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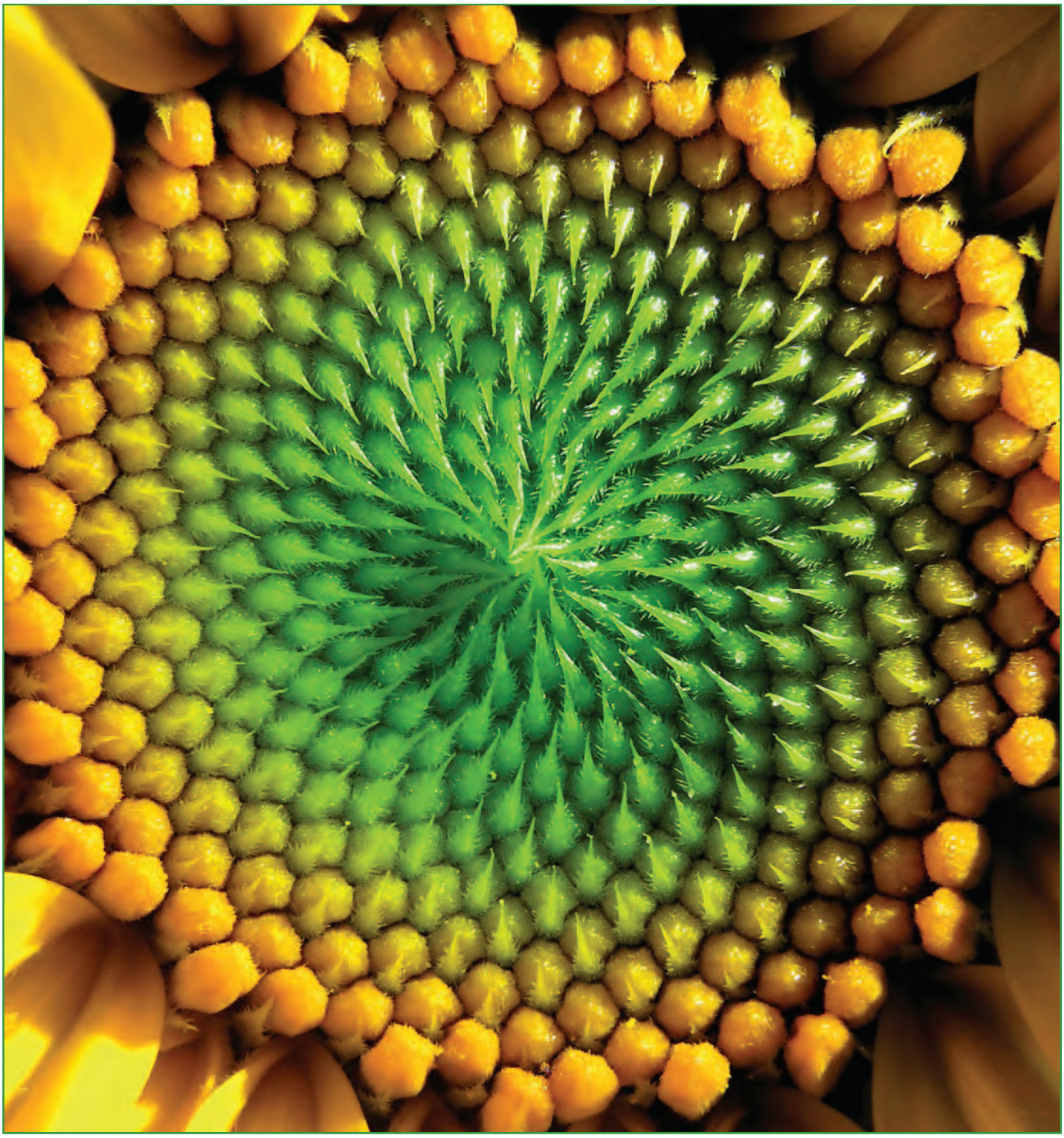


National Council of Supervisors of Mathematics *www.mathedleadership.org*

Table of Contents

Conditions that Support the Creation of Mathematical Communities of Teacher Learners

Michelle Stephan, *University of North Carolina, Charlotte*
Didem Akyuz, *Middle East Technical University*
George McManus and Jennifer Smith, *Lawton Chiles Middle School*

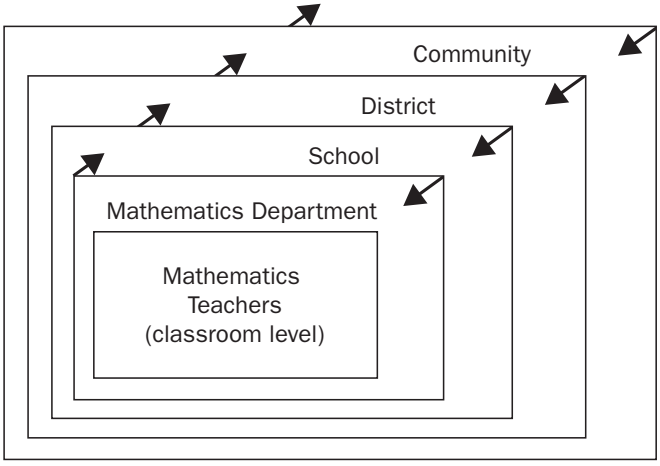
In his seminal work, Richard DuFour argues compellingly that if educational reforms are to be sustained long-term, schools must transform themselves into professional learning communities (DuFour, 1998). Professional learning communities (PLCs) can be distinguished from traditional school cultures in that all personnel from the principal to the classroom teacher are committed to collaboration using data about student learning to make decisions regarding school policy and practice. Supporting a school-wide culture that acts in this way is more difficult than it seems since teachers are accustomed to (and quite comfortable with) working in isolation. Encouraging teachers to make their students' learning public to other teachers is met with resistance because it exposes our personal teaching practices and beliefs to our peers.

In this paper we describe the conditions under which one group of mathematics teachers formed their own community of learners. We use the term communities of learner (COL) to refer to groups of two or more individuals (teachers, administrators or others) that collaborate about student learning, in contrast to an entire school body that we consider a professional learning community (DuFour, 1998, DuFour, 2004, DuFour 2007). Therefore, within one school that is operating as a PLC, there could be multiple smaller COLs at work. However, not all teams of teachers operate as COLs just because they meet on a regular basis. Our goals are to explicate 1) the characteristics of COLs and how they differ from traditional teacher teams and 2) the conditions that underlie the creation of strong COLs within schools with the hope that our work can be used to influence other cultures interested in doing the same.

Theoretical Perspective

The theoretical perspective that guides our discussion is rooted in situated learning theory (Wenger, 1998). In this view, teachers' practices and decision-making are situated within various other groups. As Cobb and McClain (2006) explain, teacher change is enabled and constrained as they form teacher networks that function within the confines of other groups within the educational system. For example, teachers must work within the context of their specific department, which is situated within the school, the district and the community at large, including parents, school boards, state legislative bodies and university officials. Teacher networks are viewed as nested within broader contexts and teacher networks can form across levels, e.g., collaborations across departments or across schools (see Figure 1).

FIGURE 1. *Nesting relationship among various education cultural groups*



In this figure, our COL can be located in the inner rectangle and is supported and constrained by other mathematics teachers within the school, which in turn operate within the larger setting of the school, within a district, and within the larger community. The participants at each level who operate within more than one level are referred to as *brokers* (Cobb and McClain, 2006). For example, one of the teachers in this paper served on various boards at the district and state level. She was, therefore, able to bring information about district and state policies regarding mathematics education to her COL.

Further, and more importantly, there is a bi-directionality of influence in that not only can people, policies. or activities in the outer levels enable and constrain the policies and practices at inner levels as is the traditional view, but also, communities at the inner levels can effect policy and practice outwardly at the department, school, district, or broader levels. As an example, our COL was asked to present our work on student interviewing to the monthly principals' meeting at the district level and also to a district-wide committee of teachers and assistant principals from each school. Our presentation contributed to the notion that assessing students via listening to them solve tasks before the unit is implemented can be a powerful tool for teaching, promoted the notion that data that is used in data-driven teaching can also be qualitative in the form of listening to students' preconceptions, and contributed to the creation of a district-wide definition of "mathematical big ideas." This example illustrates that the members of our COL served as brokers who contributed to the interchange of information between the teaching community and the district-wide committee of teachers, administrators, and policy makers. Additionally, our work had the effect of spreading from the classroom to the district (outward direction) which led to increased support for our efforts to use data-driven practices in our classrooms (inward direction) in the future through additional common planning sessions of 3 ½ hours, the creation of a leadership team, and days off from teaching to focus on collecting data to design effective instruction.

The purpose of our paper is to describe the policies and practices within multiple layers of Figure 1 that allowed for the emergence of a community of learners at the innermost level, a group of five mathematics educators. We do so by first describing the participants in the COL. We then elaborate on the three most important characteristics of PLCs that also serves as the foundation of a strong but smaller community of learners, using an example from our mathematics planning to illustrate the characteristics of COLs, and then use these three characteristics to define what makes COLs (and PLCs) different from traditional teams of teachers. We are not making any claims that our school was a PLC. Rather, we are claiming that five mathematics teachers were able to form and sustain a powerful COL situated within the context of a school that was attempting to instigate change towards a PLC. Next, we return to our theoretical framework to describe the policies and practices at multiple levels of our educational system in order to explain the conditions that led our COL to be successful and sustain its work into the subsequent years. Finally, we reflect on what we have learned in order to provide implications for other schools or teachers that might want to start their own communities.

The Mathematics Community of Teacher Learners

Our community of learners (COL) consisted of four seventh-grade mathematics teachers from a middle school serving approximately 1300 students from an upper-middle-class suburb of Orlando, Florida and one doctoral student from a local university. These four mathematics teachers included Stephan, Smith, MacManus, and Dickey, all of whom came together partway into the school year as the result of an opportunity to participate in a doctoral research project that involved using instructional material addressing integers developed the year before and tested by Stephan, McManus, and Smith (Stephan, 2009) rather than the instructional material addressing integers in the Connected Mathematics curriculum materials adopted by the district. The COL agreed to plan their instruction on integers together and, as part of this process, would also talk daily to reflect on their instruction. Since there was no teacher's manual for this instructional unit, frequent meetings were important for planning their instruction as well as tracking the mathematics learning of students and implications for their instruction.

Of the four teachers that formed the COL, only Smith could be considered a veteran with 10 years of teaching in special education. The other three teachers, Stephan, McManus, and Dickey, had taught 4, 3, and 1 years, respectively. One teacher, Stephan, had 5 ½ years experience teaching and doing research at the college level, and this year, she was teaching full time in the middle school, half of her time devoted to teaching and the other half as a mathematics coach for the school. Stephan and Smith had

co-taught in an inclusion setting for three years and Stephan and McManus had co-planned daily the year prior to this paper. Akyuz, the doctoral student, was serving an internship in Stephan's classroom and attended class three times per week for the entire school year.

We began meeting one week before our instruction on integers began. In those initial meetings, Stephan and Akyuz shared readings on the historical development of integers as well as research articles examining students' understanding of integers. From there, the focus shifted toward the instructional materials themselves, and we envisioned how these materials might be used with students—what Schoenfeld (2000) refers to as developing a lesson image. All five participants met together at least once per week for a formal meeting while more informal meetings occurred on an almost daily basis. If only two or more of us could meet, one of the members took the responsibility to debrief the other team members.

FIGURE 2. *Big ideas for the integer unit*

Big Idea One: Interpreting Net Worth as a Positive/Negative Difference
- Net worth as a combination of a positive and negative value
- When a negative value is greater than a positive, the combination is negative

Big Idea Two: Using Zero as a Point of Reference for Calculations
- Referencing zero to determine net worth
- Referencing zero to compare two net worths
- Referencing zero to add or subtract integers
- Cancelling equal positive and negative quantities

Big Idea Three: Comparing Integers with a Vertical Number Line
- Higher negative numbers are further away from zero
- Structuring the gap between two integers to find the difference

Big Idea Four: Reasoning with a vertical number line to determine the results of addition and subtraction operations
- Determining the effect that operations have on a quantity
- Finding results of integer operations on the vertical number line
- Commutativity of subtraction with integers does not hold true

Big Idea Five: Determining the meaning of positive/negative signs
- Using flexibility with symbols to find unknown operations
- A minus sign is different than a negative sign

CHARACTERISTICS OF COMMUNITIES OF LEARNERS

In this section we consider three characteristics of our Community of Learners with some examples of those characteristics. We want to stress that just because teachers meet together to plan instruction, that does not make them a Community of Learners. COLs have very specific characteristics that set them apart from teacher planning teams.

Characteristic #1: ***Student-Centered Teaching: Determining learning goals, assessing students' conceptions, and supporting students who are struggling.*** Prior to instruction, all five members of the COL met to discuss the learning goals for the integers unit. The "big ideas" important for integer addition and subtraction are listed in Figure 2 below (see Stephan & Akyuz, in press, for more details). Instruction began in the context of net worth and used finance to build subsequent integer concepts and operations with a particular focus on addition and subtraction. Consequently, the big ideas listed below are cast in the context of finance and mathematics with more specific learning goals listed beneath each.

The broad goal of our instruction was to begin with a realistic context, giving students opportunities to think about integers as net worth, debts, assets, and transactions, and then move them toward more abstract reasoning with integers such as computing the difference between -1000 and -3000. At completion of the unit, we used these big ideas to write common assessment problems. In additional, we assessed students daily in order to find out more about their developing understanding, and if any students were struggling, they received individualized instructional attention from the teacher.

Characteristic #2: ***Focus on student learning, not just teaching.*** One of the hallmarks of DuFour's PLC notion is that organizations should become learning institutions rather than only teaching ones. On a smaller COL scale, we attempted to model this, with most of our conversations focusing on student learning. Generally, formal meetings were reserved for teachers to discuss the current goals of the instructional sequence, the next few goals in the sequence, students' current and anticipated thinking, and our means of supporting that thinking. To initiate

discussions in these meetings, teachers might bring in examples of students' work, either in written form or from memory, and we would then use student thinking as the springboard for setting subsequent mathematical goals for instruction. If students' thinking did not match what we predicted in our lesson imaging, then we wrote new activities to strengthen and build on their current thinking. If students' thinking flowed as predicted, then we engaged in further lesson imaging by working out the next few pages of the instructional activities to remind ourselves of the intent of the instruction and to anticipate what strategies our students might create to solve the problems, both productive and not. We developed questions that we might ask to help students who are struggling as well as questions designed to further strengthen the thinking of students who were ready for a challenge.

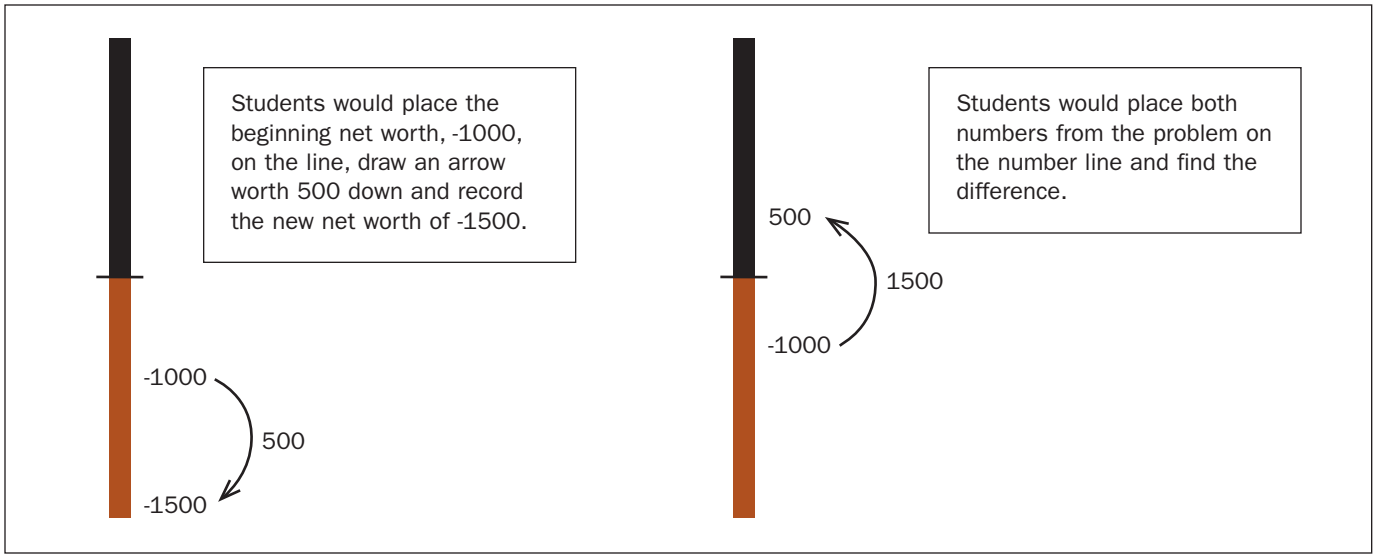
As a part of our lesson imaging, we used anticipated student thinking as the vehicle to generate possible questions for discussion in our classrooms. Each of us valued NCTM's process standard (2000) stressing the importance of creating opportunities for students to engage in meaningful, genuine mathematical discourse. This type of environment includes supporting students' conjecturing, proving, and revising conjectures based upon new ideas. Consequently, our instructional tasks were posed in ways that were intended to support conjecturing, and we discussed ways in which the teacher could highlight students' conjectures when they arose in class, so these could be used as a basis for our classroom discussions.

Characteristic #3: *Ongoing data-driven decision making/ assessment.* In describing our experiences above, we have shown that our decisions about instruction were influenced primarily by our analysis of student learning on a daily basis. The data we used to make these decisions were examples of students' work from that day, including both classwork and homework. In many instances, our analysis of these data led us to make adjustments to instruction. For instance, our unit used the context of finance to teach integers with students understanding that a person's net worth is the difference between his total assets and total debts, and we introduced problems that asked students to determine a person's new net worth when a transaction caused his original net worth to change. Based on what we saw happening with our students as they worked on these kinds of problems, we decided to introduce a vertical or "net worth" number line as a means for recording their operations with integers. This net worth number line was colored black on top (positive) and red on the bottom (negative).

At one point in our instruction, we asked students to use this net worth number line to determine someone's new net worth if their original net worth was -$1000 and they incurred a debt of $500. Students created at least two different ways of reasoning with the number line, as shown below (Figure 3).

At the time, the students' second strategy surprised us and became the major focus of our analysis. Students who were modeling the problem situation this way were having

FIGURE 3. *Two different ways students reasoned with the number line.*



difficulty interpreting their actions on the number line. The confusion occurs because the two numbers on their line represent different quantities: 1000 signifies a net worth and the 500 is a transaction. Our instructional intent was that student models would most easily fit the problem situation if the transactions were represented by the arrows. As a consequence of analyzing students' different ways of thinking about and modeling integer operations, we made adjustments to instruction the next day. We posed a similar task and asked students to symbolize their actions on the number line again. We then asked students to decide which inscription more accurately depicted what happened to the net worth, and students decided to place transactions on the arrow to show whether the net worth was changing for the better or worse.

In one of our last meetings, we focused on developing an assessment for the integer unit that all of us would all use with our students. We began by recalling what our mathematical goals had been at the beginning of the unit and any unanticipated goals that had arisen during implementation. Each teacher chose several of these goals and wrote possible questions. Stephan collected the questions and created the final unit assessment, sent it back to us for analysis and discussion, and then revised the assessment based on our feedback. Schedules did not allow for a formal debriefing meeting after we had given the assessment to our students, but we held several informal debriefs, and found that students had shown proficiency with almost all of the big ideas of the unit. A few students still had difficulty interpreting the meaning of a negative sign when problems only contained one, instead of two signs, such as -1000 – 2000 rather than -1000 – (+2000). Even though it was a minority of students, we agreed that our instruction next year should focus more heavily on problems that contain only one sign. In this way, summative assessments can show not only the success of an implementation but also lead to changes for the next year.

CONDITIONS FOR SUPPORTING COLS

In this section we revisit the theoretical model in Figure 1 and explore the policies and practices of the various communities at other levels of schooling that made it possible for our COL to thrive. We start by looking at the innermost level, the classroom teachers that comprised the COL, and move our way toward the outermost rectangle, the community.

Support #1 [Classroom Level]: We cannot stress enough that the emergence of our COL would never have been possible without the commitment of the teachers. This commitment involves teachers who believe that to teach, you must be a student. We believe that an *inquiry pedagogy*, which involves examining your classroom practice in collaboration with other teachers, is a rare phenomenon, yet one that is extremely rewarding. While it may be debatable whether or not you can mandate teacher participation in a COL of this type, we feel that voluntary participation was a key to creating and maintaining our shared goal.

While it can be frightening to share one's student data with other teachers, creating a safe environment for sharing data is essential for the community to thrive, and this requires teachers who believe that instructional decisions should be informed by student thinking and learning. One of the characteristics of our environment that helped to create safety was that our topics of discussion rarely focused on teacher actions but, rather, centered on student thinking. McManus and Smith recounted numerous times that they felt comfortable in our meetings because they never felt like their pedagogy was under scrutiny or attack from other teachers. In fact, when they would ask questions like, "How should I have taught this differently?" the lead teacher would always bring it back to students rather than the teacher by asking, "How were your students reasoning?" The focus on students' thinking made our conversations less personal and gave the teacher some basis for making their own decisions about changes to their pedagogy.

Support #2 [Classroom Level]: In our case, Akyuz's dissertation served as the catalyst for the emergence of our COL. However, we emphasize that Stephan and Akyuz could have conducted this study in the isolation of their classroom, but deliberately chose to let it serve as an opportunity to create a community of learners. This means that the establishment of COLs relies on at least one strong teacher leader that recognizes these opportunities when they arise and can take advantage of them. We contend that a strong teacher leader is one that is perceived by his or her peers as having expert knowledge of teaching in his or her field, knows how to create a safe environment for teacher collaboration, and focuses 90% of professional conversations on student learning and the implications for practice rather than administrative tasks. Good teacher leaders have what Collins (2001) refers to as a "hedgehog concept," a strong commitment to one

particular aspect of teaching, and can therefore see (and is looking for) opportunities to further their agenda. The teacher leader's hedgehog concept in this COL has always been to be the best at student-centered mathematics instruction and found ways to encourage other teachers to join her in strengthening their practice in this manner. In fact, when this project was over and the next school year began, the teacher leader was transferred to another grade level and was not available to work with these teachers again, but this limitation did not stop these teachers from forming their own COL and sustaining the practices of our collaboration. Thus, when asked whether or not COLs working at this level can be sustained, the answer is a resounding "yes," as they are still going on after four years even after the original teacher leader has moved on.

Support #3 [Mathematics Department Level]: Our mathematics department chair continually highlighted her vision that teachers collaborate with one another during common planning time. During department meetings and in personal conversations, she encouraged teachers to use their planning time to work together as much as possible. She modeled this practice herself with one other teacher in her grade level. In addition, she often set aside department meeting time so teachers could collaborate on creating common assessments for the courses they all taught. Without this support from the mathematics department chair, it is possible that our COL would have had difficulty forming.

Support #4 [School Level]: The role that our principal and assistant principal played in supporting our COL was crucial. First, the principal's vision of our school involved working towards becoming a Professional Learning Community. At the beginning of the year, she distributed a short article describing PLCs to each member of the teaching staff so that those who had not heard of them would become more informed.

Our principal continued to share this vision with us at faculty meetings and in her one-on-one conversations with each of us. Knowing this was not enough to initiate a PLC environment, she held monthly meetings with teachers in key leadership roles (e.g., coaches, department heads, technology support). In these meetings, the teachers attempted to create a vision for the school that was consistent with PLCs. By virtue of being the mathematics coach of the school, Stephan participated in many of these meetings, and therefore, was exposed to the PLC vision.

While teacher leaders were creating the school vision with their faculty and each other, the principal made key structural decisions in order to better support the emergence of COLs. She implemented a common planning period for teachers, explaining that she expected us to use that time to plan together. She hired more teachers from within the staff to serve as coaches in mathematics, technology, language arts, reading and cooperative learning. By creating these positions she was attempting to convey her vision that teachers use each other and their coaches to make meaningful inquiries into their practices.

For her part, the assistant principal in charge of the mathematics program also provided a means of support for our COL by giving us approval to set aside our adopted curriculum materials for five weeks in order to explore our teaching of this new unit. This decision required us to focus on student reasoning *without* the support of a teacher's manual that often includes material that may address the student thinking that is likely to come up in an instructional unit. We are not suggesting that it is always useful to set aside the teacher's manual for curriculum materials, as these often provide important supports for instruction. But in *this* case, having to think together about the mathematical goals, the student thinking, and our strategies for engaging that thinking *without* the support of a teachers manual created a context in which these kinds of discussions were essential. We acknowledge that COLs can *also* productively work through and discuss supports provided by a teacher's manual to address the mathematical ideas, student thinking, and strategies for engaging that thinking as an ongoing part of their planning for instruction.

Support #5 [District Level]: Our district was in its third year of implementing Connected Mathematics Project 2. Three years prior to the creation of our COL, a team of teachers and administrators from all twelve middle schools in our district formed a group called CDDRE who, in conjunction with key district personnel, adopted not only the Connected Math Project 2 program but also made a strong commitment to a student-centered approach to teaching advocated by the NCTM Standards (2000). The purpose of the CDDRE meetings was to come together in collaboration with teachers from all over the district to discuss strategies for improving mathematics instruction and strive toward our shared goal of increasing the number of students who score at the proficient level on the state test.

CDDRE administrators and teachers were taught how to use data to drive decision-making at all levels and were charged with shaping their school mathematics programs in this manner. Data was often defined in these meetings as quantitative assessments on pre- and post-tests. Teachers from this CDDRE worked together to create common assessments to be voluntarily used by teachers at various schools. Stephan participated in the committee to create these common district assessments. Our department chair, assistant principal, and a lead teacher were regular members of this CDDRE and all felt that the district vision for mathematics aligned perfectly with our principal's vision for our school.

Support #6 [Community Level]: An important means of support came from the Florida Department of Education and the local University. Recently, the Florida Department of Education convened a group of experts to rewrite the state standards for mathematics instruction using the NCTM Curriculum Focal Points (2006) as their guide. These new standards advocate teaching for understanding using only a few big ideas per grade level, rather than teaching for mastery of a large number of concepts, as was previously the case. The vision of the new State Standards is that students should be encouraged to explore, conjecture, justify and represent mathematics in meaningful and sophisticated ways while becoming proficient in skills. This message is consistent with the vision of our district as we implement a reform-based curriculum and of our principals as they provide means of support for transforming traditional mathematics classrooms to inquiry environments. In addition, the adoption of these new reform-based standards provided a catalyst for teachers in our district and our COL in particular to start investigating approaches to teaching that were more student centered. We see the adoption of the Common Core State Standards as a key opportunity to create a number of COLs within our school that explore new strategies for teaching mathematics based on student thinking and learning.

Another important source of support for our COL came from the mathematics education research community. Stephan had previous research experience as a college professor. Her research focused on supporting students' development of mathematics and designing instruction that was inquiry based. As a consequence, she was able to bring information about student learning from the research community to the COL.

Constraints: Because of the strong alignment of vision across so many levels of our school community, our COL did not encounter many constraints. As we planned instruction on integers, we were of course constrained by the district's instructional plan, as well as the State's benchmarks for students. We therefore, had to create instruction that aligned with the district's plan and taught the required benchmarks for that concept. For us, that was a minor constraint and did not inhibit our inquiry.

We also experienced many of the same constraints that are reported across school district: lack of time, money and resources. However, we were able to use what resources we had to accomplish the goals of our COL and our administrators provided us not only with common planning time but also provided us with additional time together using coverage from paid substitutes when the need arose.

Implications

We believe that there are several components that supported our Community of Learners.*

- ***Voluntary Commitment to the COL.*** One key to the success of our COL was that the teachers came together around a common purpose that had everything to do with the practical daily life of teaching. Simply put, we wanted to improve our instruction on integers, and created a COL focused on student learning to accomplish this goal. Since the COL goals were created by teachers working together toward a common goal, we were more invested in the success of our community than if we had been mandated by the principal to create a COL. That is not to say that COLs are not possible when principals charge their teachers to participate in one. In our experience, when COLs are not optional, they begin as teams and take much more time and focus to become fully operating COLs.
- ***Safe Environment for Pedagogical Discussions.*** Creating an environment in which it is safe to share your practice was a crucial characteristic of our COL. Because our conversations always started with how our students were thinking and learning, teachers did not feel their practice was under attack. This is not to

* We are grateful to an anonymous reviewer who helped us articulate these implications from our work.

say that there were never tensions among participants. Disagreements are necessary for growth of a COL. However, the disagreements focused on student thinking, and ways the team might adjust instruction to better support the students, rather than judging the success or failure of a teacher's actions in her classroom.

- ***Strong Teacher Leader(s).*** We cannot overemphasize the importance of placing strong teachers who share the vision of PLCs in leadership roles within the school. These leaders need to possess the talent to recognize when other teachers share a common interest in student learning and the ability to encourage those teachers to form COLs to accomplish their goals. They also must possess knowledge of and commitment to serving as a broker across different levels of the school community. For example, to encourage other teachers and administrators within his or her school or throughout the district to put learning at the core of teaching, the broker must be willing to and know how to seize opportunities to engage others in this vision when they arise. District administrators as well as local ones must search for this type of broker and place them in formal leadership positions if their school is to become a PLC in the long run. Administrators must also provide the resources needed by their teacher leaders such as common planning time and extra planning time.

- ***Shared Vision of Teaching.*** Another crucial characteristic of schools that work as PLCs and include COLs is that a vision of learning and teaching is shared at the beginning of their work. Because the members of our COL shared the same vision, all we needed was a teacher leader to bring us all together to engage in work focused on student learning, along with the support of our administrators who helped facilitate our work instead of constraining it.

- **Goal Alignment.** One of the significant characteristics of our experience forming the COL was that key representatives and policies at various levels, from the teachers on up to the community, had goals that were aligned around student learning and standards-based teaching. The new state standards, the district's CDDRE group, administrators and the teacher leaders at our school knew the value of student-centered learning, data-driven decision making, and inquiry learning for both students and teachers. Additionally, many of them served as brokers themselves to convey the vision of teaching as learning and learning as inquiry among their constituents in both outward and inward directions (e.g., parents, school board members and teachers and other administrators whose vision may or may not have aligned).

Conclusion

In this paper, we have described the characteristics of a Community of Teacher Learners that align with the goals of DuFour's Professional Learning Communities. While PLCs focus on a school-wide vision for attending to student learning, our COL notion refers to smaller groups of teachers that come together and work in the same manner as the larger PLC that DuFour envisions. While our particular middle school was not operating as a PLC, our principal attempted to initiate the process early on, and supported our smaller efforts to engage in practices similar to the larger PLC. We have argued that without the support of multiple brokers (e.g., administrators, teacher leaders, state standards, and district policy makers), our chances of initiating and sustaining our work as a COL would have been minimal. Additionally, our work was not only supported by other leaders outside of our COL, but also we influenced practices outside of our COL, just as Cobb and McClain's (2006) theory suggests. Teachers in other disciplines have now formed teams at our school, although it is debatable whether they are operating as true COLs yet. Furthermore, our COL members have served as brokers to speak to other educational constituents both within and outside our district.

References

Cobb, P. & McClain, K. (2006). The collective mediation of a high-stakes accountability program: Communities of networks and practices. *Mind, Culture and Activity*, 13(2), 80-100.

Collins, J. (2001). *Good to great: Why some companies make the leap…and others don't.* New York: HarperCollins Publishers.

DuFour, R. (2004, May). What is a professional learning community? *Educational Leadership*, 61(8), 6–11.

DuFour, R. (2007). Professional learning communities: A bandwagon, an idea worth considering, or our best hope for high levels of learning? *Middle School Journal,* 39(1), 4-8.

DuFour, R. & Eaker, R. (1998). *Professional learning communities at work: Best practices for enhancing student achievement.* Bloomington, IN: National Educational Service.

National Council of Teachers of Mathematics (2000). *Principles and Standards for School Mathematics.* Reston, VA: NCTM.

National Council of Teachers of Mathematics (2006). *Curriculum Focal Points for PreKindergarten through Grade 8 Mathematics.* Reston, VA: NCTM.

Schoenfeld, A. (2000). Models of the teaching process. *Journal of Mathematical Behavior*, 18(3), 243-261.

Stephan, M. (2009). What are you worth? *Mathematics Teaching in the Middle School*, 15(1), 16-23.

Wenger, E. (1998). *Communities of practice.* New York: Cambridge University Press.