

SCHOOLS OFTEN LACK A COLLABORATIVE ENVIRONMENT TO FOSTER TEACHER GROWTH.

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01 CONTEXT AND TRENDS

One of the factors contributing to the attrition of science, technology, engineering, and mathematics (STEM) teachers is the lack of a collaborative environment to foster teacher growth and learning. Research shows clear benefits for teachers when they have opportunities to work and make decisions together with their colleagues within a culture of teamwork (Park, Henkin, & Egley, 2005) and with a sense of collective responsibility (Leithwood & Poplin, 1992). Additionally, collaborative work environments and learning networks create opportunities for teachers to build knowledge to improve instruction, ultimately leading to higher student achievement (Datnow, Park, & Kennedy-Lewis, 2013). Teachers who are not provided with these types of collaborative opportunities for professional growth and affirmation with their colleagues can be left feeling inadequately supported or uncertain about their practice.

Whether actual or perceived, teachers' concerns and anxieties about their own skills affect the learning experiences of their students, thereby thwarting the potential for high student achievement (Durowoju & Onuka, 2015; Tella, 2008). Berry, Daughtrey, and Wieder (2009) assert that teacher collaboration can build teachers' skills and confidence in their practice, thereby "pav[ing] the way for the spread of effective teaching practices, improved outcomes for the students they teach, and the retention of the most accomplished teachers in high-needs schools" (p. 2).

02 DISCUSSION

The lack of a collaborative school environment can be attributed to a number of root causes. First, without a structured system for effective teachers to share their expertise with colleagues (Leonard & Leonard, 2003), a knowledge vacuum is created. Through working and learning with others, collaboration can provide the support system that all teachers need to

enhance and build on their existing knowledge (as cited in Datnow et al., 2013; Cordingley, Bell, Thomason, & Firth, 2005). This type of collegiality in the profession can be especially beneficial in the early stages of teachers' careers, minimizing the chance of them leaving the education field (McClure, 2008). Moreover, without adequate time for talking with other adults, teachers can become isolated in their classrooms (Rosenholtz, 1985). Smith and Scott (1990) conclude that "the isolated conditions under which teachers practice their profession impede professional growth by making it difficult for teachers to exchange ideas among themselves and with administrators" (p. 20).

Second, principals do not always prioritize time for peer collaboration and teacher learning in planning the school-day schedule. Collaboration is expected to happen (if at all) outside of regular school hours or on a handful of professional development days. Without designated

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and protected time for regular collaboration built into the school schedule, it is challenging for teachers to create opportunities to meet with colleagues, given their already busy schedules (Lam, Yim, & Lam, 2002). Berry et al. (2009) agree that "principals and other school leaders should allot adequate time for collaboration, organize class schedules to include common planning times that permit horizontal and vertical collaboration, and actively seek to reduce divisions among staff that may prevent open and productive exchanges among teachers" (p. 7). According to the Wallace Foundation (2013), there are strategies to fit this

time within existing schedules by reassessing how teachers' time is best spent; for example, "[effective] leaders ... might replace some administrative meeting time with teacher planning time" (p. 10). Having sufficient time to collaborate with colleagues is an important and necessary component (Leonard & Leonard, 2003) of building both individual teachers' and a whole school's capacity to improve practices and promote student success.

Third, without a culture of teamwork and collective responsibility, student assessment outcomes and data can be misinterpreted or misused. For example, teachers may be reluctant to share assessment results with colleagues, resulting in lost opportunities for educators to use their collective knowledge and experiences to review and respond to data. This may result in a less than effective use of data to improve STEM teaching and student achievement (Symonds, 2004). A study by Symonds (2004) shows a significant difference between high- and low-achieving schools in regard to the frequency of assessments and how the data are used to guide instruction. To promote efficient and frequent use of outcomes for data-driven decision-making, administrators should emphasize the expectation of instructional improvement (Datnow et al., 2013) within an environment of teamwork and collective responsibility.

To help ensure teachers are provided with support systems for peer collaboration, some districts have started addressing the root causes just discussed through their use of instructional coaches. As noted by Carr, Herman, and Harris, “investing in coaching is one way to build toward collaborative adult learning” (2005, p. 81). In some cases, districts like Spokane Public Schools, the District of Columbia Public Schools, Dallas Independent School District, and Ithaca City School District have established paid

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positions for district-based or school-based instructional coaches (Hanover Research, 2014). These coaches provide teachers with instructional support in curriculum design, teaching strategies, and classroom management. The use of coaches as a means for providing teachers with systemic and regular collaboration opportunities that are facilitated by an instructional leader can build the knowledge and content capacity of STEM

teachers (Thomas, Bell, Spelman, & Briody, 2015). Districts such as Minneapolis, Minnesota, and Rochester, New York, have developed peer coaching and evaluation models where the teachers themselves observe each other’s classrooms on a rotating basis to provide their colleagues with input and feedback, and to identify and share best practices (Jacques & Fireside, 2016). Peer coaching can build capacity, strengthen collegiality, increase the sharing of ideas, and improve practices across the team (Hendry & Oliver, 2012).

Modified school schedules can also be used to accommodate extra time for teacher collaboration. A study by Datnow et al. (2013) of six public schools in three different districts describes how one district provided collaboration time by having a late start either every week or every other week; another district in the study was providing two planning periods for teachers, one for individual planning and the other for team planning. Other ways to encourage collaboration are to align teacher schedules to ensure shared planning periods, arrange for team-teaching, and/or provide other collaborative opportunities within the school-day structure (Datnow et al., 2013). Coupling these strategies with efforts to create a culture of support and trust, along with the effective use of research-based best practices to guide the collaboration time, can provide the most effective opportunities to improve teacher practice and student achievement (Leonard & Leonard, 2003).

For those schools that struggle to offer in-school systems to support a collaborative environment, online professional learning networks, such as the Teachers Network based out of New York City, can provide alternate venues for teachers to engage in collaborative professional learning opportunities (Berry et al., 2009; Leonard & Leonard, 2003). Some examples of the services that the Teachers Network offers include hosting numerous teacher conferences, as well as publishing and distributing online and multimedia resources (made by master educators) to teachers across the nation. Through an agreement with the New York City Department of Education, new teachers to the district can receive credit for professional development requirements by using Teachers Network resources and attending their conferences. Teachers Network has also partnered with universities, such as Teachers College, Columbia University, the University of San Diego, and Nova Southeastern University to provide online courses to teachers around the nation. These are only a few of the many opportunities for teacher collaboration and networking that are facilitated through their award-winning website.

Additionally, professional organizations can provide learning opportunities and a collaborative environment in the absence of a district's or school's ability to provide such networks and environments on their own. With technology today, networks of people collaborating on innovative ways to improve student achievement in the classroom are literally at our fingertips. For example, the [Computer Science For All](#) learning community, funded by the National Science Foundation, welcomes all PK–12 teachers who are interested in teaching computer science to check out their resources. The site provides a space for teachers from around the nation to ask and answer questions posed by community members. The site also includes blog posts by community members that highlight resources, share personal reflections, and communicate important announcements relevant to the field. To further increase the opportunities for collaboration, a community calendar provides information about regionally located and facilitated teacher meet-up events where teachers can come together to meet in person.

04 CONCLUSION

There is an abundance of evidence that effective teacher collaboration supports teachers' professional growth needs and improves student achievement. It can also promote the recruitment and retention of STEM teachers in the profession. Collegial and collaborative work environments in districts and schools create a culture in which teachers feel valued and respected as professionals, while also giving them the guidance, feedback, and support they need to succeed (Schiff, Herzog, Farley-Ripple, & Iannucci, 2015).

ABOUT THE GRAND CHALLENGES WHITE PAPERS

In 2017, 100Kin10 released an unprecedented representation of the big, systemic challenges to preparing and supporting STEM teachers following over two years of extensive research alongside more than 1,500 STEM teachers and hundreds of other education experts. As a part of this work, 100Kin10 commissioned a series of short white papers from well-versed thinkers and practice-oriented researchers to synthesize the most relevant research around the specific challenge areas. Together, they compose a thoughtful and well-rounded examination of the systemic challenges currently facing STEM teaching.

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