESCO) have mandated data sharing policies, thus contributing to and motivating the open data movement (Tenopir, Allard, Douglass, Aydinoglu, Wu, Read & Frame, 2011), a movement based around the idea that some data should be freely available for anyone to use as they wish. Additionally, digital technologies have forced a paradigm shift in science, from theoretical to data driven science. This shift is often explained as the *'Fourth Paradigm,'* describing the change from empirical and theoretical based science to computational and data driven science (Hey, Tansley, & Tolle, 2009). These changes are unprecedented, resulting in new requirements for anyone pursuing a STEM field, and thus having a large effect on how we go about teaching data in STEM.

Students advancing in a STEM discipline, or simply seeking to become data savvy citizens and members of the work force, must have (1) a comfort with digital data in their selected domain, and, (2) at the very least, basic knowledge of computational and data driven approaches. These requirements make sense and can impact successful pursuit of a STEM discipline or areas of business, health, and the social sciences. Despite knowledge of the importance of these requirements, there is clear indication that the necessary skills are not being sufficiently taught to college-bound high school girls, particularly girls in underrepresented STEM populations. Our team recognized this situation, and thus proposed a Camp program to address this shortcoming.

Methods

Camp Open Data was a piloted approach to address previously mentioned challenges through an informal learning opportunity that we encourage others to recreate in their communities. The piloted program recruited college-bound girls from the Philadelphia promise

zone, a government designation for a high poverty community where the government partners with community leaders in order to address educational opportunities, violent crime, public health issues, and the like. (Housing and Urban Development, 2018). Students were recruited from this area via flyers and recruitment at community meetings, and took place at a University-affiliated community center within the promise zone. The intention of Camp was to introduce participants to the open data movement and some basics of data driven science. This program was created to be easily implemented into the school setting, therefore it was aligned to the Next Generation Science Standards and the Common Core Standards (see appendix). As many schools require curriculum to be connected to one or both of these standards, included in this article are the standards that Camp Open Data's curriculum addresses, so that the curriculum can be easily proposed to administration and implemented within the school setting.

Specific goals and objectives of the outlined camp are as follows: (1) cultivate interest in data driven STEM, and an understanding of the new, evolving scientific paradigm; (2) develop a "Let data talk" methodology, educating participants, by having them understand data in their vicinity; and (3) contribute foundational research on strategies for data-related education for college-bound high school girls, particularly girls for underrepresented STEM population. Students also work with Open Data Philly (Your Source for Open Data), to learn how they can leverage knowledge and skills of working with data to understand the world around them.

The overall framework for the Camp started with fundamental concepts, extending to doing and learning — developing a "Let-Data-Talk" strategy, and its culmination in a capstone activity. The program was designed around four stages: (1) Get to Know Data, (2) Manage Data, (3) Play with Data, and (4) Capstone. Stage 1, Get to Know Data, included an introduction to the different types of data as well as the open data movement and the emerging field of data science. This first stage consisted of several brief lectures about data. It also introduced students to TED talks about data visualization and gave them an introduction on how to use Tableau, a software to help visualize data, and Microsoft Excel. The second stage, Manage Data, focused on helping students understand the data lifecycle, while also allowing students to explore data repositories and cyber infrastructure initiatives. Students were given introductions to selected data repositories as well as an introduction to their final capstone project; students would eventually use these repositories to create their final projects.

The third stage of Camp Open Data gave students the opportunity to "Play with Data." After familiarizing students with open data repositories, they were encouraged to find data on a topic of interest to them and see what was available to them within these repositories. Students then used Tableau and Microsoft Excel to help create a final project where they showed what they had learned from the data, using Excel and Tableau. The fourth and final stage of Camp was the Capstone, where students showed what they had learned about Big Data and the open data movement through a final presentation. Students used the data that they had collected during Camp to create visualizations. Each of the previously stated stages included new concepts and activities that were designed with a final project in mind. Through incremental learning, the activities built upon concepts and activities pursued in the previous stages. Table 1 summarizes the previously described stages, activities and learning goals.

Table 1

Learning Stages, Activities, and Components

Stage	Topic and activity	Goal (Camp participants will…)
1. Get to Know Data	• Be introduced to data as a first-class object, as well as data relationships. • Learn about different data types, classes, and formats. • Learn about the Open data movement and the emerging field of data science	• Understand data hierarchies. • Have a view of the diversity of array of data types, classes, and formats. • Gain a sense of the dynamic state of data science.
2. Manage Data	• Learn about the data lifecycle, metadata, provenance, and data publication. • Explore and test selected data repositories and cyber infrastructure initiatives (e.g., Dryad, Data.gov, DataONE, GenBank). • Deposit data into a repository	• Understand the data lifecycle, and the high-level steps involved in data sharing. • Acquire knowledge of selected data repositories and their services.
3. Play with Data	• Interact with data portals through visualization software applications (e.g. IBM Watson Analytics site for visualization). • Reuse data to answer a research question.	• Gain a sense of data analytics, and the power of visualization. • Become acquainted with selected, user-friendly, data visualization tools.
4. Capstone: Let Data Talk (Final focus group day)	• Group presentations synthesizing knowledge learned. • Connect the new paradigm to pressing world problems (e.g., energy, environment, and health needs). • Discuss careers supporting the open data movement and data science.	• Reinforce Camp learning. • Recognize the need for open data and data science. • Gain a sense of career options.

Table 2 shows the planned Camp itinerary that each participant received, with the activities for each session listed. The piloted Camp took place over a three-week timespan, meeting on Tuesday and Thursday evenings for two hours, with two University-affiliated researchers serving as the instructors of the lessons. The instructors for the camp were compensated, and camp expenses, including instructor compensation, the purchase of Arduinos, and food were funded partially by a grant through the National Science Foundation as well as through funding from the College of Computing and Informatics at the researcher's University.

Table 2

Camp Itinerary

Week 1		
Day 1	Registration & Introduction	• Instructor and student introduction as well as discuss goals and objectives of the camp. • Lightning talks on data, data types, and the open data movement. TED talks about data visualization, and introduction to visualization and Tableau.
Day 2	Classroom learning	• Introduction to selected data repositories as well as a continuation of showing data visualizations.
Week 2		
Day 1	Play with Data	• Follow examples to create some data visualization samples. Students learn to describe themselves in Metadata and create a simple webpage from the template.
Day 2	Discussions	• Watch TED videos on data visualization and analysis Group discussions. Introduce capstone project and begin work on capstone.
Week 3		
Day 1	Group Learning	• Prepare presentations for capstone project.
Day 2	Let Data Talk	• Presentations and group discussions on data science careers. Chat with data science experts about how they use data in their career.

Data Collection and Analysis

In order to determine Camp Open Data's efficacy, the Camp was piloted and an evaluation strategy was developed and administered. The evaluation strategy included a pre-and post-survey instrument that allowed participants to self-assess their learning outcomes. The survey emphasized assessing knowledge and skills pertaining but not limited to: (a) understanding data; (b) data lifecycle and data sharing; (c) data analytics and data visualization; (d) significance of data to scientists; (e) gain a sense of career options; and (f) interest and engagement with the activities. Survey questions were used to reveal attitudes and understanding amongst participants, and observation analysis was conducted to interpret the quality of the activities and materials. Evaluation metrics for the Camp included: (1) demographics questionnaire, (2) pre/post survey, (3) focus groups, and (4) observations.

Demographics

Eight students participated in the pilot study for this camp. Most participants in the pilot study were African-American female high school students from the promise zone in Philadelphia. The participants all had similar self-perceptions of their academic achievements coming into the Camp and rated their math and science abilities as very high. The majority had a

GPA of 3.0 or higher at the time of their participation in the program. Most students believed that their abilities in math, science, communication skills, and problem-solving skills were average or higher compared to their high school classmates. This information gives a very clear representation of the type of student that participated in Camp Open Data.

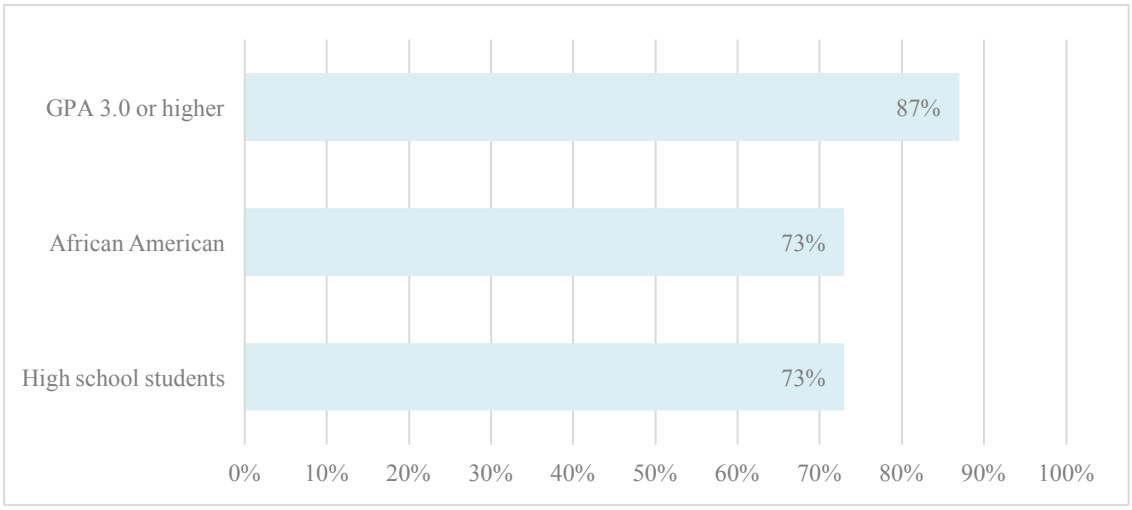

Figure 1. Demographic summary of participants. Most participants were African American high school students with a GPA of 3.0 or higher.

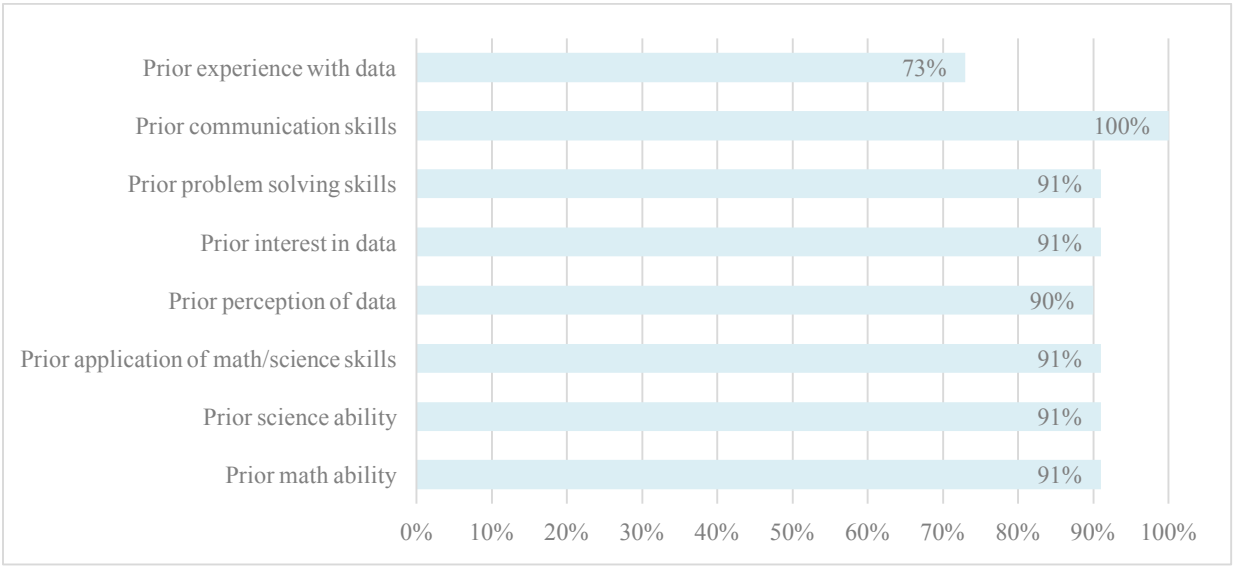

Figure 2. Participants' self-reported skills as average or above average.

Students were also asked about their expectations of the Camp prior to participating. The majority of the participants indicated an interest in understanding data, specifically how data affects the world, how everything has data, and how to apply knowledge of data to their everyday lives. One participant was expecting to gain knowledge on computer science, and another participant thought that participating in this program would help her to become a scientist in the future.

Table 3

Participant Expectations Prior to Camp Start

- The ability to understand data
- A Better understanding of numbers and how that affect the world
- Hope to get more insight and knowledge on computer science
- To learn to use data and apply it to going to the store. Also in everyday life
- Hope to learn more about programming
- Hope to learn something useful for when I go into higher levels of learning about programming and building computers
- Hope to learn more about data and career
- Hope to get knowledge on how everything has data
- More education in the field of data
- This will help me to be a scientist
- To learn about data more

Findings

A post-survey was used to gather information about what students thought about the Camp, what they learned from the Camp, as well as whether Camp Open Data lived up to their expectations. From this survey nine main categories emerged that described what students gained from Camp Open Data, and these categories can be found in Table 4.

Table 4

Camp Outcomes

- A broader understanding of data
- A kick start to their experience with data
- Conversations about importance of data
- Real life connection help to visualize data
- Designs of importance of data
- An openness to understanding data
- Understanding the importance of data
- Making in the real world
- Realization that data are everywhere

The first category, *Broader Understanding of Data*, showed a general consensus that the Camp allowed students to understand data in a broad sense and added to their existing body of knowledge. The second category, *Kickstart to Experience with Data*, revealed that students felt that although the Camp did not give them everything that they needed to know about data (due to time constraints, etc.), it was pushing them in the right direction to start understanding data better. One student said, "It prepared me like a kickoff, like it gave me the basics, like 'here you go, now apply that.'"

A third theme found within survey results is that of *Conversations*, where a student suggested that the conversations that took place during the Camp, whether about big data itself, or careers in data, were the most useful part of Camp.

Along with this, the category of *Real Life Connections* was mentioned several times in student responses, which suggested that the connections made between the data and the visualizations helped students to understand how data affects real life situations. Students commented that, "giving more real-life situations where data occurred helps you think of like more things." Students also mentioned that they learned a great deal about *Designs Themselves*. As for *Openness,* students believed that the Camp opened them up to more possibilities, and made them more aware of what is available in the job market in terms of STEM and big data. Students said, "I learned not to narrow yourself down to certain things. I learned to open myself up to more opportunities."

Importance of Data was a theme mentioned several times as well, and students mentioned how they realized through the Camp that data is not just important to scientists, but to the world as well. Students said, "Data helps the world; I think this was important." Students also reported gaining an understanding of *Making* that they did not have prior to entering the Camp**.** Students mentioned that they enjoyed tinkering and understanding of the Arduinos.

Lastly, students came to the *Realization that Data is Everywhere,* which was supported by an overwhelming number of comments on the post-survey. Students felt that data is involved in everything we have and everything we do. One student stated, "Data is everywhere out there. Now I pay more attention to it."

Conclusions and Implications

On average, students participating in Camp Open Data found that the Camp was most helpful with regards to their understanding of the significance of data. Students enjoyed having the opportunity to work with new technologies and gain a new understanding of technologies that they were already aware of. Students also reported that that Camp somewhat helped them in expanding their knowledge of data visualization as well as informed their understanding of how data informs decision making. See Figure 3 for graphic representation of these findings.

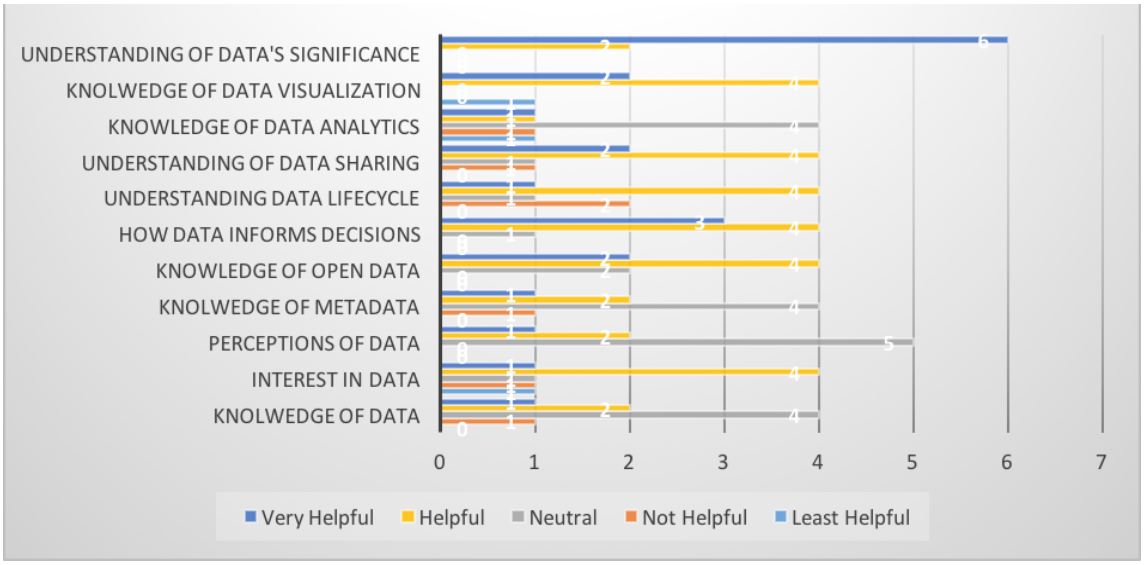

Figure 3. Participant perceptions of which aspects of camp were most helpful.

The general consensus was that the majority of the students were engaged in all of the activities and enjoyed learning Excel, Tableau, and Arduinos. Students stated that they learned more about computers than they had previously known, and became more aware of data through the Camp. Students also stated that they truly enjoyed getting to work hands on with data through the Camp. Based on this information, it is clear that Camp Open Data has the potential to bring big data to students in a new way, and can successfully give students information about big data and open data.

The success of this pilot study leads to several implications for implementation of Camp Open Data. For administrators, Camp Open Data poses a new way to address STEM in the school setting, and provides a way for administrators to think about incorporating big data into curriculum and after school programs. The Camp also provides opportunities for girls to participate in STEM while gaining important skills in regard to data and becoming a data savvy citizen. Overall, we believe, based on this pilot study, that Camp Open Data would be an excellent opportunity for administrators to implement a STEM program for girls into their school setting.

Limitations

Given the pilot status of this research, Camp Open Data had some organizational issues that could be improved, such as offering the camp at a different time, and having more virtual communication with students between class days. Students also stated that they wished the Camp could have been longer, as a large amount of material was fit into a short time frame. Besides these logistical limitations, this Camp also was limited to a small sample size (n=8) due to nature of it being a pilot. Also, not all students were able to attend every camp session, however, all students included in the data for this study attended a high majority of the camp sessions. Despite the limitations, the findings indicate that the Camp has the potential to serve as a gateway for students and teachers wanting to get more experience with big data, and gain an understanding of big data and its role in STEM fields.

Appendix. NGSS standards and Common Core standards

NGSS Standards

Standards S-ET S1-4. Engineering Design		
Performance Expectation(s) *The materials/lessons/activities outlined in this article are just one step toward reaching the performance expectations listed below.* Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.		
Dimension	**Name and *NGSS* code/citation**	**Specific Connections to Classroom Activity**
Science and Engineering Practices	Science and Engineering Practices Asking Questions and Defining Problems ● Analyze complex real-world problems by specifying criteria and constraints for successful solutions. (HS-ETS1-1) Using Mathematics and Computational Thinking ● Use mathematical models and/or computer simulations to predict the effects of a design solution on systems and/or the interactions between systems. (HS-ETS1-4) Constructing Explanations and Designing Solutions ● Design a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-ETS1-2) ● Evaluate a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-ETS1-3)	For the student's capstone project, they were asked to determine a problem within their community and research big data related to that problem. The students used this data to analyze the real-world problem. Students then used excel and Tableau to create graphic representations/models of this data.
Disciplinary Core Ideas	ETS1.B: Developing Possible Solutions ● Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs. (HS-ETS1-4) ETS1.C: Optimizing the Design Solution ● Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed. (HS-ETS1-2)	Within the students' "Let Data Talk" capstone project, they will create a visual representation/ model of their data using Tableau software.
Crosscutting Concept(s)	**Systems and System Models** ● Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions — including energy, matter, and information flows — within and between systems at different scales. (HS-ETS1-4)	Within the students' "Let Data Talk" capstone project, they will create a visual representation/ model of their data using Tableau software.

Common Core State Standards Connections (when appropriate): *ELA/ Literacy* **SL.11-12.5** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. HS-ESS2-4) **RST.11-12.1** Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-ESS3-1) *Mathematics* **HSS.ID.A.1-4** Summarize, represent and interpret data on a single count or measurement variable **HSS.ID.B.5-6** Summarize, represent, and interpret data on two categorical and quantitative variables	Through the capstone "Let Data Talk" project, students analyze big data, and use mathematical reasoning and models to represent this analysis. Student support their analysis of the data with evidence and appropriate citations.

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The Integration of Formative Assessment and Mathematical Modeling Practices

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As mathematical modeling gains increased focus in both standards and associated large-scale assessments, teachers need guidance to assist them in formative classroom assessments of mathematical modeling. Mathematical modeling can develop students' communication skills and the ability to demonstrate understanding through different representations. This article explores how mathematical modeling and associated tasks and pedagogies can bring about a change of the nature of assessment when viewed through the lens of formative assessment. We argue that mathematical modeling when undertaken with a formative assessment approach can bring about significant changes in classroom activity for learners and teachers that might better prepare students to apply mathematics.

Mathematical modeling is the use of mathematical concepts to investigate and solve real-world problems. In modeling, students use mathematics to explain or interpret physical, social, or scientific phenomena, which is an essential component of school mathematics curriculum and standards. The Common Core State Standards for Mathematics (CCSSM) categorize modeling as a K–12 standard for mathematical practice and as a conceptual category for high school (National Governors Association Center for Best Practices [NGA Center] & Council of Chief State School Officers [CCSSO], 2010). Although there are various documents and reports about teaching and assessing mathematical modeling; CCSSM (NGA Center & CCSSO, 2010) and the guidelines for assessment in mathematical modeling education [GAIMME] report (COMAP & SIAM, 2016), there is a paucity in the literature about how to integrate formative assessment in the teaching and learning of mathematical modeling.

This article explores how modeling and associated tasks and pedagogies can bring about a refocusing of the nature of assessment, which it is argued, when viewed through the lens of formative assessment can mediate the teaching and learning of mathematical modeling in the classroom. We assert that mathematical modeling when undertaken with a formative assessment approach can bring about significant changes in classroom activity for learners and teachers that might better prepare students to apply mathematics. Formative assessment can play a key role in exemplifying the new types of mathematics learning students must achieve, which includes mathematical modeling. The use of formative assessment in mathematics classrooms produces greater increases in student achievement and promotes students' learning (Black & Wiliam, 2009; Boaler & Humphreys, 2005).

Formative assessment is most successful if students are continually offered feedback that is informative, individual, and task-related. The feedback principle mentioned here involves (a) examining students' solution process and pointing out students' strengths and challenges and (b) offering strategies for students' on how to improve their work. Integrating formative assessment in modeling will help both students and teachers improve the work the students are doing in

mathematics. However, most articles and reports about the teaching and learning of mathematical modeling emphasize mathematical modeling as a content area and as a tool to teach mathematics through problem solving and logical thinking (Blum, 2015). Thus, there is limited guidance in assisting teachers with assessments practices related to mathematical modeling. Therefore, the purpose of this article is to provide strategies to enhance teachers' integration of formative assessment techniques that support learning and performance on mathematical modeling tasks.

Purpose of Formative Assessment

The National Council of Teachers of Mathematics Assessment Standard (NCTM, 1995) define assessment as "the process of gathering evidence about a student's knowledge of, ability to use, and disposition towards mathematics and of making inferences from that evidence for a variety of purposes" (p.3). Additionally, NCTM standards support the use of assessment as an integral part of mathematics instruction because it contributes significantly to all students' mathematics learning (NCTM, 2000). Wiliam, Lee, Harrison, and Black (2004) argued that increased use of formative assessment (or assessment for learning) leads to higher quality learning. We agree with this opinion, emphasizing that integrating formative assessment into the teaching and learning of mathematical modeling can have many benefits including (a) improving students' mathematical learning (b) students' development of positive attitude towards the learning of mathematics, and (c) helping teachers adjust their teaching according to their students' needs.

Van De Walle, Karp, and Bay-Williams (2013) explained that formative assessment is a continuing evaluation process that monitors the learning progress of the learner and informs the teacher on the next steps needed. Moreover, Wiliam (2007) claimed that "to be formative, assessment must include a recipe for future action" (p.41). This assertion supports mathematical modeling practices and processes, where students must sometimes revise their mathematical models (due to the iterative nature of the modeling process), so that their results can make sense in the context of the real-world. Integrating formative assessment in modeling is a strategic process, which uses evidence regarding the extent of student knowledge and procedural skill to support further learning (Clark, 2011) and as such increases student motivation and engagement (Cauley & McMillan, 2010).

Because classroom formative assessment or evaluation is so critical, it should be considered as the primary method and focus for measuring student learning in mathematical modeling. Popham (2011), characterized formative assessment as "a process used by teachers and students during instruction that provides feedback to adjust ongoing teaching and learning to improve students' achievement of intended instructional outcomes" (p. 5). We apply Popham's definition to summarize the purpose of formative assessment because it connects to mathematical modeling practices and processes, where mathematical concepts have to be used to solve real-world problems. Mathematical modeling practices and processes require justification, feedback, questioning, revision, which are all essential components of formative assessments.

Formative Assessment for Modeling

Formative assessment is an integral facet of teaching and learning. According to Black and Wiliam (1998), formative assessment provides "information to be used as feedback to

modify teaching and learning activities" (p. 104). Research related to teachers integrating formative assessments indicated changes in their assessment practices, which resulted in increases in student achievement (Black, Harrison, Lee, Marshall, & Wiliam, 2004). Black and Wiliam (1998) explained that formative assessment involves activities undertaken by teachers, and by their students in assessing themselves, which provide information to be used as feedback to modify the teaching and learning activities. However, there is insufficient use of formative assessment approaches involving students' learning of mathematical modeling (Wake, 2010). Therefore, a major challenge facing most teachers, especially those who are new to mathematical modeling practices, is to learn how to provide guidance and formatively assess students' skills and understanding in a mathematical modeling situation.

The purpose of formative assessment is not simply to show what students' "know and can do," but to unveil their present understanding so that the teacher can help the student improve. Teachers can use formative assessment to build on students' understanding on mathematical modeling and further develop ideas about the relationship between the real world and mathematics. Thus, integrating formative assessment in modeling provides a rich basis for identifying evolving mathematical understandings that can be further developed. Classroom challenges in mathematics teaching are of two major types: concept development lessons and problem-solving lessons, which embodies mathematical modeling processes. The challenge of teaching mathematical modeling is to move teachers into facilitative roles rather than directive roles. Therefore, to support classroom teachers overcome these challenges, it requires integration of formative assessment of mathematical modeling practices.

To achieve this integration of formative assessment of modeling practices, first, teachers need to have a deep and broad understanding of the mathematical modeling process and the diverse approaches that students might use to investigate a problem and create a solution. To acquire such understanding, listening to students as they interpret and explain their models is critical (Doerr, 2007). Second, teachers need to attend to the mathematical discourse by creating situations where students have to interpret, explain, justify, and evaluate the 'appropriateness' of their models. By appropriateness, we mean whether the model answers the question, and what assumptions or choices were made to create it. Finally, the creation of a modeling environment is needed, which is described by the "permanent balance between teachers' [minimal] guidance and students' [maximal] independence" (Blum & Borromeo Ferri 2009, p. 52). This minimalistic teaching strategy is not without encouragement and scaffolding. Teachers can encourage students to solve problems independently by (a) posing purposeful questions; (b) giving focused, yet broad hints; and (c) providing support.

The role of teaching and assessing mathematical modeling is critical and complex. Because of the iterative nature of the modeling process, integrating *formative assessment* in modeling will provide a suitable framework for effective and efficient approach to teaching modeling and assessing modeling tasks. We believe the integration of formative assessment in mathematical modeling should move beyond existing assessment frameworks that include rubric scores but provide an all-inclusive approach in measuring students' modeling performance. This all-embracing integration of formative assessment in modeling should encompass (a) a holistic assessment approach, which involves *technicality*, *originality and management*, and *presentation*

(Hall, 1984) and (b) the different phases in the modeling process, where feedback, questions, and justification are emphasized.

The above approaches of integrating formative assessment in modeling performance reflect the elements of the assessment triangle model as emphasized by the National Research Council (NRC, 2001) and represent a formative form of assessment. Thus, formative assessment of mathematical modeling calls for a "shift" in teachers' role in the classroom. This shift requires minimal guidance from teachers and students' maximal independence as explained in the previous paragraph. Providing students with critical feedback at all times while working on a mathematical modeling task characterizes formative assessment of a modeling performance (Blum & Borromeo Ferri, 2009). Formative assessment helps teachers evaluate students' modeling performance and promotes familiarity with the elements in the modeling process to both teachers and students. The next paragraphs discuss an example of a mathematical modeling task through the lens of formative assessment.

A Modeling Task with Formative Assessment

In this section, we describe a mathematics task that is designed to engage students in mathematical modeling that integrates formative assessment approaches. We suggest that a modeling classroom that attempts to integrate formative assessment practices should view assessment in terms of informing learning. Thus, there is a change in the way both teachers and students view learning, which alters the dynamics of the learning community. Because of the nature of this article, we will focus on essential aspects of the task, related to formative assessment practices such as teacher questioning, feedback, and peer assessment. Suppose students are given the modeling task in Figure 1 below to solve.

> You visit Egglawn University, and you wish to buy a hooded sweatshirt (hoodie) for your campus tour. An Egglawn hoodie costs $30 in shops uptown, near campus, and $35.00 downtown, near your residence. Is it worth going uptown to buy your hoodie?

Figure 1. The Hoodie Problem

To integrate formative assessment in solving this modeling task, we need to understand what constitute the modeling process. Looking at the literature on mathematical modeling, one can find many different modeling processes depending on their perspective on modeling (Borromeo Ferri, 2006). However, for the purpose of this article, we will apply Blum's (1996) modeling process in demonstrating to teachers how to integrate formative assessment in solving modeling tasks such as the Hoodie problem. Blum's pedagogical modeling process include the following steps (a) idealizing a real situation, (b) mathematizing, (c) investigating the model, and (d) interpreting your solution. In Blum's model, reality and mathematics are taken seriously, where mathematics and models are used to better understand the real world. So, with this task in mind, students may go through the following modeling process:

- Understand the situation: Is it a cost, distance, and time function problem?;
- Choose a model for the cost: shall we ignore "gas prices, fuel consumption, or means of transportation?"
- Calculate the cost for uptown and downtown, using formulas; Get the units right;

- Compute the difference;
- Use appropriate tools strategically and attend to precision;
- Evaluate the answer: "Does this make sense in the real-world?" and
- Ask: "How can we improve on it? Do we need to? Are there other factors we need to consider?"

Integrating formative assessment in this modeling task provides students with the opportunity to tackle the problem from multiple entry points, where they can employ different strategies and representations. Because of the open-ended nature of the modeling task, there would be an interaction between the teacher and the students, where the teacher prompts discussion and problem solving rather than "giving" rules and procedures. During the discussion stage, students can be given some questions to examine, asking each pair or group to consider. For example, the questions may include (a) what has been done correctly? (b) what assumptions were made?, and (c) how can they improve the work? The classroom discussion between the teacher and students through questioning is crucial in the learning of mathematics. We want to emphasize that purposeful questions that provide opportunities for noticing and eliciting student thinking and consequently learning, depend on their quality.

How teachers give feedback to students to scaffold their learning is always an issue of concern but this is possibly even more problematic when developing new pedagogic practices such as those associated with mathematical modeling. The research on the development of best practices of feedback through formative assessment suggests that, effective feedback should focus on the task, it should be given immediately, and given orally rather than in writing (Butler, 1998). In this task, teachers will give students oral feedback as they go through the modeling process to solve the problem. According to Butler (1998), as soon as teachers give a grade for a piece of work their comments about how to improve are ignored. Therefore, feedback that includes comments about how to improve instead of grades is more effective in raising student learning.

Learning is most effective when students themselves have a clear understanding of what it is they are trying to achieve, can measure their progress against clear objectives, and know how to proceed to achieve their goals. Peer assessment, where students assess each other's work, provides a valuable direct source of feedback for students and allows them to start to reflect on their own work and learning. This modeling task has the potential to provide students with self-assessment opportunities, which requires an understanding of "a good solution" and a degree of reflection on process that is absent from most mathematics classrooms. Self-assessment builds students' awareness of the need for planning, monitoring, and evaluation of one's progress. Such metacognitive skills are integral to successful integration of formative assessment in modeling.

The integration of formative assessment and the enactment of the modeling task provide both teachers and students feedback, so that teaching and learning activities can be improved according to the results. With the Hoodie modeling task, teachers first observe what students can do without any scaffolding or help, and then provide oral support to aid students analyze responses without scoring them. They then offer differentiated support to students as needed during the group work through purposeful questions and discussions. Students get constructive feedback and through classroom discourse and discussion of other students' work, they move

their reasoning forward. Therefore, we suggest that in a mathematical modeling classroom, which integrates formative assessment practices there should be a shift in the role of both teachers and students to view assessment in terms of informing learning and this in turn will considerably change the dynamics of the learning community.

Conclusion

In this article, we present information on integrating formative assessment techniques into classroom mathematical modeling practices. Integrating formative assessment with mathematical modeling practices is a challenge because formative assessment needs "adaptive expertise" and mathematical modeling practices are new to many teachers. Most teachers need both specific and generic support to develop the range of mathematical and pedagogical skills required to integrate formative assessment into mathematical modeling practices in the classroom. The ideas shared in this article mark a starting point to move forward the course of formative assessment of classroom modeling practices. However, bringing about the necessary changes in teachers' and students' actions will involve teachers—either individually or collectively—taking risk, and a shift in their roles to embrace formative assessment practices in mathematical modeling.

Despite the fact that much has been written around the purpose of assessment for learning, research about incorporating formative assessment into modeling practices is still rather limited. Formative assessment of mathematical modeling is an emerging area of research, theory, and practice that requires more studies with the implementation of the CCSSM (NGA Center & CCSSO, 2010) and the GAIMME report (COMAP & SIAM, 2016). As described in this article, the challenges of incorporating formative assessment practices in modeling are worth the benefits that stimulate student learning. When teachers actively engage in formative assessment of mathematical modeling practices, they get the opportunity to make changes to their instruction, implement new teaching strategies, and revise the course content (Diefes-Dux, Hjalmarson, & Zawojewski, 2013), which ultimately leads to student achievement as measured by their GPA.

The formative assessment ideas presented in this article suggest that it is beneficial to assess students' mathematical modeling performance holistically using tasks that focus on the phases of the modeling process and giving students critical feedback. As the relationship between teachers' beliefs and classroom practice is dynamic with each influencing the other (Fernandez, 1997), we believe that the approaches discussed will bring a change in teachers' use of formative assessment with modeling practices. We hope that teachers, students, and researchers will benefit from these ideas presented. We believe these strategies will help (a) advance the classroom integration of formative assessment in modeling, (b) support learning, and (c) measure performance on mathematical modeling tasks.

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Linking ESSA to Professional Development: Teachers Perceptions of the Pennsylvania Teacher Evaluation System and Influence on Teaching Practice

Felicia Ulsh and Joyce Pittman
Muhlenberg School District and Drexel University

The purpose of this descriptive study was to investigate teachers' perceptions of the usefulness and effectiveness of the teacher evaluation process in southeastern Pennsylvania to determine if policymakers should consider making changes to the system. To support the decision-making process, it was necessary to obtain information from teachers about whether they believe the system is useful and effective. The researcher used an explanatory sequential mixed-methods research design that included a teacher survey. In addition, the qualitative design employed a phenomenological approach, which is meant to explore the culture of a group of individuals. The primary population and sample for participation in this study were teachers and teaching specialists. The study used a cross-sectional survey and face-to-face interviews. In conclusion, there was no relationship between the evaluation of teachers and enhanced classroom instruction. Further study is required to determine how improvements could be made to the Teacher Evaluation System in Pennsylvania.

The Every Student Succeeds Act (ESSA) of 2017 intends to ensure all children have equal opportunity to receive a free education and that schools have the proper support to provide that education. Calling for effective teachers to provide students with the best education possible allows school leaders to focus on creating an environment where learning becomes the priority. One way that effectiveness can be assessed is based on teacher perceptions of the teacher evaluation process. To that end, the purpose of this study was to investigate teachers' perceptions of the usefulness and effectiveness of the teacher evaluation process in southeastern Pennsylvania to determine if policymakers should consider making changes to the system. Students are at the center of our framework for education and our teachers are the main stakeholders for supporting and providing instruction for our children in the classroom, therefore our teachers need to be held to high standards in order to be effective. The effectiveness of teachers correlates with student success. It is important to understand what teachers believe as being useful and effective in regard to the teacher evaluation system, in order for them to perform to the best of their abilities. The information in relation to the study, allows policy makers to consider making changes to the teacher effectiveness system. The perceptions of teachers, the people who are the people directly involved in the educational process for students, should be taken into consideration. ESSA allows federal education monies to open a great door of opportunities (Berg-Jacobson, 2016). ESSA offers a chance for states to revise, modify and reaffirm their vision of educator effectiveness (Berg-Jacobson, 2016).

It is essential to assess the relationship between ESSA, teacher evaluation strategies and professional development to support a workforce of educators in which teachers are highly qualified, diverse in nature and effective. Appropriate preparation of teachers must be a priority to ensure that all children have an equal opportunity to receive a free and high quality education and that schools have the proper teacher performance provisions in place to make that possible (Every Student Succeeds Act, 2017).

Conceptual Framework

When teacher evaluation systems were introduced, they were recognized as a bureaucratic way to assess teaching professionals in the field (Goe, Holdheide, & Miller, 2014; Hull, 2013). Initial evaluation systems failed to recognize certified teaching professionals' strengths and weaknesses. Teacher evaluations are governed by the state, and each state has different parameters for how districts include evaluation criteria. For example, districts may include student achievement data within classroom observations in their evaluation system, while others do not include the use of student achievement data or building level data. Research shows both positive and negative effects in the use of teacher evaluation results to enhance instructional practices and promote students success (Ulsh, 2017; Research for Action, 2013).

In Pennsylvania, the 2012 Act 82 gave the Pennsylvania Department of Education (PDE) authority to develop regulations governing educator effectiveness. Under this act, PDE incorporated a newly revised framework, which was created to guide annual teacher assessment (Danielson, 2011(a/b); Research for Action, 2013; Pennsylvania Association of School Administrators [PASA], Pennsylvania Principals Association, & Pennsylvania School Board Association [PSBA], 2017). This framework includes evaluation domains on preparation and planning, classroom environment, instruction and profession responsibilities as outlined in Figure 1.

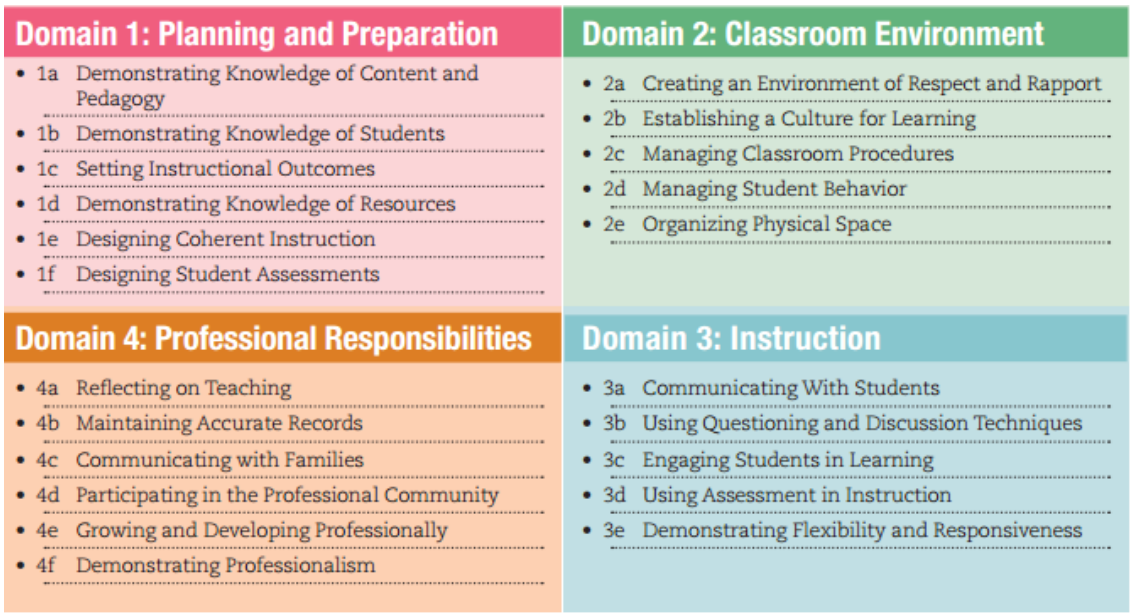

Figure 1. Charlotte Danielson Framework for Teacher Evaluation (retrieved from Educator Effectiveness, 2015)

Act 82 enhanced an outdated evaluation system that focused primarily on instruction. Not only is classroom observation considered, but student performance data is also incorporated. Figure 2 displays the weights for each category in which teachers are evaluated. Fifty percent (50%) of the teacher effectiveness system includes observation and practice, and 50% is dedicated to student performance data. The changes under Act 82 were made to improve classroom instruction, to ensure quality teachers, meaning teachers who are implementing classroom instruction according to the revised standards on the extensive rubric, and to hold teachers more accountable under this revised evaluation system using student performance data (Educator Effectiveness Project, 2015).

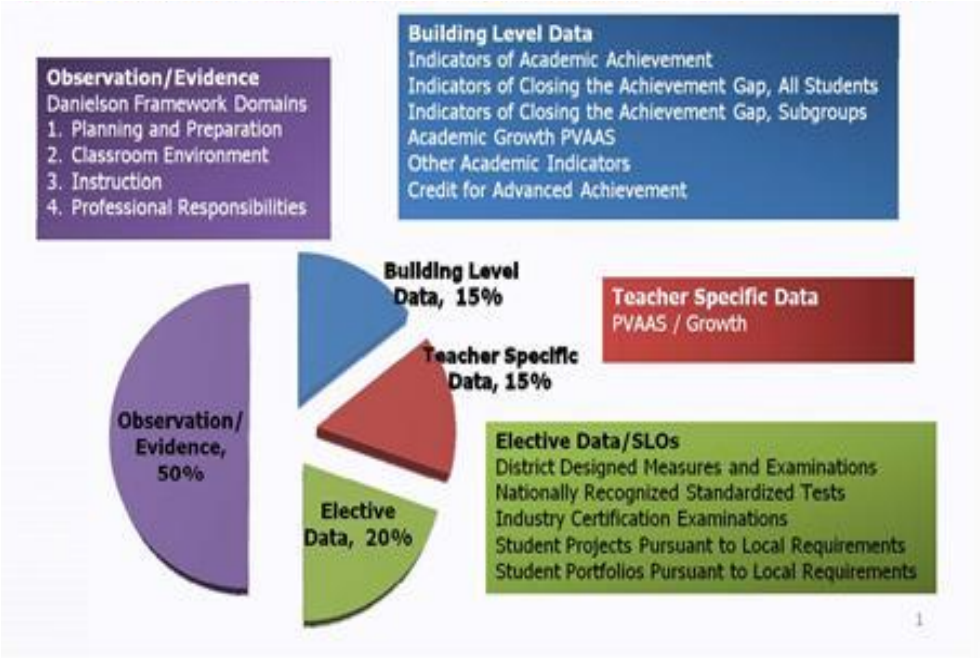

Figure 2. Pennsylvania teaching evaluation core propositions (from the Educator Effectiveness Project, 2015).

Research indicates both positive and negative effects of these teacher evaluation systems on instructional practices in the classroom (Ulsh, 2017); however, these students do not include teachers' perceptions of the system or linkage to ESSA requirements, specifically in Pennsylvania. To ensure PDE promotes high quality teachers and successful and effective leaders within the Commonwealth, a strong evaluation system must be in place to ensure access and equity to quality instruction. It is vital to include teacher voices about their perceptions of the teacher effectiveness system, professional development and ESSA expectations.

The teacher evaluation system must be one that teachers and administrators feel is valuable and will ensure student equity and access to highly effective teachers; thus, it is important to connect the system to ESSA. School districts in Pennsylvania must also ensure the teacher effectiveness system is implemented with fidelity and fiscal responsibility. Research to determine teachers' perceptions of the system will not only enhance professional development for teachers and improve their practice, but it will also provide remediation for teachers who do not meet satisfactory ratings.

The problem in this mixed-methods research study was whether the teacher effectiveness system is operational, meaningful, and useful to evaluate teacher performance in practice from the perspective of the teachers. A second aim was to determine if the Pennsylvania teacher effectiveness system provides administrators with a consistent evaluation system.

Teacher evaluations can have both a positive and negative impact on how teachers and administrators enhance their instructional practices (Ulsh, 2017). The outcome of the evaluation only affects classroom-based instructional strategies when the individual teacher decides to enhance personal practice and professional skills (Fox, 2014). Professional development must focus on the mission of ESSA and the whole education system, which is student achievement and success. Professional development can be used to enhance classroom instruction by aligning the current teacher evaluation system with opportunities for professional development. If professional development is geared toward what teachers need, then we would see an increase in student success rates (Ulsh, 2017).

In 2010, the PDE began the Teacher Effectiveness Project as an effective model for evaluating teaching professionals, non-teaching professionals, and administrators. Following the initial implementation of the system, the overarching questions remains, what are Pennsylvania teachers' perceptions of the teacher effectiveness system and the strategies used to implement the system? Assessing the overall quality of teacher evaluation systems, the usefulness and effectiveness of the procedures used for system implementation helps provide insight into the quality of the current evaluation systems. Perceptions of Pennsylvania's teacher effectiveness system could support program improvements, implementation and instructional practices in the classroom.

Research

The study was guided by an explanatory, sequential, mixed-methods design. A survey design was used for quantitative design and a phenomenological research approach was used as the qualitative method. The researcher focused on individual teacher perceptions of and experiences with the teacher effectiveness system (Creswell, 2013). The main focus group consisted of teachers and teaching specialists. Participants' responses produced common themes. The study also used a descriptive, quantitative research approach. The researcher derived quantitative data from cross-sectional surveys. The explanatory, sequential, mixed-methods model was used in this study; therefore, the quantitative data preceded the qualitative data and established the framework for the creation of interview questions.

Sixty-four out of 200 teachers completed the survey within the selected school district. See Tables 1, 2 and 3 for the demographics of the teacher surveyed. Table 1 specifies the total years of service. Table 2 indicates the total years of service within the researched school district, and Table 2 shows the participants' grade levels and titles.

Sample Demographics and Response Rate

Of the 200 teachers invited to participate in the survey, 64 responded within the given timeframe, for a response rate of 32%. Six of those respondents participated in face-to-face interviews in which questions were created based on the responses to the survey questions. The

respondents included 52 (83.9%) females and 10 (16.1%) males. Most participants had over eleven years of teaching service (Table 1) and nearly 77% taught in grades 5-12 (Table 3).

Table 1

Total Years of Service

Number of Years	Responses	%
1 year	3	4.92%
2-5 years	7	11.48%
6-10 years	9	14.75%
11-15 years	12	19.67%
16 or more years	30	49.18%
Did not indicate	3	4.92%

Table 2

Total Years of Service within Researched School District

Number of Years in District	Responses	%
1 year	6	9.38 %
2-5 years	9	14.06%
6-10 years	17	26.56%
11-15 years	13	20.31%
16 or more years	19	29.69 %
Did not indicate	3	0%

Table 3

Participants' Grade Levels/Titles

Grade Level	Responses	%
Pre-K-Kindergarten	2	3.13%
Grades 1-4	12	18.75%
Grades 5-8	32	50.00%
Grades 9-12	17	26.56%
K-12	1	1.56%
Did not indicate	0	0%

Data Collection

The central research questions was, what are teachers' perceptions of the teacher evaluation system and its implementation strategies in the Commonwealth of Pennsylvania? The following sub-questions were investigated:

1. What are teachers' perceptions about the overall quality of the teacher effectiveness system in Pennsylvania?
2. What are teachers' perceptions of the usefulness and effectiveness of the procedures used for the teacher evaluation process in Pennsylvania?
3. How do teachers describe their perceptions of the relationship between the Pennsylvania's teacher performance system's usefulness and effectiveness of the feedback provided in teacher evaluations and instructional delivery?

Survey Results

The survey consisted of 34 multiple choice questions for which teachers and teaching specialists were asked to rate questions on a 1-5 Likert-type scale. In the survey, a rating of 5

indicated a strength and a rating of 1 indicated a weakness. This survey focused on teachers' perspectives on their current experiences with Pennsylvania's teacher effectiveness evaluation program (See appendix for survey tool). The researcher collected data using the online program Survey Monkey. Descriptive research allowed the researcher to classify, organize, and summarize numerical data about a particular group of observations (Ravid, 2011). The researcher conveyed data using a frequency distribution chart to report measures of central tendency, which produced a summary of scores representing the larger set of scores (Ravid, 2011).

The focus of the central research question was how teachers perceived the overall quality of the teacher evaluation system. The researcher analyzed the survey and reported descriptive statistics including the mean, standard deviation and variance of each question. According to the results of both the Teacher Evaluation Profile for Teachers survey (TEP) and the face-to-face interviews, teachers believed that the teacher effectiveness is of high quality, however implementation needs improvement. The TEP survey results indicate a high rating of 3 and above on a 1-5 scale, where 5 indicates very high quality.

The highest number of respondents rated the evaluation system as a 4, indicating it was of above-average quality. Table 4 shows the positive and negative components that rated higher on according to the results of teacher perceptions on the TEP survey.

Table 4

Teachers Perceptions of the Teaching Evaluation System from TEP Survey

Positive	Negative
• A high number of teachers rated the evaluation system as having an average impact on their professional practices	• Standards are not tailored to subject-specific teachers
• Teachers believed the evaluation process had an average impact to very little impact on instructional practices	• Meeting with their evaluators were somewhat used or not considered
• Great amount of time is spent on the evaluation process	• Student and peer evaluation of teachers were not considered
• Examination of artifacts and student performance were used extensively in the evaluation	• Average amount of feedback to a little amount of feedback from administrators was received
• Classroom observation was highly considered and used extensively in the weighting of their observation.	• Formal and informal feedback was not frequent and average to below average in detail of information
Standards were communicated clearly and they had a clear understanding of what was expected of them.	• Quality of feedback was average to below average, however was descriptive/specific to their classroom observation
• Procedures of evaluation were communicated clearly	• Feedback focused on rubric standards without a clear connection to teacher practice
• Teachers understood the role of the evaluation relating to teacher accountability	• Standards are not tailored to subject-specific teachers
• Feedback was timely	• Professional development time was rarely allotted/designed based on results of evaluation
	• Professional development/trainings were rarely available
Total: 9 Positives	Total: 10 Negatives

When comparing the overall impact of the system, there is a difference in perceptions between how teachers perceive the evaluation and how it affects their classroom instruction. According to both forms of measurement, teachers perceive that the system has no significant effect on their individual classroom practices. Meetings with the evaluator do not support teachers with connecting performance evaluation to influence on their instructional practices.

There is no connection in the data concerning usefulness and effectiveness of evaluation procedures. Teachers believe the teacher effectiveness system provides a clear and explicit layout that allows them to understand the full effects of the evaluation. Teachers believe the standards are clearly communicated and that they had a strong understanding of the standards when presented by administrators at trainings and meetings. Most teachers feel the standards are appropriate for their teaching assignment; however, they also noted that the standards are not subject specific. The qualitative data also supports this idea because teachers believe the standards are difficult to meet, and it is "impossible" to achieve the highest rating.

The procedural components also include the examination of artifacts and student performance. Teachers indicated that artifacts from the classroom observation and student performance are used extensively in their final ratings. There is a difference in data when survey results are compared to interview responses when further discussing the use of artifacts. Teachers believe that a "snapshot" of instruction does not provide sufficient information to evaluate their overall classroom instruction; however, they do perceive the overall evaluation links extensively to student performance. Teachers believe that using student test data is the biggest priority in overall rating. Teachers express discomfort with the use of student test data to evaluate their performance based on the many variables involved with students' performance on tests.

The relationship between teachers' perceptions of the usefulness and effectiveness of feedback provided in teacher evaluations and instructional delivery align with data from the survey and the face-to-face interviews. Teachers receive an average to low average amount of information from administrators; however, the frequency of formal feedback is not consistent. Timely feedback and ways to improve and enhance teaching must be incorporated into teacher evaluations (Eller & Eller, 2015; Looney, 2011). Teachers discussed in the face to face interviews that the formal feedback was most important (Ulsh, 2017).

According to the survey results, significant time is spent on each evaluation. In the interviews, this amount of time is viewed as a weakness of the teacher effectiveness system. Overall, teachers do not feel that the feedback helps them improve their classroom instruction or professional practices due to a lack of follow-through on evaluations. In comparison with the previous research, teachers believe that constructive feedback is a major component in a good evaluation system.

Positive constructive feedback should focus on the school's overall goals, which will help create a clearer picture of what traits effective teachers should possess (Armstrong, 2012; Donaldson, 2012; Hodgman, 2012; Ramsey, 2004; Taylor & Tyler, 2012). This improved feedback will also ensure that various administrator perceptions of implementing the system are similar.

Interview Results

Phase II of the study included face-to-face interviews to allow the researcher to "dig-deeper" into the phenomenon of what teachers perceive is being done effectively and if the evaluation is useful to help improve their instructional practices within the classroom. Interviews were coded transcripts of interviews for common themes. Teachers who participated in the interviews were asked to provide information on their backgrounds in education. Second, teachers were asked how the teacher effectiveness system affected them in their current positions and what they believe the strengths and weaknesses of the teacher effectiveness model are. Finally, teachers provided information about whether they felt the system's implementation provided them with a solid understanding of how the systems worked, and whether they perceived administrators' feedback was meaningful to help improve their classroom instruction. Based on the interviews the researcher concluded that three major themes emerged based on the data. First, teachers perceived that when relating to the effects of the evaluation on teachers there was a tremendous amount of pressure with the incorporation of student performance within the framework of the evaluation. Second, the framework of the evaluation is strong. It has a clear layout and has an intense, modified rubric. The rubric adds the data component, which holds teachers more accountable for classroom practice. Lastly, some weaknesses of overall teacher evaluation system quality included standards that were too high for teachers to achieve based on the rubric and poor feedback and implementation by administrators based on the inter-rater reliability. In addition, the evaluation process was very time consuming. Finally, there was no connection between evaluation and improvement of classroom instruction.

Data from the interviews specifies that good feedback depend on the administrator that is assigned as a teacher's evaluator. Sometimes several administrators evaluate a person throughout the year; thus, teachers do not receive consistent feedback. Teachers believe that different administrators have dissimilar expectations when it comes to implementing the rubric's standards. In addition, feedback depends upon how much time the evaluator spends on the evaluation. Teachers receive pertinent feedback to enhance their instruction from administrators who spend more time on the evaluation. Teachers whose evaluators spend less time claim they receive a minimal amount of feedback that does not enhance their instructional practices.

The depth of information provided by administrators is shallow when they spend less time on the evaluation and more time focusing feedback on the system's standards. Suggestions and ideas are consistent in both survey and interview responses showing that most teachers receive suggestions to improve their classroom instruction. Information is specific to the classroom observation, and the nature of the information provided is descriptive. For the 30- to 45-minute observation included in the evaluation, teachers believe the timing of the feedback is immediate.

Conclusions

The purpose of the descriptive research was to investigate teachers' perceptions of the usefulness and effectiveness of the teacher effectiveness system used in southeastern Pennsylvania to determine if changes should be considered. The study was constructed to examine perceptions of the system and its implementation strategies in Pennsylvania. The study measured teachers' perceptions of the overall quality of the teacher evaluation system, the usefulness and effectiveness of the procedures used for teacher evaluation, and the relationship

between teachers' perceptions of the usefulness and the effectiveness of the feedback provided in teacher evaluations and their instructional delivery. Analysis of both quantitative and qualitative data supported relationships between teacher perceptions of the teacher effectiveness system and its usefulness and effectiveness.

The results indicate that the overall quality of the teacher evaluation system is meaningful to their careers. Teachers report that the evaluation system is designed well and that it is outlined with clear standards and a rubric. Teachers felt the evaluation system lacked focus on improving classroom instructional practices. Teachers reported that the evaluation system has not changed their forms or strategies for instructional delivery.

The sub-questions of this study required the researcher to examine teachers' opinions of the overall quality of the teacher evaluation system using the TEP survey. Face-to-face interviews provided additional findings on the topic. The results indicate that the overall quality of the teacher evaluation system is meaningful to their careers. Teachers perceive the standards as being clearly communicated; thus, they have a clear understanding of these standards.

In this study, most teachers reported an adequate amount of feedback was given, however the frequency of the formal feedback is limited. When following up on this data in the face-to-face interviews, teachers discussed that the amount of feedback was given; however, the frequency of the formal is feedback is limited. Different administrators provided different feedback; therefore, inter-rater reliability was a weakness.

However, both quantitative and qualitative data suggests that teachers perceive the overall quality of the evaluation system to be effective. Teachers believe the usefulness and effectiveness of the procedures used for the teacher evaluation clearly communicates and provides a clear understanding of teacher expectations. Nevertheless, revising implementation strategies could improve the effectiveness in practice.

Implication for Future Research and Practice

The purpose of the study was to identify teachers' perceptions of the teacher effectiveness system in Pennsylvania. The study expands the understanding that the teacher effectiveness system is lengthy and time consuming. Teachers perceive the teacher evaluation system has a solid structure; however, implementation strategies can be improved. From the survey and interview data, teachers perceive there is little to no overall impact of the teacher evaluation system on individual professional practices, including on profound changes in teaching practices, attitudes about teaching, or understanding of the teaching profession.

Moreover, quantitative and qualitative results indicated that effectiveness and usefulness of feedback provided to teachers depends upon the evaluator. Therefore, it is critical that the evaluator take the time to relay constructive feedback and engages in a meaningful conversation that reflects on the feedback, only then can instructional practices be improved within the classroom. When the administrator spends little time and does not follow up on feedback, the information is not considered to enhance instructional practices.

In summary, there was no relationship between the evaluation of teachers and enhanced classroom instruction. The connection to how the current system is positioned to deliver mandates under ESSA to produce and support highly effective teachers and learners equitable

access to these essential components of a high quality educational system remain unclear and is need of further study. Therefore, it is recommended that further research be conducted to help revise and enhance the current evaluation system to ensure equity and access to highly effective teachers and provide high quality professional development that builds capacity for teachers to deliver high quality instruction that promotes all learners success within the classroom.

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Appendix: Teacher Evaluation Profile for Teachers (TEP)

The Definition of Teacher Evaluation

Teacher evaluation takes different forms in different programs. For the purpose of this study, teacher evaluation procedures may include all or some of the following:

- Classroom observations
- Student evaluations
- Meetings with teacher evaluators
- Peer evaluation
- Examination of lesson plans, materials or other artifacts
- Self-evaluation
- Student achievement

When reference is made to this questionnaire to teacher evaluation, it should be understood to encompass any of these procedures that are followed in the evaluation program within your school district.

Overview

This form has been designed to allow you to describe in some detail your most recent experience with teacher evaluation in your school district. Your responses will be combined with those of other teachers to yield a picture of the key components in the teacher evaluation experience in your school district. The goal of this survey is to determine how the evaluation process can be revised to help it serve relevant and useful purposes. Your frank and honest responses are important to reach this goal and will remain anonymous.

While this questionnaire is designed to be comprehensive in scope, it will take only a short time to complete. Please follow the instructions carefully and set aside about 10 uninterrupted minutes to provide thoughtful responses.

Instructions

Please use the scales provided on the following pages to describe yourself and the nature of your most recent teacher evaluation experience in your school district. Do this by:

- Considering each of the items carefully,
- Studying the scale to be used to describe each,
- Circling the number of the scale that best represents your response.

Thank you for your participation.

Section 1: Demographic Information

1. Including the current year, how many years have you taught in your current district?	1. 1 year 2. 2 to 5 years 3. 6 to 10 years 4. 11 to 15 years 5. 16 or more years
2. If you have taught in multiple districts, including the current year, how many total years have you taught?	1. 1 year 2. 2 to 5 years 3. 6 to 10 years 4. 11 to 15 years 5. 16 or more years
3. Your current teaching assignment grade level (select the answer that best describes your current position)	1. Pre-K through K 2. Grades 1 through 4 3. Grades 5 through 8 4. Grades 9 through 12 5. K-12
4. Your gender	1. Female 2. Male

5. Date of most recent evaluation

1. During the academic year 2011-2012

2. During the academic year 2010-2011

3. Between 2009-2010

4. Prior to 2009

Section 2: Overall Rating

Please reflect on your most recent experience with the evaluation process in your school district. Consider the entire evaluation process including planning for evaluation, observations, or other procedures and feedback.

A. Rate the overall quality of the evaluation:

Very poor quality	1	2	3	4	5	Very high quality

B. Rate the overall impact of the evaluation on your professional practices. (Note: A rating of 5 would reflect a strong impact leading to profound changes in your teaching practices, attitudes about teaching, and/or understanding of the teaching profession. A rating of 1 would reflect no impact at all and no changes in your practices, attitudes, and/or understanding.

No impact	1	2	3	4	5	Strong impact

Section 3: Rating Attributes of Evaluation

A. Describe the attributes of the procedures used during your most recent evaluation:

Standards are the criteria used to evaluate your teaching. Describe the procedures related to standards in the items below:

8. Were standards communicated to you?	Not at all	1	2	3	4	5	In great detail
9. Were standards clear to you?	Vague	1	2	3	4	5	Very clear
10. Were standards endorsed by you as appropriate for your teaching assignment?	Not endorsed	1	2	3	4	5	Highly endorsed
11. Were the standards…	The same for all teachers?	1	2	3	4	5	Tailored for your unique needs?

B. To what extent were the following sources of performance information considered as part of the evaluation?

12. Observation of your classroom performance	Not considered	1	2	3	4	5	Used extensively
13. Meetings with the evaluator	Not considered	1	2	3	4	5	Used extensively

14. Examination of artifacts (lesson plans, materials, home/school communication)	Not considered	1	2	3	4	5	Used extensively
15. Examination of student performance	Not considered	1	2	3	4	5	Used extensively
16. Student evaluations	Not considered	1	2	3	4	5	Used extensively
17. Peer evaluations	Not considered	1	2	3	4	5	Used extensively
18. Self-evaluations	Not considered	1	2	3	4	5	Used extensively

C. Describe the extent of the observations of your classroom, based on your most recent evaluation experience in your school district. (Note: In these items, formal refers to observations that were pre-announced and/or were accompanied by a pre- or post-conference with the evaluator; informal refers to unannounced drop-in visits.)

19. Number of formal observations per year

1. 0 Observations
2. 1 Observation
3. 2 Observations
4. 3 Observations
5. 4 Observations

20. Approximate frequency of informational observations

1. 0 Observations
2. 1 Observation
3. 2 Observations
4. 3 Observations
5. 4 Observations

D. Please describe the attributes of the feedback you received during your last evaluation experience:

21. Amount of information received	None	1	2	3	4	5	Great deal
22. Frequency of formal feedback	Infrequent	1	2	3	4	5	Frequent
23. Frequency of informal feedback	Infrequent	1	2	3	4	5	Frequent
24. Depth of information provided	Shallow	1	2	3	4	5	In-depth
25. Quality of the ideas and suggestions contained in the feedback	Low	1	2	3	4	5	High
26. Specificity of information provided	General	1	2	3	4	5	Specific
27. Nature of information provided	Judgmental	1	2	3	4	5	Descriptive
28. Timing of feedback	Delayed	1	2	3	4	5	Immediate
29. Feedback focused on standards	Ignored the standards	1	2	3	4	5	Reflected the standards

E. Please describe these attributes of the evaluation context:

Resources available for evaluation:

30. Amount of time spent on the evaluation process, including your time and that of all other participants	None	1	2	3	4	5	Great deal
31. Time allotted during the semester for professional development	None	1	2	3	4	5	Great deal
32. Availability of training programs and models of good practices	None	1	2	3	4	5	Great deal

District values and policies in evaluation:

33. Clarity of policy statements regarding purpose of evaluation	Vague	1	2	3	4	5	Very clear
34. Intended role of evaluation	Teacher accountability	1	2	3	4	5	Teacher growth

Section 4: Additional Information

Is there anything about the teacher evaluation process that has not been asked that you would like to add?

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Social Emotional Learning Leadership

Thom Stecher and S. Alex Fizz
Neumann University

Today's school leaders face the challenges of addressing the needs of diverse learners, raising the achievement bar for all students, and ensuring proficiency through a model of standardized testing. The importance of integrating social emotional learning with academic content is clear. Outlined in this article is a leadership framework aligned to the competencies put forward by the research of the Collaborative for Academic, Social and Emotional Learning. Confronting those challenges and remaining true to the social emotional learnings at the core of education, leaders must engage in reflection and critical dialogue around the power of emotional connection, the modeling of trust, the analysis and alignment of systems, empowerment and the practice of ethics in our profession as essential tools. Therein lie the keys to discovering our strengths and opportunities within these competencies with our students, families, faculty, our staff and ourselves.

Social Emotional Learning Leadership

James Comer says that "no significant learning occurs without [first] significant relationships"(Comer, 2005). However, through more than forty-five years of educational experience, the authors have seen that schools, now more than ever, are being challenged to address the needs of diverse learners, raise the achievement bar for all students, and ensure proficiency through a model of standardized testing. More is expected of this generation of educational leaders than ever before. The question at hand is can all of this be done while remaining true to the social and emotional learnings that are at the center of education?

A growing number of schools, districts and state systems of education have begun to implement a competency or standards-driven approach to the integration of social, emotional, and academic learning. The Collaborative for Academic Social Emotional Learning has crafted a model that highlights five competencies "that educate hearts, inspire minds, and help people navigate the world more effectively" when integrated across the diverse settings of classrooms, schools, homes and communities (Durlak, 2015).

- Social-Awareness
- Self-Awareness
- Relationships Skills
- Responsible Decision-Making
- Self-Management

Through their research, CASEL has seen that "satisfying the social and emotional needs of students does more than prepare them to learn. It actually increases their capacity for learning. Social and emotional learning has been shown to increase mastery of subject material, motivation to learn, commitment to school, and time devoted to schoolwork. It also improves attendance, graduation rates, and prospects for constructive employment while at the same time reducing suspensions, expulsions, and grade retention" (Collaborative for Academic, Social, and

Emotional Learning, 2005). As their work has progressed, they are now seeing "gains of eleven to seventeen percentile points on achievement tests indicat[ing] that SEL programs offer students a practical educational benefit" (Payton et al., 2008).

The power of the integration of social emotional learning with academic learning of our students is clear; but, as leaders, we must be willing to engage in deep reflection and critical dialogue around where our strengths and opportunities lie within these competencies with our faculty, our staff, and ourselves. As we discover our strengths, it is from there that we build into our opportunities.

Embedded between each competency is a leadership behavior. These leadership behaviors offer an access point to enhance and grow the competencies. This framework illustrates the key leadership qualities that create the bridge from our strengths into areas of growth.

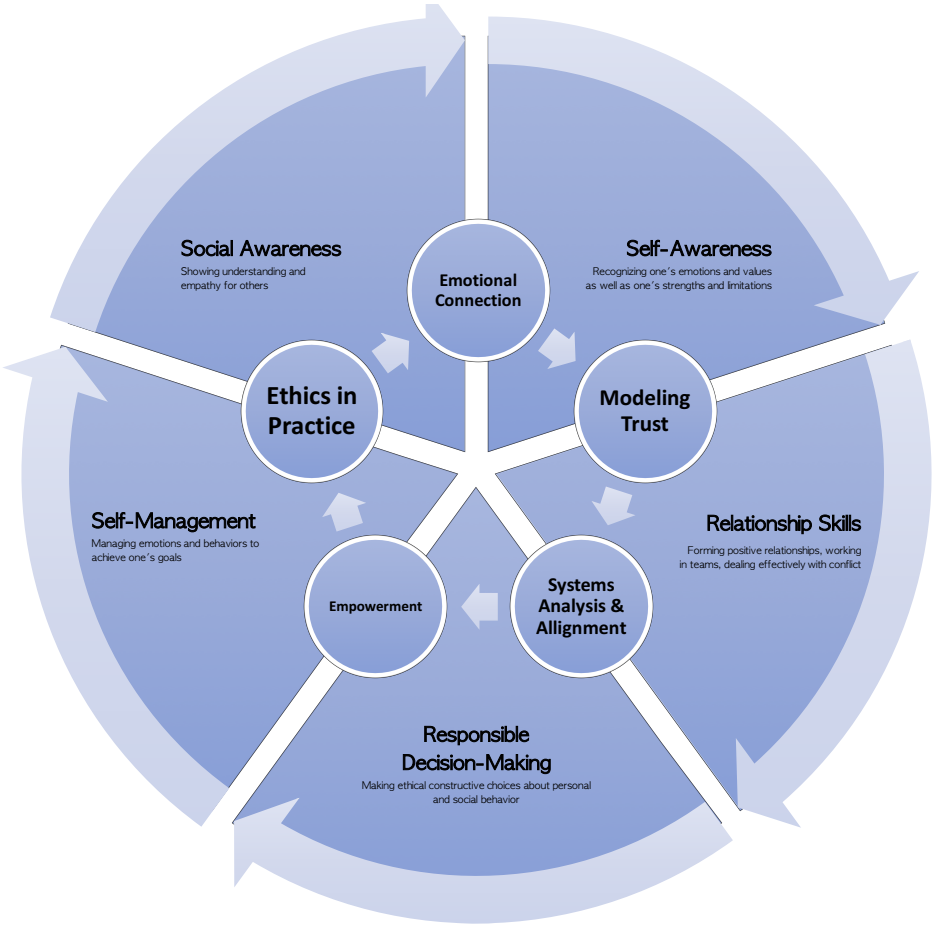

Figure 1. Framework for social emotional learning leadership

Emotional Connection

In the hierarchy of schools, stakeholders want those in leadership positions to see what they have done and to approve of their actions (Sinek, 2014). A leader's ability to emotionally connect is "integral to a culture of sacrifice and service" (Sinek, 2014, p. 7), which connects all

levels of educational systems. Emotional connection, belonging, shared values, and a deep sense of empathy dramatically enhances trust, cooperation, and problem solving (2014).

We must create programs that support understanding and celebrate the differences and commonalities present in the learning community. Students, teachers, families and stakeholders should be able to see meaning and relevance of the work in which we invite them to join. When that is in place, we are motivated and invest in the community we share.

Modeling Trust

The social emotional qualities of self-awareness and relationship skills are connected through and driven by the leadership competency of modeling trust. Leaders are responsible to their staff, colleagues, students, and parents through shared purpose. Forming positive relationships, working in teams, and dealing effectively with conflict allows leaders an opportunity to model and build trust. "The true social benefit of trust is reciprocal. … For trust to serve the individual and the group, it must be shared" (Sinek, 2014, p. 74). In order to celebrate the educators who experiment and take risks in an effort to help students succeed, we must be willing to take that first vulnerable step with them.

This reciprocity of trust begins in self-awareness, the ability to assess one's behavior and make appropriate changes and/or enhancements. When leaders can recognize their own emotions and values as well as practice the relationship skills of authenticity and integrity, they become models of trust. Leaders must lead with their hearts as well as their head.

Systems Analysis and Alignment

Systems analysis and alignment is the discipline where people learn to better understand human interdependency in the process of change (Senge, 2012). The process of systems analysis and alignment invites leaders to effectively connect relationship skills with responsible decision-making as it impacts ethical choices and personal and social behavior. Whether it is creating a consistent language or a set of common core beliefs or values, aligning our systems requires a level of integrity that permeates the culture that we build.

Empowerment

If schools are to reach their fullest social, emotional, mental, and spiritual potential, solutions for social emotional concerns can no longer be sought through old paradigms of standardized testing and prefabricated solutions. Solutions to systemic social emotional problems lie at a deeper level. Successful leaders make responsible and ethical decisions and empower the self-management of their colleagues. This empowerment through interconnectedness helps all staff and students manage emotions and behaviors and achieve both personal and organizational goals. "To do this requires shared conversations, and open mind and heart and thinking creatively at a much deeper level" (Jaworski, 2012, p. 87).

Leaders empower their staff and those served by creating an atmosphere of emotional safety. They encourage others to find their voice and share their story. They find opportunities for their staff and faculty to show their expertise and teach each other.

Ethics in Practice

Connecting the competencies of self-management and social awareness is the ability of leaders to practice personal ethics in their professional capacity. In his book *Ethical Leadership*, professor of education at Boston College, Robert Starratt, defines ethics as denoting "a study of the underlying beliefs, assumptions, principles, and values that support a moral way of life" (2004, p. 5). Authenticity is essential to ethical leadership. The authentic leader always acts with the good of others in view. They work to become aware of the needs and realities of the community they serve and seek to act with consistency, equity and fairness. "Authentic ethical leaders believe deeply in people and their abilities to make ordinary things into great things" (2004, p. 71). "There has never been a greater need for social ingenuity and integrity" (Hargreaves, 2004, p. 203).

Conclusion

Remaining true to the social emotional learnings at the center of education is not done by taking our attention off of the acadmic success of students. Nor is it accomplised by doubling down on a mastery of testing tequnique and data collection. It is done by treating social and emotional learning as not one more thing, but rather as the essential thing that we do for our students, our famlies, our facutly, our staff, and ourselves. Authentic integration begins with courageous leadership. From that place of social and emotional relevance, we empower students to reach for academic success and, more importantly, success beyond the walls of our classrooms.

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Play in Kindergarten: The Battle Between Standards and Developmentally Appropriate Practice

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The purpose of this literature review is to identify the historical changes in kindergarten programs in the United States and convey the current perspectives of play in these programs. Using the various perspectives of play in relation to social-emotional learning, academics, and developmentally appropriate practices, there has become a distinct battle between supporting the academic expectations of kindergarten programs while still utilizing developmentally appropriate practices, which will be illuminated. Additionally, readers will understand how today's early childhood practices, kindergarten specifically, have changed over time and what that means for the success of students in today's transformed programs. Overall, there is no denying that kindergarten teachers, specifically, are working in a time of conflicting ideas; therefore, the literature review will conclude with specific implications for current teachers, such as transforming their practice and becoming advocates for policy or program changes, to aid in addressing this challenging trend.

Kindergarten programs in the United States have changed dramatically over time. The expectations for students and teachers alike continue to evolve and grow, which is alarming when considering the striking changes that have already occurred within kindergarten programs in recent years. Historically, kindergarten programs, typically of children 5-6 years old, acted as children's first formal educational experience in the United States and focused on play (nonacademic, free choice activities) and the development of children's foundational skills (Snow, 2012). To a large extent, media sources, such as newspapers and television broadcasts, have influenced society's expectation of 21st century kindergarten programs being focused on serious academic instruction (Russell, 2011), superseding previous priorities on social, emotional, and moral development. As such, kindergarten programs in the United States have dramatically increased standardized testing, similar structure of first grade programs, with less time being spent on art, music, science, and play (Bassok, Latham, & Rorem, 2016). For instance, in Miller and Almon's (2009) study of the importance of play, they found in a typical day, kindergarten students were spending "four to six times as long being instructed and tested in literacy and math (two to three hours per day)" in comparison to the 30 minutes of free play being offered (p. 3). This trend toward academic development at the expense of other types of development results in an education that may not fully meet children's developmental needs.

In addition to the changing historical trends in kindergarten programs, Snow (2012) described how there are also very different opportunities for children to learn in today's public-school kindergarten programs. Some of these issues include: inconsistency in policy (half day vs.

full day), various ages of entry (ranging from five to eight years old), and disparities in teacher preparation requirements (each college/university having different requirements) (Snow, 2012). The variations in kindergarten programs lead to additional issues as teachers already face the challenge of balancing developmentally appropriate practices with the high demands of the Common Core standards. When there is inequality among individual kindergarten programs, it creates even more challenges for educators to assure a high-quality program that adheres to the high demands of the standards (Snow, 2012). Such inequities evoke the following question: Are we as society doing a disservice to our children as the academic demands increase, developmental needs are being neglected, and programs do not provide all kindergarten students with the same opportunities?

To further explain these trends of inconsistency and challenges in kindergarten programs, Little and Cohen-Vogel (2016) described in their study of the different viewpoints of kindergarten programs in the United States that both *developmentalists* and *academic advocates* believe kindergarten programs should be child-centered, include hands-on play, and support developmentally appropriate practices. However, their beliefs differ when considering the standards and predetermined skills students should learn. Developmentalists believe there should be no predetermined standards of learning in kindergarten, while academic advocates believe there should be a set of expectations set forth for kindergarten programs (Little & Cohen-Vogel, 2016). This is a clear picture of the ongoing debate present in today's educational world and the challenges teachers of young children face every day.

Play and Early Childhood Social-Emotional Learning (SEL) Development

Social-emotional development and academic learning are closely intertwined and together are both important, developmentally appropriate aspects of a successful kindergarten or early childhood education program (Daunic et al., 2013). During kindergarten, children are developing social skills that are essential for their overall development and well-being. Russell (2011) explained there is much evidence that "teachers increasingly focus on academic skill development" while they "spend less time on traditional developmental domains such as social skills and play" (p. 259). This could lead one to believe that this may be a result of the government mandated Common Core standards, which are "a set of college- and career- ready standards for kindergarten through 12th grade" (Common Core State Standards Initiative, 2018).

Additionally, in their meta-analysis that reviewed 82 school-based social and emotional learning interventions, Taylor, Oberle, Durlak, and Weissberg (2017) found areas in which SEL interventions led to significant improvements for students, including the following categories: social emotional learning skills, attitudes, positive social behavior, academic performance, conduct problems, emotional distress, and drug use. Therefore, it is important to consider the detrimental effects that could potentially occur if time is not spent on social skills and play in kindergarten, such as: lack of social skills, inability to control emotions, and loss of interest in learning as all emphasis is placed on academics (Johnson, 2015).

Overall, play has been found to provide learning opportunities for children to enhance their social skills and learn ways to regulate their emotions (Whitebread & O'Sullivan, 2012). After conducting their follow up study focusing on attention and theory of mind skills, McGlamery and Ball (2008) suggested that teaching social skills and promoting play in a classroom does not

need to take focus off of academics, but instead be incorporated into regular academic studies by choosing literature that promotes acceptance, cooperation, and diversity, while also providing *guided play* activities for students. In guided play the teacher creates activities that promote play and are clearly related to the objectives or standards that need to be taught, so students can benefit both academically and socially in these situations (Johnson, 2015). Johnson (2015) suggested that one way for kindergarten educators to promote the development of social-emotional skills is by providing opportunities for play in the classroom as this leads to authentic, real-life situations for children to interact with others to develop those skills.

Furthermore, while research has found that play in a classroom promotes the authentic development of social and emotional skills, there are also studies that help us understand the long-term effects of proper social-emotional development. For instance, Zinsser, Shewark, Denham, and Curby (2014) explained children learn to be emotionally competent primarily through the social interactions they are exposed to. Play is a primary way that children are exposed to social interaction, which is why young children are especially influenced by these experiences as it sets them up to be successful throughout their school years and lives (Zinsser et al., 2014). In their research on teachers' beliefs about social-emotional learning, Zinsser et al. (2014) studied teachers and children from various centers in Northern Virginia and found that teachers' beliefs about emotions are closely related to their own social-emotional teaching practices; meaning most elementary or early childhood educators placed more value on social emotional learning experiences than middle or high school teachers. The aim of this mixed-method study was to combine the *quantitative* research on teacher emotional support with the *qualitative* techniques used in the study. The resulting data revealed contrasting ways in which teachers approach social emotional learning and how educators could benefit children if they are consistent in their support and approaches to SEL. Therefore, promoting SEL opportunities through play on a schoolwide scale can lead to a more meaningful approach for young children to develop these skills.

Play-Based Learning: Building the Case

Play is not always incorporated into kindergarten classrooms due to the expectations of the Common Core standards, yet play can be purposefully included in daily classroom routines by utilizing the play-based learning approach. However, play-based learning is not as common in current classrooms as Kindergarten programs have dramatically changed over time by incorporating much less play than past programs. Since play is declining in current programs, it is vital for educators to take a closer look at the effects play has on an early childhood education experience and what is deemed as developmentally appropriate for kindergarten-aged children to be sure all student needs are being met.

Characteristics of Play-Based Learning

Play-based learning is a way for children to engage in play to make sense of the world around them, while also learning necessary academic and life skills. Firstly, play-based learning gives children the opportunity to develop essential life skills by doing what children do best: play. Lynch (2015) explained one of the important aspects of play when she recognized children's innate intrinsic motivation to participate in play. Since children are naturally engaged in play, there are various benefits for children as they learn through these play experiences.

Pretend play. One of the ways children experience play is through pretend play, or sometimes referred to as dramatic play (Johnson, 2015). These experiences allow children to re-enact real-life situations that they may or may not have experienced firsthand in their own lives. Pretend play can help children make sense of their world and what their role is in given situations. For instance, while playing in a toy kitchen, children might recognize their role is to cook or be careful not to burn themselves. These pretend play experiences can lead to these children learning meaningful life skills (Lynch, 2015).

Social pretend play. In addition to pretend play as a component of play-based learning, there is a more complex idea, referred to as *social pretend play*. Social pretend play is when children are simulating real-life situations while socially interacting with one or more other children (Whitebread & O'Sullivan, 2012). The goal of Whitebread and O'Sullivan's (2012) study of young children's play in the United States was to consider how social pretend play could potentially support the development of metacognitive and self-regulatory skills in young children. The study reviewed academic literature and studies on the topic of social pretend play and young children and analyzed the literature and studies for some common conclusions. Whitebread and O'Sullivan (2012) found that young children benefited from engaging in social pretend play as it supported their development of both metacognitive and self-regulatory skills by interacting with other children. Sometimes this can be a struggle for some children as they are shy or hesitant to interact or play with their peers. One suggestion from the Whitebread and O'Sullivan (2012) study was for teachers to be involved in children's social pretend play experiences by encouraging those who are not engaged in social pretend play to participate with their peers.

Guided versus free play. In addition to these specific types of play children can encounter, such as pretend play and social pretend play, there are two different ways to approach play in a classroom. Play can either be *guided* or *free* (Johnson, 2015). In guided play the teacher creates activities that promote play and are clearly related to the objectives or standards that need to be taught, so students can benefit both academically and socially in these situations. Contrastingly, free play is when children determine what and how they are going to play (Johnson, 2015). Regardless of which approach is being used, both types of play lead to children becoming "more creative" and "more confident when experimenting with new activities" (Lynch, 2015, p. 347). Therefore, including either type of play can be beneficial to children's overall development.

Play-Based Learning as Developmentally Appropriate Practice (DAP)

Researchers have found that play-based learning is a way for children to authentically develop many positive social and emotional skills (Lynch, 2015). Because children are naturally inclined to play, play-based learning is important in classrooms (Lynch, 2015). Furthermore, it is different from the type of play children in today's society are experiencing at home, such as electronic devices and video games (Lynch, 2015). Play in a classroom setting can potentially teach children to share and cooperate with other students, while also teaching children how to effectively communicate with other people. Skills such as sharing, cooperation, and effective communication skills are not the only accomplishments students can make through play. For instance, Johnson (2015), an early childhood scholar, described in his chapter about play pedagogy how free play can lead children to these accomplishments as they "naturally select

play activities that will help them to cope and master anxieties and to make progress with developmental tasks of one kind or another" (p. 182). Therefore, an approach such as free play helps young students to develop essential academic and life skills while being taught in a developmentally appropriate way.

While play-based learning promotes the development of essential life skills, it is also viewed as a more developmentally appropriate practice than many of the more academic-driven approaches that are found in many kindergarten classrooms today. Researchers have explored the ways in which some U.S. early childhood teachers view the use of developmentally appropriate practices in their classrooms. According to Hegde, Sugita, Crane-Mitchel, and Averett (2014), teachers' beliefs of developmentally appropriate practices, such as social-emotional learning and play in kindergarten, aligned closely with a play-based curriculum. Yet most current kindergarten programs are eliminating play and replacing it with academic work (Bassok, Latham, & Rorem, 2016). This is significant as teachers are recognizing the positive effects play and other developmentally appropriate practices have on children, yet the challenge is that current policy and curriculum do not directly support this philosophy.

Although current policy and curriculum structures do not openly support developmentally appropriate practices such as play-based learning, if planned effectively, play-based learning can still be appropriately integrated in many areas of the academic curriculum. Kinzer, Gerhardt, and Coca (2016) reviewed current studies and literature to provide suggested activities for kindergarten teachers to utilize blocks as a way to support the Common Core math standards. When Kinzer, Gerhardt, and Coca (2016) studied how blocks can be used to support Common Core math standards they found support for learning centers that included blocks stating that they allowed children to "play, explore, and informally engage in mathematical ideas" (p. 389). The interaction with blocks in these activities also helped promote children's overall mathematical development (Kinzer, Gerhardt, & Coca, 2016). Therefore, using blocks and other manipulatives can be an effective way to utilize play in the classroom to enhance everyday academic learning.

Lack of Play in Academics and Accountability

Kindergarten programs are becoming more and more academically focused with the push for accountability and the Common Core standards. With a greater push for academics, less, if any time is being spent promoting play-based activities. These changes led some researchers to considering whether the Common Core standards are too demanding for such young children (Main, 2011). Main (2011) explored this critique by comparing the math Common Core standards to international standards of high achieving countries and using NAEYC's developmentally appropriate practices. Main (2011) found the standards required "too much too soon" for young children, including kindergarteners (p. 73). The NAEYC and NCTM continue to work on how to better revise the original Common Core math standards so that students are given fair and realistic opportunities (Main, 2011). Overall, some still believe the Common Core standards are unrealistic for our youngest students.

Other research, however, has focused on the opposing idea that kindergarten and young classrooms are ready for the challenge of the Common Core standards (Kramer-Vida, Levitt, & Kelly, 2012). In their study of a yearlong writing professional development project in the United States, Kramer-Vida, Levitt, and Kelly (2012) suggested that kindergarten is "more than ready

for the common core" and focused primarily on teachers transforming their own strategies for teaching writing to meet the demands of the Common Core (p. 93). Additionally, Casbergue (2017), an education professor, found ways to support Common Core early literacy expectations by approaching literacy with more "sophistication", such as promoting deeper learning in alphabetic and phonemic awareness and modeling difficult strategies (p. 647). Furthermore, coming from their work on understanding and implementing Common Core vocabulary standards in U.S. kindergarten programs, Baker and colleagues (2015) discussed ways to successfully meet the mandates of the Common Core vocabulary standards at the kindergarten level and provided strategies for teachers to be successful. The strategies included primarily paper and pencil work, with limited guided play through prescribed games (Baker, et al., 2015). Although the collective findings from all of these studies may seem to contradict the use of play, the Common Core standards state: "The use of play with young children is not specified by the Standards, but it is welcome as a valuable activity in its own right and as a way to help students meet the expectations in this document" (Common Core State Standards Initiative, 2018). Therefore, this research encourages teachers to accept the challenge of the Common Core standards by altering their practices, even if they still include play, to support these new and challenging expectations of the Common Core.

Implications

Kindergarten programs are caught in the battle between implementing very rigorous Common Core standards, while also trying to promote developmentally appropriate practices that provide positive academic and social experiences. These challenges can pose the question: How can developmentally appropriate practices, such as play, be utilized successfully with limited time that often ends being dedicated to academics? Unfortunately, this phenomenon can be challenging. However, one suggestion is to incorporate more *guided play* for young students. Johnson (2015), when reviewing the contemporary pedagogy of play in United States programs, described guided play as a strategy when "the teacher deliberately intervenes to improve children's play or point it in new directions that can assist learning" (p. 182). This might be beneficial in supporting play in the classroom while addressing the Common Core standards, because the teacher has more influence in the play situation than in free play. Furthermore, teachers can promote play and social peer interaction by producing educational and standard-related games or activities that promote the development of social skills while still promoting the standards (Baker et al., 2015). Although this may not completely solve the debate, it may lead educators in the direction of implementing developmentally appropriate practices, even in a world of high accountability.

Additionally, adequate professional training and professional development for teachers is a suggested implication in order for schools to implement both the Common Core standards and play-based learning (Kramer-Vida, Levitt, & Kelly, 2012). When Peterson and Riehl (2016) studied the rhetorics of play in kindergarten programs, they suggested that teacher education programs provide profound information about the ways children interact with materials during play. Furthermore, Main (2011) recommended from her study of the appropriateness of the Common Core math standards that "Cooperation, collaboration, and professional development is needed before we experiment with our children" by immediately implementing the Common Core math standards (p. 76). Lastly, Kramer-Vida, Levitt, and Kelly (2012) identified professional development as the driving change in their study of how to show that kindergarten

programs can successfully implement the Common Core writing standards. Together, these researchers suggest our schools could provide adequate professional development for teachers in order for them to effectively teach kindergarten-aged students, using a balance of both developmentally appropriate practices and the Common Core standards.

Conclusion

In conclusion, kindergarten education programs are living in a challenging time as the strategies to implement the Common Core standards are interrupting teachers from fully utilizing developmentally appropriate practices in their classrooms. In order to provide students with the quality education they deserve, teachers must look beyond the accountability of the standards and consider how to incorporate play to support their students' overall success. In order to make this happen, educators need to consider how they can influence administrative decisions and current policies in relation to kindergarten programs and developmentally appropriate practices (Snow, 2012). One cannot sit on the sidelines and watch these policies unfold when it is known they are not what is best practice for our students. When considering current routines in early childhood education programs, Johnson (2015) suggested, "heightened awareness now exists that indicates it is time to develop and implement a sustainable alternative" (p. 180). Therefore, we must take his advice to do what is best for our students and bring play back into the kindergarten classroom again.

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Calling all Team Members to the Table: The Importance of Including Special Education Teachers in Curriculum Planning

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The purpose of this paper is to argue for the inclusion of special education teachers on curriculum planning teams. While research exists that supports this practice, special education teachers generally continue to be omitted from curricular planning for a variety of reasons. Insights into why special education teachers should be included in curriculum planning are discussed. In order to ensure that instructional content is accessible by all students, special education teacher inclusion in curriculum planning is critical. General challenges to curriculum planning include its infrequency of occurrence and the perceived loss of class time. Consistent curriculum planning, teacher collaboration and perspective sharing, especially in terms of understanding the needs of students who receive special education services, are described as opportunities. With laws such as the Individuals with Disabilities Education Improvement Act (2004) and the Every Student Succeeds Act (2015), it is pertinent that regular education teachers, special education teachers, and school principals work collaboratively on curriculum planning.

Working with students with disabilities is an experience that nearly all K-12 educators encounter at some point during their careers. While public school district support students with disabilities in different ways, using various practices, policies, or programs, all school districts are required to comply with the Individuals with Disabilities Education Improvement Act (IDEIA, 2004) and the Every Student Succeeds Act (ESSA, 2015) if they are in a state that receives federal money for education. While IDEIA (2004) and ESSA (2015) are in place to ensure equal access to education for students with disabilities, they come with stringent mandates with which schools must comply. IDEIA (2004) is a law that outlines special education services afforded to students who attend public schools. ESSA's (2015) focus is to ensure equal educational opportunities for all students.

There are many practices that can be implemented within an educational institution, such as a public school, to support students with disabilities. Working with students who have disabilities is everyone's responsibility, and in order to provide equitable educational opportunities to all students, regular and special education teachers must be included in curriculum planning because of their unique perspective and training. Special education teachers in addition to regular education teachers should be actively and regularly involved in curriculum planning in addition to the development of curriculum policies at the school level, especially since all teachers share in the education of students with special needs. (Feiler, 2013). Koppang (2004) concluded that curriculum maps are beneficial to special education teachers for

determining where in the sequence skills are taught within the curriculum, which is helpful to the development of the Individualized Education Program (IEP).

Background

Under these federal laws, the topic of least restrictive environment (LRE) is a central component to educating students with disabilities in the LRE (IDEIA, 2004). LRE refers to identifying and placing students with disabilities in an appropriate instructional environment that does not over- or under-support the student, and one that creates an opportunity for the student to make educational progress with the appropriate amount of support. One challenge with the concept of LRE is that this is unique to each student. For many students the LRE may be the regular education classroom with accommodations and modifications stipulated in the students Individualized Education Program (IEP) while for another student, placement in a specialized school (such as a school for students who are deaf that uses total communication), may, in fact be perceived as LRE.

The common practices regarding curriculum planning and instruction tends to omit special education teachers, but in order to ensure that students with disabilities receive an equitable education, regular and special education teachers must be given ongoing opportunities to collaborate. While a student with a disability may require special education services, it is the district's responsibility to educate these students in the LRE, which means that in many cases, students have educational experiences in the regular education classroom, making it important for regular and special education teachers to communicate and collaborate. Their collaboration would result in improved communication about LRE decisions for specific students, especially when issues arise relating to curricular planning and instruction.

However, this problem extends beyond omitting special education teachers from planning practices. Special education teachers are often not formally trained in curriculum planning during their pre-service preparation programs, and generally do not receive curriculum planning training in their preparation studies, or at least not as extensively as regular education teacher programs (Jenkins, Pateman, & Black, 2002; Hinders, 1995; Semmel, Abernathy, Butera, & Lesar, 1991). Depending on the degree of need, a student with disabilities may be educated in a regular education classroom and curriculum planning is an important process for special education teachers to experience. The knowledge and expertise of the special education teacher should be tapped in order to properly support students with disabilities, for example, Oliver (2016) found that special education teachers have a unique skill set that uniquely qualifies them to support not only students with disabilities, but also students at-risk of academic difficulties.

There are many institutional practices that can be implemented to support educating students with disabilities in the regular education setting. Issues of teacher leadership, inclusive practices, and cross-curricular activities are methods that may be used to increase the quality of education that is provided to students with disabilities (as well as those without disabilities). Including regular and special education teachers in curriculum planning presents a few key opportunities and challenges which are summarized in Table 1 below. The identified opportunities offer teachers the chance to grow professionally and the challenges present obstacles for school teams to address.

Table 1

Opportunities and challenges of including all teachers in curriculum planning activities.

Opportunities	Challenges
• Chance to collaborate with peers • Creates opportunity for inclusive practices and cross-curricular experiences. • Fosters teacher leadership	• Time • Misconceptions of roles between regular and special education teachers

Collaboration

At the core of supporting students with disabilities is the idea of collaboration, especially between regular and special education teachers. The National Board for Professional Teaching Standards (NBPTS, 2001) and the National Staff Development Council (NSDC, 2001) argue that teacher collaboration improves the effectiveness of schools. These teachers should work together on curriculum planning and instruction throughout the school year. This practice creates opportunities for regular and special education teachers to share their experiences and strategize on instruction techniques and interventions that may be implemented in the regular education classroom to support students with disabilities (Carroll, 2007; Hamilton, et al., 2009). Ronfeldt, Farmer, McQueen, and Grissom (2015) explain that teacher collaboration increases student achievement in reading and math.

Curriculum and instructional planning affords teachers the opportunity to not only align curriculum to standards, but it also allows the chance to identify weaknesses in the curriculum and identify research-based supplemental materials (Glatthorn, Boschee, & Whitehead, 2009; Udelhofen, 2005). During these conversations, teachers are able to identify student needs and brain storm methods or strategies to implement in order to support students in the learning process. This time can also be spent discussing effective strategies and teaching techniques as well as identifying and replacing approaches that are ineffective. Teachers can also exchange ideas with their colleagues during this time.

Teacher Leadership

Teacher leadership in curriculum and instructional planning is also critical to the success of supporting students with disabilities (Feiler, 2013; Law, Wan, Galton, & Lee, 2010). Within the topic of curriculum planning, there are two varying perspectives about who should lead curriculum and instructional planning: principals or teachers (Feiler, 2013; Glatthorn, Boschee, & Whitehead, 2009; Graff, 2011; Law, et al., 2010). Teachers have a breadth of experience with teaching students who have varying abilities and skills. Therefore, teachers should take on a leadership role in curriculum and instructional planning. Given that teachers have this valuable hands-on experience working with students, they are best equipped to use this information while planning curriculum and preparing instructional materials. With this knowledge, teachers are qualified to step into leadership roles while planning as opposed to principals or curriculum specialists guiding the planning sessions. Instead, principals and other administrators can step into a supportive role rather than one of leadership.

Principal Leadership

Conversely, leadership from the principals is vital to the curriculum planning process. Principals are widely viewed as the managers and experts of their schools and with this comes the need to be actively involved in building level curriculum planning (Glatthorn, Boschee, & Whitehead, 2009). They are also responsible for facilitating change, getting teacher buy-in, supporting teacher growth, identifying building-specific planning needs, and effectively communicating the importance of curriculum planning (Law, 2012; Lui, 2012; & Shilling, 2013). Given that curriculum planning is an ongoing activity that should occur regularly, there is often the need for professional development not only on curriculum planning, but also about conducting meetings and collaborative activities (Law, Wan, Galton, & Lee, 2010). Since school budgets are often tight and highly scrutinized, providing this ongoing training for principals is a cost-effective alternative to the ongoing training and the cost associated with supporting teachers. There is also the argument that principals are more publicly accountable for school performance which is linked to curriculum planning, making it critical for principals to take an active role in the process (Glatthorn & Jailall, 2008; IDEIA, 2004)

Inclusive Practices and Cross-Curricular Activities

Collaborating on curricular and instructional planning sets the platform for the implementation of inclusive practices and cross-curricular activities. The term "inclusive practices" refers to techniques employed by school districts or more specifically, teachers, which enable students with disabilities to be educated in the regular education setting (Fullan, 2002; Lynch, 2012; Nichols & Sheffield, 2014). Co-teaching is one method that falls under the inclusion model (Friend, Cook, Hurley, Chamberlain, & Shamberger, 2010; Murawski & Lochner, 2011). One approach to co-teaching is having a regular and special education teacher share the teaching responsibility for a single class. This creates an opportunity for students with disabilities to learn in the regular education classroom.

Another learning opportunity that presents is cross-curricular activities (Oliver, 2016). These cross-curricular activities can take on many forms. Regular and special education teachers who generally teach in their own classrooms may collaborate on a lesson or project and teach together for a selected exercise. Cross-curricular activities can also refer to a science teacher working with a physical education teacher on a lesson that they then teach to a class of students. Encouraging inclusive and cross-curricular practices provide learning opportunities for all students, but especially those with disabilities.

Challenges

The resource of time in public schools is a coveted commodity. In order to plan curriculum and instruction, teachers need to be able to have time to collaborate and share experiences to create such learning opportunities for their students. Dedicating time to allow teachers to work together is a key responsibility of the school principal (Kauffman, Johnson, Kardos, Liu, & Peske, 2002). Creating a schedule that supports teacher collaboration is critical to the success of effectively implementing curriculum and instructional planning, inclusive practices, and cross-curricular activities. This sacred time would afford teachers the opportunity to work with one another on curriculum and lesson planning.

Another issue related to time is that districts often plan curriculum during the summer months or during the school day, but both come at a costly expense. Planning curriculum during the summer often means that teachers need compensation for their time, and curriculum planning during the school day means that the district must spend money to pay for substitute teachers so that the full-time teaching staff can participate in curriculum planning. In-service days, which are often reserved for professional development, may be a possible solution depending on the district's needs for professional development and curriculum planning time.

An issue that may arise when creating these types of collaborative relationships is that misconceptions may exist between regular and special education teachers regarding their roles (Oliver, 2016). Regular education teachers are largely viewed as content area experts, whereas, special education teachers tend to not be viewed as content area experts (Mason, Thormann, O'Connell, & Behrmann, 2004). Defining the roles of all teachers in curricular or instructional practices is necessary in order for the relationships and activities to be successful. No teacher should serve a greater role than his counterpart. These relationships should be created on an equal playing field. Under a co-teaching model, teachers who teach together should have equal roles that respect their skills and acknowledge their expertise.

Conclusions

Including special education teachers on curriculum planning teams offer many benefits to them as well as regular education teachers. Enacting this practice is not only beneficial to teachers, but more importantly to the students that they serve in an effort to provide more equitable educational opportunities to all students. Including special education teachers in curriculum planning creates an opportunity for teachers to collaborate and it bolsters teacher leadership. It also creates a platform for teachers to develop inclusive practices and cross-curricular activities to support the creation of appropriate opportunities in the LRE for students with disabilities to work with their typical peers. ESSA (2015) and IDEIA (2004) necessitate that students with disabilities be afforded appropriate learning opportunities and by including special education teachers in curriculum planning is one way to ensure that such opportunities be created. The importance of collaboration in curricular planning cannot be underestimated. Ultimately, the team approach is about children and children are best served by involving special education teachers with regular education teachers both of whom will eventually be a part of the IEP process.

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About the Author

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An Invitation to Write for Pennsylvania Educational Leadership

Kathleen Provinzano, Editor

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Manuscripts should be emailed to Editor Kathleen Provinzano (Drexel University) at ktp37@drexel.edu. All submissions are initially reviewed by the editor. Submissions evaluated as appropriate for review are then sent to three readers for blind review. Manuscripts should follow the guidelines set forth by the American Psychological Association.

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