

## Capstone 2 – Spring 2018

### I. Math and Science Learning

“Curriculum matters *and* teachers matter.”

- Dr. Janine Remillard, February 4, 2018

In a March 2018 survey of the math department at Flintridge Preparatory School where I work as a math teacher and STEAM coordinator, one common concern about switching to a modified block schedule next year resonated throughout the department: “How will we get through all of the essential curriculum?” The concern arose from a common understanding that longer 77-minute blocks require more progressive, student-centered teaching methodologies, and that switching from direct instruction to a student-centered model means sacrificing learning for “fluffy” projects and activities.

It was clear from the survey that almost everyone in the math department agreed that lecturing for seventy-seven minutes was out of the question. However, two major assumptions prevailed—assumptions I myself held before undertaking my graduate degree in educational leadership at the University of Pennsylvania—(1) direct instruction is the only effective form of instruction for math learning and (2) all of the material we teach is “essential.”

As a teacher leader at my school and director of the STEAM program, I have a responsibility to challenge and support members of the adult community while simultaneously ensuring high levels of math and science learning. That means challenging some of these long-held assumptions in math department. Similar assumptions prevail in the science department. Sitting in on the science department meetings, I heard time and time again that science teachers

were concerned that reduction in overall class time on the new modified block schedule would mean sacrificing essential content. “How are we supposed to teach everything that needs to be taught?”

Of course teachers will argue that the way they’ve been doing things is the most effective way—after all, what is experience for? Knight (2014) warns that “...all of us are prone to seek out data that support our preconceived understanding of reality—what psychologists refer to as confirmation bias” (p. 21).<sup>1</sup> So most teachers will cherry-pick those examples from their personal experience that verify what they already believe to be true about teaching and learning.

Furthermore, Leithwood, Aitken, & Jantzi (2001) write: “People overlearn habitual responses and continue to use them long after they could have been replaced by more effective responses” (p. 36).<sup>2</sup> Teachers will not only hold to their assumptions and find evidence to support them, but they will also fall back on old habits long after new methods of teaching and learning have proven to be effective.

As a school leader, I must push back against assumptions, fight old habits, and find a way of helping my teachers see that (1) direct instruction is not the only effective method of math and science instruction and (2) not everything we currently teach is essential. Marzano (2003) asserts, “*Schools should drastically reduce the amount of content teachers are required to address in class*” (p. 27).<sup>3</sup> He supports this assertion with a very straightforward fact:

---

<sup>1</sup> Knight, J. (2014 May). “What You Learn When You See Yourself Teach.” *Educational Leadership*. 71(8).

<sup>2</sup> Leithwood, K., Aitken, R., and Jantzi, D. (2001). *Making Schools Smarter*. CA: Corwin Press.

<sup>3</sup> Marzano, R. (2003). *What Works in Schools?* Alexandria, VA: Association for Supervision and Curriculum Development.

“[T]he TIMSS [Third International Mathematics and Science Survey] indicates that U.S. mathematics textbooks address 175 percent as many topics as do German textbooks and 350 percent as many topics as do Japanese textbooks. The science textbooks used in the United States cover more than nine times as many topics as do German textbooks and more than four times as many topics as do Japanese textbooks. Yet German and Japanese students significantly outperform U.S. students in mathematics and science (Schmidt, McKnight, & Raizen, 1996)” (p. 26).<sup>4</sup>

If German and Japanese students are outperforming U.S. students in math and science while covering significantly less material, then something about the way we’ve been doing things doesn’t check out. It simply cannot be true that *everything* we teach in American classrooms is essential.

As for direct instruction—it has its place in teaching and learning. However, according to Whitman (2016), “research suggests although each student has individual learning preferences, all students learn best when taught in a variety of modalities. The best modalities to use will vary from concept to concept” (Kindle Location 391-393).<sup>5</sup> Weiss, Heck, & Shimkus (2004) found that “In the high quality lessons, students were fully and purposefully engaged in deepening their understanding of important mathematics content. Some of these lessons were ‘traditional’ in

---

<sup>4</sup> Ibid.

<sup>5</sup> Whitman, G., (2016). *Neuroteach: Brain Science and the Future of Education*. Rowman & Littlefield Publishers.

nature, including lectures and worksheets; others were reform in nature, involving students in more open inquiries” (p. 25).<sup>6</sup>

As a teacher leader, it will be my responsibility to lay out the facts for my math and science teachers. They need to see evidence that challenges their long-held assumptions. Direct instruction is *not* the only effective way of conveying content, and not *everything* in our current curriculum is essential.

Weiss, Heck, & Shimkus also suggest four important factors that “seem more instrumental than instructional strategies in promoting student opportunity for learning” (p. 31). These “include the extent to which lessons engage students with important mathematics concepts; create an environment that is both respectful and rigorous; use questioning effectively; and help students make sense of the mathematics concepts being addressed” (p. 31).<sup>7</sup> Each of these four factors requires that the teacher be aware of the tone he or she sets in the classroom. Whether the teacher is engaging the student in problem-based learning (PBL) or direct instruction, he or she can use questioning to engage students in respectful and rigorous exploration of the mathematical concepts at hand. Questioning is also at the foundation of sound science instruction. The National Science Teachers Association Position Statement on Scientific Inquiry (2004) says, “Understanding science content is significantly enhanced when ideas are anchored to inquiry experiences” (p. 1).<sup>8</sup> The research shows that more than specific strategies, effective use of questions and questioning is at the heart of effective math and science instruction. Boaler (2013) supports this assertion:

---

<sup>6</sup> Weiss, I., Heck, D., & Shimkus, E. (2004, Spring). “Looking Inside the Classroom: Mathematics Teaching in the United States.” *Journal the National Council of Supervisors of Mathematics*.

<sup>7</sup> Ibid.

<sup>8</sup> National Science Teachers Association Position Statement on Scientific Inquiry (2004).

“All of my research studies have shown that when mathematics is opened up and broader math is taught—math that includes problem solving, reasoning, representing ideas in multiple forms, and *question asking*—students perform at higher levels, more students take advanced mathematics, and achievement is more equitable” (p. 2, emphasis mine).<sup>9</sup>

In my role as a teacher leader, I have a responsibility to challenge the assumptions of my math and science teachers. Curriculum is important, but what and how much a teacher covers in any given school year can vary. In fact, it may be more beneficial to cut some curriculum in favor of deeper learning through inquiry and question asking. The research supports these assertions. Dr. Warren Mata said, “The principal is not only responsible for student learning; they are also responsible for teacher learning” (January 7, 2018). As a school leader and lead learner, it becomes my responsibility to arm my teachers with the facts so that they can most effectively improve student outcomes.

## II. Coaching and Evaluating

“Support flows downhill like water.”

- Dr. Robert Evans, February 3, 2018

Dr. Robert Evans said, “Conflict avoidance is a way of life in schools” (February 3, 2018). In all of my experience as a student of school leadership, no statement has resonated more

---

<sup>9</sup> Boaler, J. (2013). “The Stereotypes That Distort How Americans Teach and Learn Math.” *The Atlantic*. Nov. 12.

profoundly with me than this one. I, too, have a leadership style that tends to lean more toward diplomacy and less toward direct conflict. Evans went on to explain that one should not expect to change one's fundamental leadership style in any meaningful way (February 3, 2018). This is an interesting dilemma. If I have a tendency to be conflict avoidant, and I cannot expect to change that about myself, then how am I to act as an effective coach and/or evaluator of teachers?

For starters, I take issue with idea that one cannot expect to change one's essential leadership style. Already in my time in the educational leadership program at the University of Pennsylvania, I have begun to address conflict with more directness. Knight (2014) stated that "To grow...we need two things: a clear picture of current reality and a goal we want to achieve" (p. 21).<sup>10</sup> That is something I have focused on in my time in the program. I am aware of my tendency to avoid conflict (the current reality) and I have a strong desire to be a more direct coach and evaluator of teachers (the goal).

Daresh (2007) explained, "Clinical supervision is best viewed as a collegial practice—not as something that a superordinate (an administrator or supervisor, for example) does to a teacher, but as a peer-to-peer activity" (p. 318).<sup>11</sup> Since I am not yet in the role of supervisor, I can strive to be direct while also helping my peers find their own paths to improvement through self-reflection, ownership, and empowerment. For example, Leithwood, Aitken, & Jantzi (2001) wrote, "Encouraging journal-keeping, developing video recordings of teaching for subsequent consideration, and writing more formally about what one does are ways to help teachers become more aware of what they do, so that then they can consider the reasons for what they do" (p.

---

<sup>10</sup> Knight, J. (2014 May). "What You Learn When You See Yourself Teach." *Educational Leadership*. 71(8).

<sup>11</sup> Daresh, J. (2007). *Supervision As Proactive Leadership*. Waveland Press.

36).<sup>12</sup> One does not need to be a master of conflict to inflect change. There are ways to help another teacher come to their own conclusions about what needs to be done differently. Encouraging self-reflection through journaling and video recordings can be a way of showing a teacher what it is she can be doing differently without having to say it outright.

Evans (2009) makes the argument for letting teachers choose goals they set for themselves—“In clinical supervision, for example, supervisory observations are targeted toward goals chosen by the teacher in conjunction with the supervisor, whose role is to provide specific feedback about the teacher's performance in the identified areas” (Kindle Locations 3500-3501).<sup>13</sup> This allows the teacher some ownership over the process and can help keep the teacher from becoming defensive. Evans also wrote:

“If...negative feedback is administered in a timely, thoughtful way, spells out the specifics of a problem, and offers concrete assistance, it can help people learn from their mistakes and can actually support their self-esteem and expectations, creating a positive self-fulfilling prophecy by conveying confidence that they will improve” (Kindle Locations 3506-3508).<sup>14</sup>

There is a way of both providing feedback *and* building self-confidence. Being factual about the way one delivers the feedback and offering manageable steps to address a problem are two ways that a coach or evaluator can point to problem areas without heaping judgment and criticism on the teacher.

---

<sup>12</sup> Leithwood, K., Aitken, R., and Jantzi, D. (2001). *Making Schools Smarter*. CA: Corwin Press.

<sup>13</sup> Evans, R. (2009) *The Human Side of School Change: Reform, Resistance, and the Real-Life Problems of Innovation*. Jossey-Bass.

<sup>14</sup> *Ibid.*

Furthermore, Gardner (1990) wrote:

“To the extent that leaders enable followers to develop their own initiative, they are creating something that can survive their own departure. Some individuals who have dazzling powers of personal leadership create dependency in those below them and leave behind a weakened organization staffed by weakened people. Leaders who strengthen their people may create a legacy that will last for a very long time” (p. 36).<sup>15</sup>

Another important aspect of coaching and evaluation is empowering those being coached or evaluated. Not only does this spark initiative in the teachers, but it also creates a strong organization that can operate successfully even as leaders come and go.

Of course, there is a time and a place for conflict in every leader’s tenure. One can only go so far using methods of self-reflection, ownership, and empowerment. There will always be those teachers who refuse to change. Evans (2009) calls them “resistors.” A school leader must prepare for conflict when confronting resistors. As Evans noted, “[confrontation’s] aim is not to convert the truly negative but to limit their behavior and support the committed” (Kindle Locations 3467-3468).<sup>16</sup> One must be prepared to use one’s authority to stand up for those people who have shown commitment to the mission of the school. You can’t win them all, they say, and you especially can’t expect to win over resistors. But you can dampen the effect they have on the other members of the faculty.

---

<sup>15</sup> Gardner, J. (1990). *On Leadership*. The Free Press, McMillan, Inc.

<sup>16</sup> Evans, R. (2009) *The Human Side of School Change: Reform, Resistance, and the Real-Life Problems of Innovation*. Jossey-Bass.

Fullan (2016) wrote, “I have already concluded that principals cannot affect the school one teacher at a time. They must change the culture of the school toward greater focused collaboration. They do this by becoming the lead learner” (p. 132).<sup>17</sup> In the role of school leader, I will be responsible for both coaching and evaluating teachers. But I will not make it my task to change every teacher one by one. Rather, I will need to act as lead learner, demonstrating to my faculty that I am willing to work as hard as anyone else to improve student outcomes. I am responsible for guiding the vision of the school, and it is through a balcony-view lens that I must shape the culture to be one in which all members of the school community—adults and students alike—are learners.

---

<sup>17</sup> Fullan, M. (2016). *The New Meaning of Educational Change*. Teachers College Press.