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# **PREPARING HEALTH SCIENCE TEACHERS FOR A WORLD IN NETWORKING:**

**INCREASING TEACHER  
COLLEGIALITY AND  
PROFESSIONALISM PRACTICES**

Mental Health America of Los Angeles  
Center for Educational Research and Development

**PREPARING HEALTH SCIENCE  
TEACHERS FOR A WORLD IN  
NETWORKING:  
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AND PROFESSIONALISM PRACTICES**

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## TABLE OF CONTENTS

Executive Summary . . . . .	1
Introduction . . . . .	8
Review of Related Literature . . . . .	9
Factors that Affect Teachers' Networking Capacity . . . . .	11
Teachers' Knowledge and Skills . . . . .	11
Teachers' Motivation to Engage in Networking Practices . . . . .	13
School (Organizational) Culture and Context . . . . .	15
Research Questions . . . . .	16
Research Methodology . . . . .	17
Survey Respondents . . . . .	17
Description of Health Science Pathway Programs . . . . .	19
Survey Administration . . . . .	21
Survey Items and Subscales . . . . .	22
Collegial Teaching and Learning . . . . .	23
Collective Efficacy . . . . .	23
Research Findings and Implications . . . . .	24
Research Question 1: How knowledgeable are health science teachers . . . . . about health science curriculum?	24
Research Question 2: What current networking approaches do . . . . . health science teachers use to access support and resources?	25
Research Question 3: What do health science teachers do to stay current . . . . . with teaching and learning resources?	29
California Association of Health Careers Education (CAHCE) Website . . . . .	31
Research Question 4: What is the association between health science . . . . . teachers' characteristics and their reported levels of collegiality?	34
Research Question 5: What is the association between program and school . . . . . factors and health science teachers' reported levels of collegiality?	36
Conclusions and Future Directions . . . . .	39

Appendices

Appendix A. *Collegial and Learning Scale* . . . . . 42  
Appendix B. *Teacher Collective Efficacy and Perceived Efficacy Scale* . . . . . 43

List of Exhibits

Exhibit 1. *Demographic Characteristics and Educational Background* . . . . . 18  
*of the Program Staff*

Exhibit 2. *The Current Positions of the Program Staff and the Subject* . . . . . 19  
*Areas of the Teachers*

Exhibit 3. *Health Science Pathway Program Sites by County where* . . . . . 20  
*Surveys were Collected*

Exhibit 4. *Strategic Pathway Assessment Model* . . . . . 22

Exhibit 5. *Teachers and Non-Teachers' Knowledge of Health Science* . . . . . 24  
*Curriculum*

Exhibit 6. *Teachers' Knowledge of Health Science Curriculum* . . . . . 25  
*Disaggregated by Subject Area*

Exhibit 7. *Access to a Teacher Network* . . . . . 26

Exhibit 8. *Types of Networks in which Teachers Belonged* . . . . . 26

Exhibit 9. *Preferred Ways to Network with Other Teachers* . . . . . 27

Exhibit 10. *Contacting a Regional CAHCE Coordinator* . . . . . 28

Exhibit 11. *Membership in a Formal Professional Association* . . . . . 28

Exhibit 12. *Staying Up-to-Date on Teaching and Learning* . . . . . 30  
*Resources in Health Sciences*

Exhibit 13. *Methods Used to Stay Up-to-Date on Teaching* . . . . . 31  
*and Learning Resources in Health Sciences*

Exhibit 14. *Familiarity with the CAHCE Website* . . . . . 32

Exhibit 15. *Reasons for Visiting the CAHCE Website* . . . . . 33

Exhibit 16. *Types of Information Obtained from the CAHCE Website* . . . . . 33

Exhibit 17. *Information that the Educators Would like to See on* . . . . . 34  
*the CAHCE Website*

Exhibit 18. *Means and Standard Deviations on the Collegial Support and* . . . . . 36  
*Collective Efficacy Scales Disaggregated by Ethnicity, Gender,*  
*and Subject Area*

Exhibit 19. *Path Model with the Program and School Factors* . . . . . 38  
*Predicting Collegiality*

Exhibit 20. <i>Student Outcomes Perceived to be Improved</i> . . . . .	40
<i>by the Health Science Programs</i>	
References . . . . .	44

## **EXECUTIVE SUMMARY**

Health Science Capacity Building Pathway programs have emerged as a career technical education framework for increasing health science capacity in California. This pathway model is also concerned with increasing networking practices among secondary and post-secondary educators and the industry sector. The focus on teacher networks is an important aspect of the programs. The networks play a critical role in teachers' professional development, continued sense of professionalism, and social support.

Too many teachers plan their curriculum in isolation and are rarely given the opportunity to share knowledge or the opportunity to improve their practice by interacting with other teachers during the school day (Darling-Hammond, 2002, 2008). Many teachers, especially in technical career-related programs, often report feeling isolated and end up leaving the profession. Also, many schools do not support communities of practice or provide much professional development that focuses on teachers' concerns about curriculum and students.

The purpose of this study was to examine the methods health science teachers presently use to obtain the most current knowledge about their field, and, specifically, the role networks play in the acquisition of knowledge. This study also examined teachers' capacity to collaborate with their colleagues to enhance their classroom instruction and impact student motivation and learning. The overall goal of this study was to gather information on specific school organizational and teacher factors and examine the link between these factors and effective professional learning communities. According to Clark and Estes (2002), there are three key factors that must be examined when identifying causes of performance gaps, including the functioning of networks: (1) teachers' knowledge and skills – how knowledgeable are teachers about networking practices; (2) teachers' motivation toward achieving a goal – the amount of effort and perseverance dedicated toward working with other teachers to increase technical knowledge; and (3) organizational (school/district) obstacles – school conditions that act as barriers preventing access to networking resources.

A total of 317 teachers, coordinators, staff, and principals completed the Health Career Teacher Survey. The health science staff worked in 41 health science capacity building pathway programs across California. Forty-seven percent of the respondents were solely academic

teachers. In addition, 6.0% were solely ROCP teachers, 2.2% were solely career technical education (CTE) teachers, and 3.5% were solely program coordinators. Other positions, such as principal, assistant principal, administrator, counselor, or school nurse, were held by 22.1% of the respondents. The remaining 19.1% of the individuals held multiple positions in their programs.

### **Research Question 1: How knowledgeable are health science teachers about health science curriculum?**

*Key Findings:* A small percentage (11.4%) of the educators reported being “very knowledgeable” about health science curriculum. On the other hand, more than half of the educators (57.5%) reported that they were “not knowledgeable” or “somewhat knowledgeable” about health science curriculum. The majority of the teachers who taught a CTE health science subject indicated that they were “knowledgeable” (47.1%) or “very knowledgeable” (22.1%). Conversely, only a small percentage of the teachers who did not teach CTE health science or science (e.g., English, social studies, and math teachers) reported that they were “knowledgeable” (17.8%) or “very knowledgeable” (4.4%). The science teachers’ responses were in between the two other groups of teachers. Specifically, 42.6% of science teachers reported that they were “knowledgeable” and 11.1% were “very knowledgeable” about health science curriculum. In sum, the teachers who did not teach CTE reported much lower levels of knowledge about health science curriculum.

*Recommendations:* These findings suggest that the California Department of Education (CDE) may want to offer workshops and conferences that aim to boost all teachers’ knowledge of health science curriculum. One approach would be to continue providing teachers with a series of regional curriculum alignment training sessions. It is critical that the sessions take place in an industry context. As one health science teacher stated: “...when I went to Kaiser for an open house for careers about pharmacy, I didn’t know anything. I thought they just counted pills. I didn’t realize there were five different areas of pharmacy. As far as putting together lessons, that one day in the industry was amazing.” If health science teachers are to be expected to increase their knowledge base for health science, then they need to be immersed in the proper industry context of practice. Engaging in meaningful dialogue with health science industry professionals

will provide teachers with a general infrastructure to begin to construct knowledge in health science, which will lead to improved instruction.

**Research Question 2: What current networking approaches do health science teachers use to access support and resources?**

*Key Findings:* Nearly three-fourths of the teachers felt that they had access to a teacher network that provided resources. Specifically, 65.4% of the teachers indicated that they had access to a face-to-face teacher network. The face-to-face networks referred to by the respondents were likely comprised of the teachers in their own schools and programs. Additionally, a larger percentage of the teachers (41.9%) reported that they had access to an email-type teacher network. The findings indicate that a many of the respondents belonged to more than one type of teacher network that could provide support and resources. However, it should be noted that slightly over a quarter of the respondents did not report that they had access to a teacher network. In addition to reporting on their current teacher networks, the teachers commented on their preferred ways to network with other teachers. The three most frequently identified methods were using a “professional website where teachers can access information,” attending “regional meetings/conferences,” and attending “regional professional development workshops.”

The teachers and non-teachers (i.e., coordinators, principals, nurses, etc.) also reported on their membership in formal professional associations outside of their schools. The three associations that were most frequently reported were the Association of California School Administrators (ACSA), the California Teachers Association (CTA), and the National Science Teachers Association (NSTA). Smaller numbers of respondents reported that they were members of the Association for Supervision and Curriculum Development (ASCD), the California Association of Regional Occupational Centers and Programs (CAROCP), and the Health Occupations Students of America (HOSA).

*Recommendations:* These findings suggest that the CDE Health Science Capacity Building Pathways should continue to hold meetings and conferences. Further, these findings indicate that the CDE may want to continue to invest in a website design that strongly encourages teacher collaboration and look into holding regional professional development workshops. Finally, findings suggest that, since the Health Science Capacity Building Pathway grants require that the

teachers and students belong to HOSA, more needs to be done to educate teachers about HOSA and present it as a strategy of acculturation into the health field. It is unclear at this time whether the teachers who responded to the survey are not members of HOSA, do not know they are members of HOSA, or simply did not indicate that they were members on the survey.

### **Research Question 3: What do health science teachers do to stay current with teaching and learning resources?**

*Key Findings:* Overall, the majority of the educators (74.1%) indicated that they engaged in activities to stay up-to-date on the resources in health sciences. The teachers were significantly more likely than the non-teachers to report that they engaged in activities to remain up-to-date on the resources. Teachers and non-teachers used a wide range of methods and approaches to stay up-to-date on the teaching and learning resources in health sciences. The two most frequent responses for both groups of educators were “Internet resources” and “interactions with teachers in my school.” It is interesting to note that most educators used the Internet but only a relatively small percentage reported that they used the CDE website and even a smaller percentage used the California Association of Health Careers Educators (CAHCE) website. Specifically, only 19.0% of the respondents indicated that they were familiar with the CAHCE website and the remaining 81.0% stated that they were not familiar with the website. Of the 60 individuals who were familiar with the website, 51 (85.0%) reported that they had visited the CAHCE website. The 51 respondents who indicated that they visited the CAHCE website provided a range of responses to an additional question regarding what they gained from their visit to the website. The three most typical responses [i.e., “Information about Health Occupations Students of America (HOSA),” “Information about Career Technical Education (CTE),” and “Useful information about resources”] were provided by 47% to 55% of the individuals who indicated that they visited the CAHCE website. All of the educators identified the information they would be most interested in seeing on the CAHCE website. The two most frequent responses were “academic resources that are current and relevant to my students” (81.1%) and “curriculum alignment activities” (73.2%).

*Recommendations:* It is recommended that more be done to advertise CAHCE or a similar website that would provide teachers with access to relevant academic, post-secondary education, and career technical education resources. For example, a website could offer secondary and post-

secondary health science teachers the opportunity to: (1) access the best practices of other health science pathway programs that have already been shown to increase student learning and motivation; and (2) share innovative approaches to aligning academic curriculum with industry sector standards that prepare students for the current workforce. In one focus group, one teacher stated: “I think teachers have to be willing to share. There are people out there reinventing the wheel. There are lots of lessons on the web and you need something where people are really sharing.” Moreover, linking the website to valued social benefits, such as increasing networking opportunities (both within and outside of the programs), enhancing professional identity, and increasing teachers’ sense of efficacy, could lead to a higher number of teacher visitors and increase the value of the website.

**Research Question 4: What is the association between health science teachers’ characteristics and their reported levels of collegiality?**

*Key Findings:* The teacher characteristics investigated were: (1) ethnicity; (2) gender; (3) subject area taught; and (4) the number of years as an educator. Overall, the results showed that the four teacher characteristics that we investigated were not significantly associated with the reported levels of collegiality. Collegiality was assessed with self-report scales that were designed to measure the teachers’ levels of collegial support and collective efficacy.

*Recommendations:* It is recommended that CDE use the Health Science Capacity Building Pathway grant to continue to strongly encourage teachers to establish networking strategies that promote high levels of collegiality. Also, it is suggested that these strategies be published as teacher networking “best practices” for existing and new health science programs to adopt statewide. Another recommendation is to recognize teacher teams that continue to demonstrate high levels of collegiality and whose outcomes are linked to student achievement. Professional recognition can enhance teachers’ sense of professional identity—a critical component in strengthening the benefits of belonging to a network.

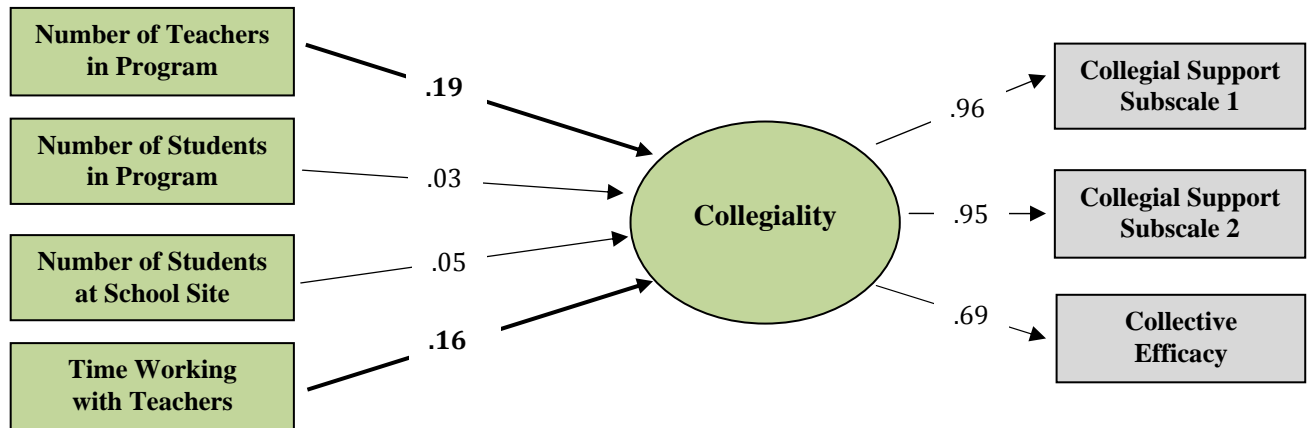
**Research Question 5: What is the association between program and school factors and health science teachers’ reported levels of collegiality?**

*Key Findings:* The program and school factors of interest were: (1) the number of teachers in the program; (2) the number of students in the program; (3) the number of students at the school site;

and (4) the amount of time the teachers spend working on interdisciplinary projects in a typical week. We utilized structural equation modeling (SEM) to examine the association between the four factors and the teachers' reported levels of collegiality. Structural equation modeling (SEM) is a statistical technique that allows researchers to test whether the data they have collected provides support for hypothesized models. One of SEM's strengths is the ability to construct latent variables or variables that are not measured directly, but can be estimated in a model from other directly measured variables. The model showed that the number of teachers in the program and the time spent working with other teachers were significantly related to the collegiality factor. In other words, respondents who reported that they had more teachers in their program were more likely to report higher levels of collegial support and collective efficacy. Similarly, teachers who reported working more with other educators on interdisciplinary curriculum projects tended to report higher levels of collegial support and collective efficacy. The model did not show that the number of students in the program and at the school site was significantly related to the collegiality factor after accounting for the other predictors (see Exhibit E-1).

*Recommendations:* The current results showed that having more teachers in a program was related to higher levels of collegiality. These conflicting findings are likely due to the fact that all of the programs were relatively small in size in comparison to traditional high schools. In fact, some of the programs may have had too few teachers to adequately promote collaboration among the teachers. Fifteen percent of the teachers ( $n = 30$ ) reported that there were three or less teachers in their program. As such, within the context of the Health Science Capacity Building Pathway programs, having more teachers is related to higher levels of collegiality. Moreover, CDE should place more emphasis on programs increasing their interdisciplinary efforts. In other words, it could be a requirement that programs direct grant resources toward teachers spending more time working together on interdisciplinary projects and aligning health science curriculum across more academic courses.

Exhibit E-1. Path Model with the Program and School Factors Predicting Collegiality



Note: Standardized parameter estimates are shown. The bolded paths predicting the collegiality factor were significant at  $p < .05$ .

### Conclusions and Future Directions

Health science teachers are being called on by the CDE to increase networking and collegiality practices and to employ collaborative strategies that address issues of knowledge about health science curriculum, motivation, and organizational school structures. Overall, this study indicates that there are high levels of networking and collegiality within individual schools. However, there does not seem to be as much networking occurring across schools on a statewide level. Furthermore, we have learned through this study that more needs to be done in the area of interdisciplinary/curriculum alignment in order to ensure an inclusive process where teachers from all subject areas benefit from the collaboration. We also encourage education policy makers at the CDE to design a website with specific networking features that would allow teachers across the state to access other professional learning communities and share best practices with each other. Approximately 68% of the respondents indicated that a professional website was one of their preferred methods to network with other teachers. Perhaps establish an interactive adjunct website dedicated to networking and curriculum sharing among health science professionals who can be offered to already existing teacher associations as a link. Such a website would provide teachers an identity and provide them with a venue to establish close collaboration with colleagues from other health science pathway programs. Moreover, linking with existing professional associations would also help to market the Health Science Capacity Building Pathway website.

## **Introduction**

Health Science Capacity Building Pathway programs have emerged as a career technical education framework for increasing health science capacity in California. This pathway model is also concerned with increasing networking practices among secondary and post-secondary educators and the industry sector. The focus on teacher networks is important—they are an important aspect of professional development, continued sense of professionalism, and social support. Most of the literature on teacher networks uses such terms as “professional learning communities,” “communities of practice,” and more recently, “critical friends groups.” This research looks at how networks ultimately improve outcomes for students, as well as for the teachers themselves (Berry, Johnson & Montgomery, 2005; Hollins, McIntyre, DeBose, Hollins & Towner, 2004; Strahan, 2003; Vescio, Ross & Adams, 2008). These studies illustrate how opening channels for collaboration among teachers improves current instructional methods, aids in the development of new practices, and enhances the focus on shared values and goals for the school, which in turn create opportunities for learning among students. Most of the emphasis in the literature has been placed on teaching and learning in the areas of literacy and mathematics. What lacks from these studies is a focus on elements pertaining to teachers in the areas of health science, and how teacher networks exist in this subject domain.

An organizational culture that promotes a lack of focus on the success of the school and teachers can lead to work done in isolation. This type of culture is a nationwide problem that education faces. Further, this type of culture promotes teachers to feel alienated and pushes them to lack a sense of purpose and responsibility to the overall success of the school. Too many teachers work in isolation and they are not given sufficient time to work with colleagues during the school day. They plan their curriculum in isolation and are rarely given the opportunity to share knowledge or improve their practice by interacting with other teachers (Darling-Hammond, 2002, 2008). Many teachers, especially in technical career-related programs, often report feeling isolated and end up leaving the profession. Also, many schools do not support professional learning communities or provide much professional development that focuses on teacher concerns about curriculum and students. For most teachers, the only opportunity they have to connect with their peers is through informal common planning time and several brief afterschool professional development workshops. These typically detached workshops often produce poor

results and fail to impact student learning, primarily because they are hardly ever connected to teachers' classroom instruction or student achievement (Glazer & Hanafin, 2006).

The purpose of this study was to examine the methods health science teachers presently use to obtain the most current knowledge about their field. This study also examined teachers' capacity to collaborate with their colleagues to enhance their classroom instruction and impact student motivation and learning. The overall goal of this study was to gather information on specific school organizational and teacher factors and examine the link between these factors and effective professional learning communities. This research shares the goal of Vavasseur and MacGregor's (2008) study that established the importance of teachers using technology to communicate with colleagues, enhance curriculum, and increase their efficacy. The motivation is to better understand why some health career teachers work in isolation, while others prefer to engage and collaborate in networks of teachers. The literature review that follows examines the research on teacher collegiality and networking practices followed by a description of the study.

### **Review of Related Literature**

Within the context of professional learning communities, teacher networks can be viewed as a support system to foster innovative ideas about instruction and student learning. Sergiovanni (2004) describes an effective networking culture as one where educators trust each other and take part in reciprocal relationships that lead to shared obligations and leadership. Moreover, students are more likely to feel a sense of engagement and see purpose in learning if they experience a supportive environment where people and learning matter (Larson, Eccles, & Gootman, 2004). Research suggests that an effective teacher networking framework consists of five key features: (1) shared norms and values – common beliefs about teachers' roles in teaching, learning, relationships and commitment to a collective effort; (2) collaborative activity – an openness to sharing knowledge and increasing a sense of community and responsibility; (3) inclusive practice – inviting mentor colleagues to observe and provide corrective feedback on instruction; (4) reflective dialogue – engaging in meaningful conversations with colleagues about instruction, student learning and motivation, and problem solving; and (5) an emphasis on impacting student learning – a collective effort to examine unique ways to engage students in authentic learning and increase their school success (Louis, Marks, & Kruse, 1996; Marks & Louis, 1997).

Teacher networks yield positive outcomes for teachers. Networks allow teachers to share lesson plans with one another, develop protocols to guide decision-making processes, and communicate with each other about their day-to-day work (Berry et al., 2005). Structured study-groups of teachers provide a public forum in which teachers reflect on their work and engage in dialogues that in turn yield improvements in current instructional strategies (Hollins et al., 2004). Establishing a sense of professional community in schools permits networks of teachers to encourage the achievement of each other's students through social support, and to engage in higher order thinking and knowledge that goes beyond that which is taught in the classroom (Louis & Marks, 1998).

Professional learning communities are defined as groups of people working together in a professional context with a shared common purpose (Wenger & Snyder, 2000) and collaborative processes to solve problems (Brown, 1997; Dufore & Eaker, 1998). There is evidence that attention to professional learning communities in general and specifically web-based professional learning communities are essential to enhancing teacher networking/collegiality in a considerable and meaningful way. Studies have reported that both face-to-face and online methods of networking have generated positive outcomes associated with collegiality and efficacy (Goddard, Hoy, & Hoy, 2000; Hoy & Woolfolk, 1993; Talbert & McLaughlin, 1994; Vavasseur & MacGregor, 2008). Learning in a social context of a community encourages teachers to support each other and to practice their teaching techniques on each other, and it renews their sense of efficacy (Liberman & McLaughlin, 1992; Niesz, 2007).

A recent study showed that a sample of teachers reported mixed reactions about establishing online connections with other teachers. These teachers found that face-to-face connections were valuable when the connections occurred within their school. This same group also felt that connections with other educators should occur beyond the walls of their school (Vavasseur & MacGregor, 2008). While there might be some traditional professional development programs that offer time for teachers to collaborate, most are viewed negatively and ineffective by educators (Lindstrom & Speck, 2004). Moreover, little is known about successful collegial networking practices or how these practices will help educators from secondary and post-secondary institutions to collaborate more effectively. Evidence on the effectiveness of long-range implementation and impact of networks is still lacking (Dede et al., 2006). To date, there has been only limited research on how teachers use online technology as a method of

networking on a local, state and national level and whether their participation in networks impacts their classroom instruction. Too many health science teachers work without a professional learning community of teachers and, as a result, may not be aware how networking can improve their pedagogy. The opportunity to network is vital in order to disseminate best practices and to establish strong career pathways. A teacher professional learning community is essential to increasing teacher commitment (Hausman & Goldring, 2001) and potentially reducing high teacher turnover rates (Smith & Ingersoll, 2004).

### **Factors that Affect Teachers' Networking Capacity**

Despite the many traditional professional development workshops offered in schools that focus on teacher networking, some teachers do not use networks while others do. Teachers who do not use networks often report a lack of follow-up to professional development and are rarely supported in acquiring the proper knowledge and skills to engage with teachers who share similar goals. According to Clark and Estes (2002), there are three key factors that must be examined when identifying causes of performance gaps in teaching: (1) Teachers' knowledge and skills – how knowledgeable are teachers about networking practices; (2) Teachers' motivation toward achieving a goal – the amount of effort and perseverance dedicated toward working with other teachers to increase technical knowledge; and (3) Organizational (school/district) obstacles – school conditions that act as barriers preventing access to networking resources. These three factors can play an important role in the functioning of teacher networks.

#### *Teachers' knowledge and skills*

At the outset of determining performance gaps, it is important to know how much people know or do not know about achieving a goal and their capacity to acquire new strategies for future challenges (Clark & Estes, 2002). In an attempt to determine teachers' ability to collaborate with colleagues, it is important to better understand their background (prior) knowledge about health science curriculum. This study focuses on investigating how teachers use or do not use professional learning communities while at the same time addressing their knowledge of health science curriculum.

A collaborative culture requires that teachers possess a certain level of knowledge about a subject area, but equally important is knowledge of how best to teach that subject (Marzano,

2003). Prior research examining teachers' years of experience (Orr, 2005; Bryk, Camburn & Louis, 1999; Pennell & Firestone, 1996, 1998) found that having a strong knowledge base was positively correlated with teachers joining a professional learning community. In other words, as Kardos and Johnson (2007) indicated, teachers who are knowledgeable about the workings and purpose of professional learning communities will show higher levels of commitment to sustaining a collegial culture. Acquiring the necessary knowledge and skills set through proper education and training is critical to sustaining an environment of professionalism and positively impacting student learning. Education is the acquisition of "*conceptual, theoretical, and strategic*" knowledge and skills to tackle new challenges, whereas training is the "*how to*" knowledge and skills and the practice to achieve team goals (Clark & Estes, 2002). Good mentors that spend quality time teaching others, an administrative structure that supports and allows teachers to be innovative, and constant interaction with the environment (i.e., sharing of knowledge) are three essential elements in educating and training others (Aubrey & Tilliette, cited in Bolman & Deal, 1997).

The role of technology has long been considered a vital component for scaffolding knowledge and impacting teaching practices and student learning. As a matter of fact, the No Child Left Behind (NCLB) Act contains language that specifically calls for 25% of funds to be used for educational technology. But, there appears to be significant knowledge gaps in the use of technology in an efficient way to transform practices in teaching and practices in sharing of knowledge (Darling-Hammond et al., 2005). Research has indicated that teachers' isolation from a professional learning community increased as a result of poor school conditions and lack of adequate technology (Barnett, 2006; Hausman & Goldring, 2001; Newmann, Rutter, & Smith, 1989; Rosenholtz, 1985, 1989). With today's technology, it is much easier to: (1) access information via the Internet; (2) join online communities of people; (3) engage in coordinated conferencing; and (4) communicate and transport documents via e-mail. Although most teachers have access to a computer and email while in school (Darling et al., 2005), more education and training is needed on "how to" strategies for using a variety of networking technology (Clark & Estes, 2002). For example, teleapprenticeship (Levin & Waugh, 1998) or teleconferencing is one technology approach aimed at enhancing communication and collaboration among teachers in a way that is efficient but does not require participants to be in the same location at the same time.

Technology tools can benefit online teacher professional learning communities. One example is the use of video tools that same subject teachers from different schools can employ to consider and analyze each others' teaching strategies (Darling et al., 2005). These immersive virtual simulations (Dede, 2004) are unique multimedia strategies that improve teachers' knowledge, skills, and networking capacity. The purpose of instructional multimedia communication is to foster learning (Mayer, 2009). It is possible that knowledgeable and skilled teachers who become experts in their subject area are the best ones to invest the necessary amount of effort to create effective teaching strategies that increase student achievement.

### *Teachers' Motivation to Engage in Networking Practices*

One of the biggest barriers to creating effective networking practices is teachers' busy schedules (Green & Cifuentes, 2008). Many teachers are simply overwhelmed and hardly ever have time to think about collaboration. A concrete example of this is a new teacher in her classroom in the late afternoon working alone on a health science lesson plan for the next day. After having spent a number of hours the night before surfing the Internet for interesting teaching practices, she becomes exhausted and frustrated at not finding any relevant and useful practices. Even when teachers have the time to access the Internet, they usually have difficulty locating relevant and teacher-friendly resources. Most new teachers who could benefit from spending time learning from more experienced colleagues often do not spend the time. They do not engage in these dialogues because they worry about being perceived as a novice and a potential barrier to the school's overall goals. Others feel the need to protect their lesson plans because: (1) sharing the materials would open them up to corrective criticism from the more experienced teachers and (2) other teachers would not value or deliver the lesson plan as intended. Examining gaps in motivation helps to explain and eradicate the notion of teachers working within the walls of a classroom detached from their colleagues (Clark & Eates, 2002; Collinson & Cook, 2004).

Some teachers are comfortable with cultural practices that emphasize collaboration and professional learning communities; others are not. Teachers who work in isolation tend to be motivated by individual work. They may think of collaboration and collegiate relationships as less interesting and rarely share their resources (Dede et al., 2006; Goddard, Goddard, & Tschannen-Moran, 2007; Liberman & Miller, 1992, 1999, 2004). In contrast, teachers who are

comfortable engaging in learning in a social context are motivated to work harder when efforts are in collaboration with their colleagues (Clark & Estes, 2002; Niesz, 2007). Teachers who participate in learning and sharing in a social network build capacity for joint work and develop a sense of community that supports openly sharing failures and mistakes (Fullan & Hargreaves, 1996), trust, innovation, risk taking (Lieberman & Miller, 2004), and corrective feedback (Clark & Estes, 2002). As Clark and Estes (2002) explain, “Motivation is the product of interaction between people and their work environment” (p. 86). Teachers need time to engage in meaningful dialogue with their colleagues in order to build individual and collective competence in approaching new tasks (Green & Cifuentes, 2008) and to create a structure that supports teacher efficacy (Larson, Eccles, & Gootmann, 2004).

Teachers achieve efficacy when they feel capable of performing and succeeding at a particular task. Efficacy beliefs are tied to past feedback on performance (Bandura, 1997). Too much or too little efficacy can affect teachers’ sense of personal agency and lead to less engagement and more isolation. Under-confident people have trouble making choices and persisting at a specific goal; over-confident people invest little effort (Clark & Estes, 2002). For example, under-confident teachers may choose not to interact with colleagues because they feel that their teaching practices are not good enough. When teachers do begin working with colleagues but are too distracted by their personal belief that they lack capacity to contribute, they are more likely to stop trying and disengage. Over-confident teachers may also choose to invest little effort working with colleagues. Too much confidence may cause teachers to believe that their teaching practices are their own and lead them not to want to share their teaching practices. They protect their lesson plans, work in isolation and take no responsibility for the failure of the team and program. This type of internal belief emphasizes that the individual is the one in charge of most of what happens to him/her (Clark & Estes, 2002).

A shared belief that the group is capable of succeeding at a particular task is collective efficacy (Bandura, 1997). In the context of a school, an example of collective efficacy is teachers’ perceptions that their collective efforts will have a positive impact on student achievement (Goddard, Hoy, & Hoy, 2000). This concept is grounded in Bandura’s social cognitive theory and when applied at the school organizational level, teachers are able to acquire knowledge and increase their collective efficacy. This is achieved as teachers’ environments converge with their personal characteristics and personal experiences. When teachers exhibit

high levels of collective teacher efficacy, it requires the team of teachers to work together with a shared purpose to impact student motivation and learning. Individuals are thus “both products and producers of their environment” (Wood & Bandura, 1989). Evidence shows that successful professional learning communities enhance a sense of collective efficacy and collaboration for teachers, in addition to increasing learning outcomes for both teachers and students (Oliver & Hipp, 2006).

### *School (Organizational) Culture and Context*

It is important to examine how school (organizational) factors affect teacher collegiality and professional learning communities. The culture and context of a school plays a critical role in how teachers perceive professional learning communities. An effective teacher network infrastructure can only be achieved if teachers perceive it as a critical component for improving instruction, professionalism, and student achievement (Schlager & Fusco, 2003). According to Schein (1990, 2004), there are three fundamental areas that contribute to an organizational culture: (1) observable artifacts, (2) values, and (3) basic assumptions.

*Observable artifacts* are the physical aspects that people observe when they first come in contact with an unfamiliar culture. It is at this level that teachers can begin to understand the meaning of a teacher network by simply observing how teachers in that environment behave toward each other and interact with each other. *Values* are the set of principles that govern the actions of a group. A teachers’ decision to join a community of teachers is based on whether or not a particular set of principles support or inhibit his/her professional development. Finally, *basic assumptions* refer to a groups’ sense of identity. At this level, much of what teachers need to know about teacher networks must be learned within the context of a professional learning community. For example, teacher immersion programs or trainings allow teachers to practice and live the process of collaboration long enough that they become clear on the meaning of teacher networking.

To understand how an academic organizational culture influences teachers’ decision to join a professional learning community of teachers, it is necessary to go beyond the visible aspects and to experience the culture at the deeper levels of teachers’ shared values and assumptions (Schein, 2004). Teacher networks that consist of like-minded professionals, both

within and outside individual school sites, function as a ubiquitous culture that shapes teachers' professional identity while at the same time giving them a sense of purpose (Niesz, 2007).

Previous research indicates that conditions, such as size of the school and size of the program (i.e., number of students and number of teachers), influence the degree to which teachers collaborate. Small schools tend to report higher levels of professional learning community, but Bryk, Camburn, and Louis (1999), note that smallness itself does not cause a professional learning community. Small school size is a structural facilitating factor of a professional learning community: "Smaller schools pose simpler managerial problems because they tend to have more constrained missions and because the overall social network among adults is more compact. This creates a set of conditions conducive to the human and social resource developments necessary for a professional community to emerge and be sustained . . . In contrast, the structural features inherent in large schools make positive developments harder, although not impossible, to attain" (p. 768). Given that many of the Health Science Capacity Building Pathway programs operate as a school within a school, the teachers and staff may be experiencing the benefits of smaller schools.

### **Research Questions**

Given the existing literature, the review indicates that there has been little work done on the degree to which teachers use online technology as a method of networking on a local, state and national level to learn instructional techniques. There is a particular lack of research on the use of online technology by career technical education teachers in health career pathway programs. Therefore, the following questions were addressed in this study: (1) How knowledgeable are health science teachers about health science curriculum? (2) What do health science teachers do to stay current with teaching and learning resources? (3) What current networking approaches do health science teachers use to access support and resources? (4) What is the association between health science teachers' characteristics and their reported levels of collegial support? and (5) What is the association between program and school factors and health science teachers' reported levels of collegial support?

## Research Methodology

### *Survey Respondents*

Three-hundred and seventeen teachers, coordinators, staff, and principals completed the Health Career Teacher Survey. The health science staff worked in 41 health science capacity building pathway programs across California. The average number of respondents per program was 7.68 ( $SD = 3.00$ ) and ranged from 1 to 16 individuals<sup>1</sup>. The demographic characteristics and the educational backgrounds of these individuals are outlined in Exhibit 1. The majority of the respondents were White (70.2%) and Hispanic/Latino (16.2%). Females comprised nearly 66% of the respondents. With regards to the respondents' educational backgrounds, 40.1% reported their highest education level was a bachelor's degree and 45.3% reported their highest level was a master's degree. A small number of staff indicated that they received an Ed.D. or a Ph.D., or were education specialists that required schooling beyond a master's degree. Finally, 66.2% of the respondents indicated that they held a California Secondary Teaching, Single Subject Credential and 36.3% reported that they held a California Cross-cultural, Language, and Academic Development (CLAD) Certificate. Smaller numbers of individuals reported that they held other credentials, such as a Standard Designated Subject/CTE Credential.

The health science pathway program staff who completed the survey held a variety of positions (see Exhibit 2). Forty-seven percent of the respondents were solely academic teachers. In addition, 6.0% were solely ROCP teachers, 2.2% were solely career technical education (CTE) teachers, and 3.5% were solely program coordinators. Other positions, such as principal, assistant principal, administrator, counselor, or school nurse, were held by 22.1% of the respondents. Finally, 19.1% of the participants reported that they held multiple positions in their program. The teachers in the sample taught a range of subjects. Fourteen percent of the teachers provided instruction for CTE subjects and another 17.8% taught a CTE subject and another subject, such as math or English. Additionally, 25.2% of the teachers taught science and 29.0% taught social studies, English, or Spanish. The respondents had an average of 13.79 years ( $SD = 9.23$ ; Range = 0<sup>2</sup> to 44) of experience as educators and reported that they had been educators at their schools for an average of 7.72 years ( $SD = 6.85$ ; Range = 0 to 33).

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<sup>1</sup> We were not able to identify two of the respondents' programs.

<sup>2</sup> The respondent that reported having zero years of experience as an educator was an industry partner.

*Exhibit 1. Demographic Characteristics and Educational Background of the Program Staff*

	Percentage	<i>n</i>
<b>Ethnicity</b>		
African American	1.9%	6
Asian/Pacific Islander	3.2%	10
Filipino	1.6%	5
Hispanic/Latino	16.2%	51
Native American	0.3%	1
White	70.2%	221
Other/Mixed	6.7%	21
<b>Gender</b>		
Female	65.7%	207
Male	34.3%	108
<b>Highest educational level</b>		
Bachelor's degree	40.1%	123
Master's degree	45.3%	139
Education specialist or professional diploma <sup>1</sup>	7.5%	23
Ed.D.	0.7%	2
Ph.D.	2.6%	8
Non-teaching certificate or license	3.9%	12
<b>Teaching credentials/certificates</b>		
California Secondary Teaching, Single Subject Credential	66.2%	210
California Cross-cultural, Language, and Academic Development (CLAD) Certificate	36.3%	115
Standard Designated Subject/CTE Credential	16.7%	53
California Elementary Teaching, Multiple Subject K-12 Credential	11.4%	36
California Bilingual, Cross-cultural, Language, and Academic Development (BCLAD) Certificate	3.8%	12
Probationary certificate	2.2%	7
Other credential or certificate	25.9%	82

Note: <sup>1</sup>The response option was "Education specialist or professional diploma based on at least one year's work past Master's degree."

*Exhibit 2. The Current Positions of the Program Staff and the Subject Areas of the Teachers*

	Percentage	<i>n</i>
<b>Current position</b>		
Academic teacher only	47.3%	150
ROP teacher only	6.0%	19
Program coordinator only	3.5%	11
CTE teacher only	2.2%	7
Other only	22.1%	70
Academic teacher and CTE teacher	2.8%	9
Academic teacher and coordinator	2.5%	8
Academic teacher and other	3.8%	12
CTE teacher and ROP teacher	2.2%	7
CTE teacher and coordinator	1.3%	4
Three or four positions	4.1%	13
Other combinations	2.2%	7
<b>Current subjects<sup>1</sup></b>		
Social studies, English or Spanish	23.4%	50
Social studies, English or Spanish and other	5.6%	12
Science only	20.1%	43
Science and other	5.1%	11
CTE only	14.0%	30
CTE and other	17.8%	38
Math only	8.9%	19
Math and other	3.3%	7
Other	1.9%	4

Note: <sup>1</sup>The current subjects were calculated only for 214 program staff that indicated they were academic teachers, CTE teachers, or ROP teachers and reported the subjects they taught.

### *Description of the Health Science Capacity Building Pathway Programs*

The 41 health science pathway programs represented in this survey are 87.3% of the 47 Health Science Capacity Building Pathway programs in California. The 41 health science pathway program sites and their counties are illustrated in Exhibit 3. These health science pathway programs work toward accomplishing the mission and purpose of the Carl D. Perkins Vocational and Technical Education Act of 1998 to educate and prepare young people to meet the critical worker shortages in the health-care industry. The health-care industry is a field that has a serious shortage of qualified workers. Health Science Capacity Building Pathway programs operate as a career technical education training partnership between secondary schools, post-secondary institutions, and the industry sector. These programs, which are located primarily at high schools and adult school campuses, serve students by combining classroom education, community work and college planning toward a range of jobs in health sciences. The goal of each of the 47 Health Science Capacity Building Pathway programs is to strengthen their

Exhibit 3. Health Science Pathway Program Sites by County where Surveys were Collected



connections with two-year colleges and the industry sector in order to establish a quality integrated education model accessible to all students. Although these programs share the overall goal of offering a small, supportive learning environment to increase students' college and career readiness and to improve their academic achievement, there are clear differences in their design and structure. Some operate as: (1) career academies – schools within schools on a high school campus that typically target high-risk youth in the 10<sup>th</sup> through 12<sup>th</sup> grades; (2) Regional Occupational Centers and Programs (ROCPs) – programs that emphasize career and workforce preparation for high school students and adults, preparation for advanced training, and enhancement of existing skills; and (3) Tech Prep programs – programs that function as consortiums consisting of high schools, two-year and technical colleges, four-year universities, and the industry sector. Tech Prep programs' key emphasis is on alignment between secondary and post-secondary education in order to support students' transitions into post-secondary education. Moreover, there are five main components that are critical to the design and structure of these health career education programs: (1) administrative support; (2) pathway teams; (3) student learning; (4) professional development; and (5) partnerships. These components are described in Exhibit 4.

### *Survey Administration*

Using a mixed-mode approach (Dillman, Smyth, & Christian, 2009), web-based and paper-and-pencil versions of the survey were administered to the program staff. Every effort was made to keep the visual presentation of the items the same across the two versions of the survey. During April, May, and June of 2009, the research team contacted all of the coordinators of the health science pathway programs in the state via email and phone. The research team explained the goals of the project and asked the coordinators if their programs would be interested in participating in the research study. The coordinators who agreed to have their programs take part in the study provided the email addresses of their staff to the research team or opted to distribute the survey URL and survey access codes to their staff themselves. The research team emailed the URL and survey access codes to the staff whose emails were provided by their coordinators. Email and phone follow-up were employed as needed after the URLs and codes were initially distributed. In July of 2009, most of the staff of the Health Science Capacity Building Pathway programs in the state attended a conference in Sacramento, California. One member of the

research team attended the conference and administered the paper-and-pencil version of the survey to program staff that did not complete the web-based version during the initial period of survey administration.

*Exhibit 4. Strategic Pathway Assessment Model*

Pathway Component	Description and Collegiate Outcomes
Administrative Support	The administrative support component consists of four areas: (1) administrative involvement; (2) shared planning time; (3) flexible schedules; and (4) data driven pathway evaluation. The overall purpose of this component is the level of involvement of the school administration in advancing the key areas of the academic program.
Pathway Teams	The pathway teams component is concentrated around two main areas: (1) interdisciplinary teams and (2) career development. The overall focus is on teachers working as a collective whole in designing curriculum around a common theme, culminating in projects. Also, working with students and their parents on developing a career-educational plan and enhancing students' college and career readiness is a major focus.
Student Learning	Student learning is a component that is divided into six parts: (1) standards-based curriculum; (2) integrated curriculum; (3) diversified teaching strategies; (4) work-based learning; (5) multi-measurement assessments; and (6) data analysis. The aim here is to achieve a curriculum that is fully organized and sequenced around the industry sector career pathways, which include CTE, academic, and industry standards.
Professional Development	The aim of this component is for teachers to function as a professional learning community and work as a collective unit to enhance classroom instruction and student learning and motivation.
Partnerships	This component is mainly concerned with increasing parent and community participation. Partnerships are formalized, interdisciplinary, and sequenced across levels of education while at the same time offering a seamless student transition across grade levels. Industry partners are fully engaged as team members. Parents and community groups are well informed, parents are involved in decision-making, and community is supportive.

Source: California Department of Education. California Health Science Capacity Building Grant.

*Survey Items and Subscales*

The survey focused on a broad range of topics related to teaching in health career education programs. The initial items pertained to the program staff's demographic characteristics, educational backgrounds, and current roles in their program. The survey also contained items asking about the staff's years of experience and the size of their programs. Included in the survey were questions related to the staff's knowledge of health science

curriculum, networking practices, and instructional practices. A set of questions included in the survey dealt with the California Association of Health Careers Educators (CAHCE) website. An additional item asked about the student outcomes that the respondents felt were impacted by their health science pathway program.

The questionnaire contained a number of existing survey scales or subscales and individual items from existing measures that were combined to form new scales. All of the items from the existing measures were rated on a five point Likert scale that ranged from 1 (*strongly disagree*) to 5 (*strongly agree*). The items comprising each subscale were averaged to form composite variables. The two scales analyzed in the current report are described below.

*Collegial Teaching and Learning.* A slightly modified version of Davis, Ellett, and Rugutt's (1999) 15 item *Collegial Teaching and Learning* scale from the Revised School Culture Elements Questionnaire (RSCEQ) were used. The scale was modified by inserting "teachers in my program" in place of "teachers" in 14 of the 15 items. According to Davis et al. (1999), the scale focuses on "teachers' perceptions of elements of culture that reflect relationships among teachers who focus on their personal and collective teaching and learning activities" (p. 28). An example of an item on the scale is, "Teachers in my program frequently communicate with each other about the quality of their teaching." The scale showed excellent reliability ( $\alpha = .95$ ) with the current sample.

*Collective Efficacy.* The seven items that formed the collective efficacy scale were derived from two existing scales. Four items from Clark's (n.d.) Teacher Collective Efficacy Scale were used. The four items selected from Clark's scale addressed the teachers' efficacy for obtaining help or assistance from their colleagues (e.g., "I feel encouraged to talk to anyone in my school about any educational issue.") Additionally, three items were adapted from Caprara, Barbaranelli, Borgogni, and Steca's (2003) perceived efficacy scale. The three items assessed the teachers' self-efficacy for working effectively with their colleagues (e.g., "I am able to earn the trust and appreciation of my fellow teachers."). The seven item scale showed good reliability ( $\alpha = .81$ ) with the current sample.

## Findings and Implications

### ***Research Question 1: How knowledgeable are health science teachers about health science curriculum?***

The health science educators reported on how knowledgeable they were about health science curriculum. As shown in Exhibit 5, the responses for teachers and non-teachers were very similar. A small percentage (11.4%;  $n = 36$ ) of the educators reported being “very knowledgeable” about health science curriculum. On the other hand, more than half of the educators (57.5%;  $n = 181$ ) reported that they were “not knowledgeable” or “somewhat knowledgeable” about health science curriculum. In general, a small group was very knowledgeable and the bulk of educators were not particularly knowledgeable.

*Exhibit 5. Teachers’ and Non-Teachers’ Knowledge of Health Science Curriculum*

	Teachers		Non-Teachers	
	Percentage	<i>n</i>	Percentage	<i>n</i>
Not knowledgeable	6.0%	13	12.0%	12
Somewhat knowledgeable	48.4%	104	52.0%	52
Knowledgeable	33.0%	71	27.0%	27
Very knowledgeable	12.6%	27	9.0%	9
Total	100.0%	215	100.0%	100

There was a clear association between the teachers’ reported knowledge about health science curriculum and the subjects they taught (see Exhibit 6). The majority of the teachers who taught a CTE health science subject indicated that they were “knowledgeable” (47.1%;  $n = 32$ ) or “very knowledgeable” (22.1%;  $n = 15$ ). Conversely, the majority of teachers who did not teach CTE health science or science (e.g., English, social studies, and math teachers) reported that they were “not knowledgeable” (11.1%;  $n = 10$ ) or “somewhat knowledgeable” (66.7%;  $n = 60$ ). The science teachers’ responses were in between the two other groups of teachers. Specifically, 44.4% of science teachers ( $n = 24$ ) reported that they were “somewhat knowledgeable” and 42.6% ( $n = 23$ ) were “knowledgeable” about health science curriculum.

The CTE teachers generally reported that they were knowledgeable about health science curriculum. However, the staff who did not teach CTE or science reported much lower levels of knowledge about health science curriculum. The non-CTE and non-science teachers’ lack of knowledge about health science curriculum is a particular concern given the emphasis that has been placed on interdisciplinary curriculum. Interdisciplinary teams of teachers will likely have difficulty devising health science curriculum and aligning CTE curriculum standards with core

academic curriculum standards if many individuals on the teams do not have much knowledge about health science curriculum or are not confident in their knowledge about health science curriculum. These findings suggest that the CDE may want to have workshops and conferences that aim to boost all teachers’ knowledge of health science curriculum and curriculum alignment. In this view, curriculum alignment immersions become the driving force that bring together the academic and industry sectors and increase knowledge about health science. The immersions provide teachers with the opportunity to engage in conversations with health professionals in a health industry environment. These conversations are critical for teachers to be able to gain knowledge about the variety of health care professions, to increase their awareness of specific competencies necessary to the industry workforce, and to experience the work environment and culture of a health professional.

*Exhibit 6. Teachers’ Knowledge of Health Science Curriculum Disaggregated by Subject Area*

	CTE Teachers		Science Teachers		Non-CTE and Non-science Teachers <sup>1</sup>	
	Percentage	<i>n</i>	Percentage	<i>n</i>	Percentage	<i>n</i>
Not knowledgeable	2.9%	2	1.9%	1	11.1%	10
Somewhat knowledgeable	27.9%	19	44.4%	24	66.7%	60
Knowledgeable	47.1%	32	42.6%	23	17.8%	16
Very knowledgeable	22.1%	15	11.1%	6	4.4%	4
Total	100.0%	68	100.0%	54	100.0%	90

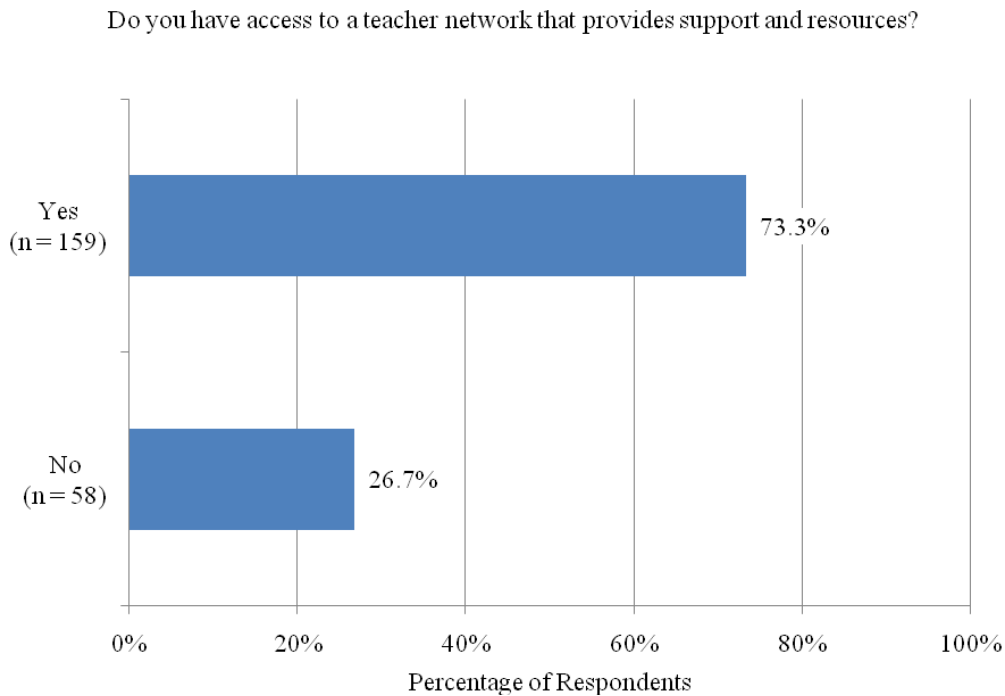
Note: <sup>1</sup>Non-CTE and non-science teachers taught a variety of subjects, such as English, social studies, math, and drama.

***Research Question 2: What current networking approaches do health science teachers use to access support and resources?***

The academic teachers, CTE teachers, and ROCP teachers in the sample of health science educators reported on their access to a teacher network that provided support and resources. Nearly three-fourths of the teachers felt that they had access to a teacher network that provided support and resources (see Exhibit 7). The 159 (73.3%) teachers who indicated they had access to a network were subsequently asked to classify the type of network or networks in which they belonged. Exhibit 8 shows that the vast majority of these 159 teachers (89.3%; *n* = 142) indicated that they had access to a face-to-face teacher network. The face-to-face networks referred to by

the respondents were likely comprised of the teachers in their own schools and programs. Additionally, over half of the 159 teachers (57.2%;  $n = 91$ ) reported that they had access to an email-type teacher network. The findings outlined in Exhibit 8 indicate that many of the respondents belonged to more than one type of teacher network that could provide support and resources. However, it should be noted that slightly over a quarter of the respondents did not report that they had access to a teacher network. Research suggests that these teachers are more

*Exhibit 7. Access to a Teacher Network*



likely to work in isolation from other teachers and this condition can lead to poor expectations of sharing with colleagues and commitment to their school (Cochran-Smith & Lytle, 1992; Collinson & Cook, 2004; Hausman & Goldring, 2001).

*Exhibit 8. Types of Networks in which Teachers Belonged*

	Percentage	<i>n</i>
Face-to-face teacher network	89.3%	142
Email-type teacher network	57.2%	91
Web-based teacher network	24.5%	39
Other	5.0%	8

Note: Only the 159 teachers who reported they had access to a teacher network identified the types of networks in which they belonged. Teachers were allowed to select more than one type of network.

In addition to reporting on their current teacher networks, the teachers commented on their preferred ways to network with other teachers. The three most frequently identified methods were using a “professional website where teachers can access information,” attending “regional meetings/conferences,” and attending “regional professional development workshops.” Each of these methods was selected as a preferred way to network with other teachers by roughly two-thirds of the teachers (see Exhibit 9). These findings suggest that the CDE and Health Science Capacity Building Pathways grant committee should continue to hold meetings and conferences. Further, these findings indicate that the CDE may want to continue to invest in a website design that strongly encourages teacher collaboration and look into holding regional professional development workshops.

*Exhibit 9. Preferred Ways to Network with Other Teachers*

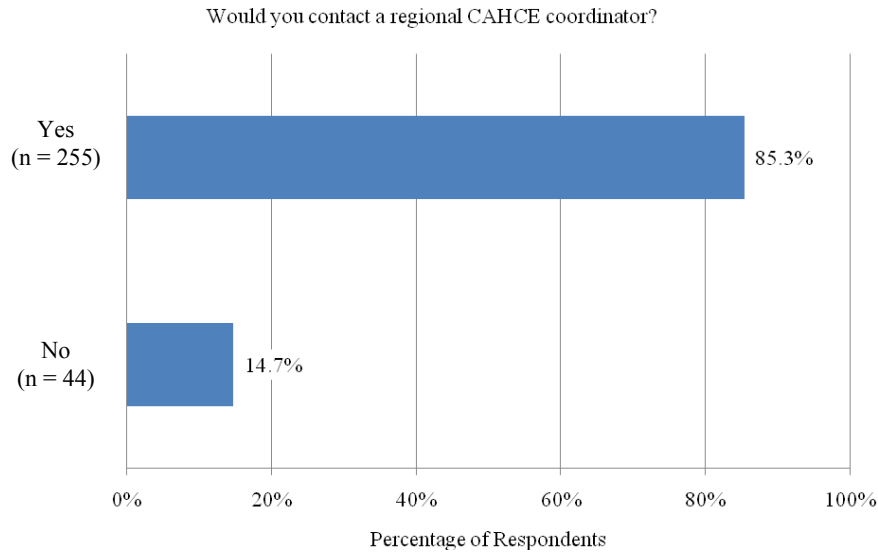
	Percentage	<i>n</i>
Professional website where teachers can access information	68.2%	148
Regional meetings /conferences	67.3%	146
Regional professional development workshops	64.1%	139
Membership in professional teacher associations	26.7%	58
Online social networking (e.g., Twitter, Facebook)	24.0%	52
Webcasting and video podcasting	19.4%	42
Other	4.1%	9

Note: The teachers were allowed to select more than one way to network.

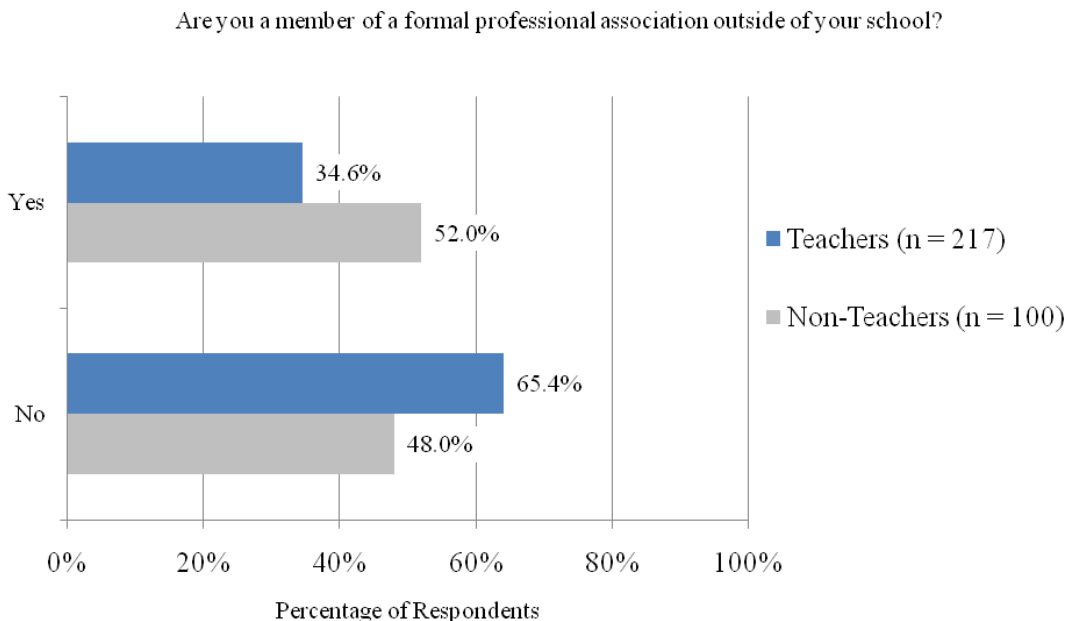
The teachers and non-teachers (i.e., coordinators, principals, nurses, etc.) reported on whether they would contact a regional CAHCE coordinator who could provide them with information about health careers and professional development. As shown in Exhibit 10, the vast majority of the respondents (85.3%; *n* = 255) indicated that they would contact a regional CAHCE coordinator for assistance. The percentage of teachers (84.4%) and non-teachers (87.4%) who reported that they would contact a regional CAHCE coordinator did not differ significantly,  $\chi^2(1, N = 299) = 0.42, ns$ . The CDE and Health Science Capacity Building Pathways grant committee may want to consider having a number of regional coordinators who can assist the various pathway programs in each region with dissemination of information and professional development workshops.

The teachers and non-teachers reported on their membership in formal professional associations outside of their schools and the results are graphed in Exhibit 11. The teachers (34.6%;  $n = 75$ ) were significantly,  $\chi^2 (1, N = 317) = 8.67, p < .01$ , less likely to report that they belonged to a formal professional association in comparison to the non-teachers (52.0%;  $n = 52$ ).

*Exhibit 10. Contacting a Regional CAHCE Coordinator*



*Exhibit 11. Membership in a Formal Professional Association*



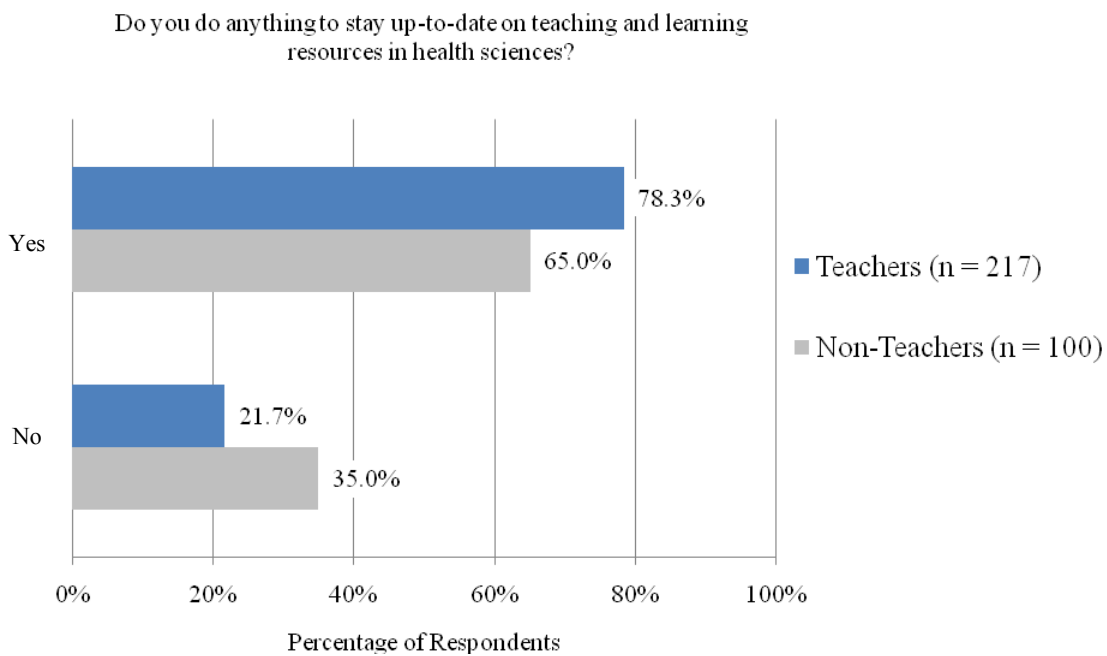
The 127 respondents who indicated they were members of a formal professional association provided the names of the associations. The three associations that were most frequently reported were the Association of California School Administrators (ACSA;  $n = 13$ ), the California Teachers Association (CTA;  $n = 12$ ), and the National Science Teachers Association (NSTA;  $n = 11$ ). In addition, smaller numbers of respondents reported that they were members of the Association for Supervision and Curriculum Development (ASCD;  $n = 9$ ), the California Association of Regional Occupational Centers and Programs (CAROCP;  $n = 6$ ), and the Health Occupations Students of America (HOSA;  $n = 6$ ). The remaining individuals provided the names of a wide range of associations, such as the California Association of School Counselors (CASC), the National Biology Teachers Association (NABT), and the American Society for Clinical Pathology (ASCP). Researchers have found that membership in professional associations is associated with higher levels of teacher efficacy (Baumen, 2008) and job satisfaction (Yeager & Kline, 1983). It should be noted that the Health Science Capacity Building Pathway grants require that the teachers and students belong to HOSA as a strategy of acculturation into the health field. It is unclear at this time whether the teachers who responded to the survey are not members of HOSA, do not know they are members of HOSA, or simply did not indicate that they were members on the survey. HOSA should function as an acculturation strategy for new and existing staff to become more knowledgeable about the health field.

***Research Question 3: What do health science teachers do to stay current with teaching and learning resources?***

The educators commented on whether they engaged in activities to stay up-to-date on the most current teaching and learning resources in health sciences. Overall, the majority of the educators (74.1%;  $n = 235$ ) indicated that they engaged in activities to stay up-to-date on the resources in health sciences. The teachers' and non-teachers' responses are displayed separately in Exhibit 12. The teachers were significantly more likely than the non-teachers to report that they engaged in activities to remain up-to-date on the resources,  $\chi^2 (1, N = 317) = 6.35, p < .05$ . The 235 educators who reported that they engaged in activities to stay up-to-date on the resources also identified the methods and approaches they used. The responses of the teachers and non-teachers are displayed separately in Exhibit 13. Both groups of educators used a wide range of methods and approaches to stay up-to-date on the teaching and learning resources in health sciences. The two most frequent responses for both groups of educators were "Internet

resources” and “interactions with teachers in my school.” It is interesting to note that most educators used the Internet but only a relatively small percentage reported that they used the CDE website and even a smaller percentage used the CAHCE website (see the CAHCE website section). It is worth examining teachers’ perceptions of the free information available on the Internet. The case may be that teachers are worried about quality control and the accuracy of the content on the websites they use as resources. Additionally, teachers may need training on strategies to use to navigate the Internet to find reliable websites and training on how to avoid information saturation. Finally, maintaining and updating the CAHCE website or a similar one on a regular basis with health science related information can be essential in sustaining and retaining teachers’ interest in that website.

*Exhibit 12. Staying Up-to-Date on Teaching and Learning Resources in Health Sciences*



*Exhibit 13. Methods Used to Stay Up-to-Date on Teaching and Learning Resources in Health Sciences*

	Teachers		Non-Teachers	
	Percentage	<i>n</i>	Percentage	<i>n</i>
Internet resources	88.2%	150	83.1%	54
Interactions with teachers in my school	82.9%	141	73.8%	48
Professional conferences	64.7%	110	63.1%	41
Professional development workshops	64.1%	109	60.0%	39
Interactions with teachers from another school(s)	53.5%	91	56.9%	37
Research journals	40.0%	68	41.5%	27
Interactions with community-based organizations	39.4%	67	64.6%	42
California Department of Education website	36.5%	62	63.1%	41
Professional association websites	30.0%	51	23.1%	15
Other	6.5%	11	6.2%	4

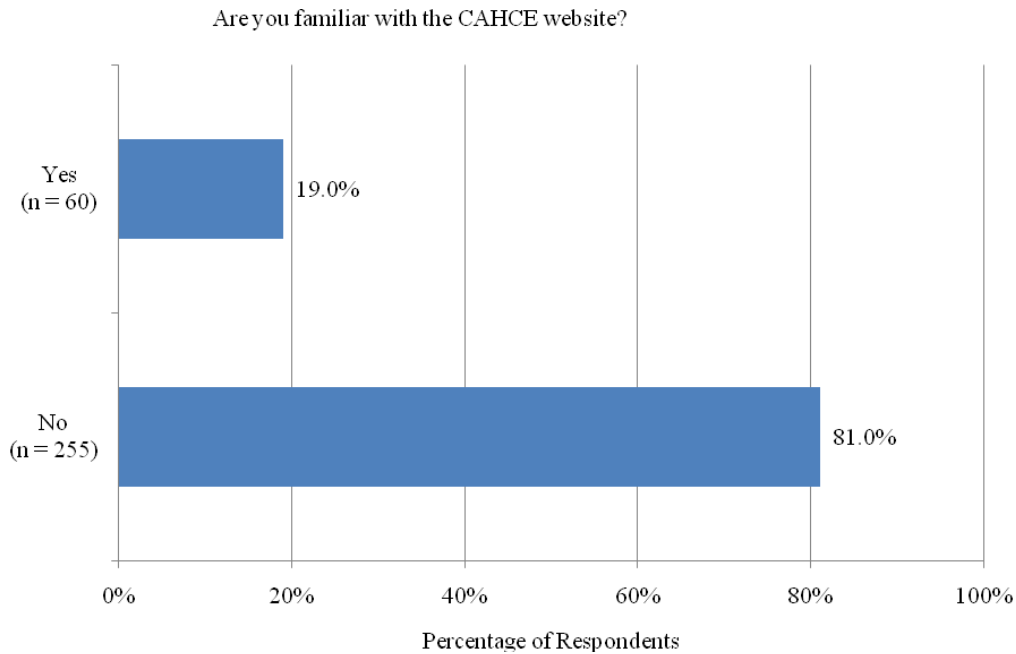
Note: Only the 235 respondents who indicated that they engaged in activities to stay up-to-date reported on the methods they used. The educators were allowed to select more than one method.

*California Association of Health Careers Educators (CAHCE) Website*

The California Association of Health Careers Educators (CAHCE) is a statewide organization that promotes professional growth, networking and leadership opportunities, and advocacy and support for California's health career educators. The overall goal of CAHCE is to improve the quality of career preparation and education to meet the diverse health care needs of the community.

The survey included several items pertaining to the CAHCE website. The respondents initially reported on their familiarity with the CAHCE website. As shown in Exhibit 14, the majority of the educators indicated that they were not familiar with the CAHCE website. Specifically, only 19.0% of the respondents ( $n = 60$ ) indicated that they were familiar with the CAHCE website and the remaining 81.0% ( $n = 255$ ) stated that they were not familiar with the website. The percentage of teachers (18.1%) and non-teachers (21.2%) that were familiar with the CAHCE website was similar and did not differ significantly,  $\chi^2 (1, N = 315) = 0.44, ns$ .

Exhibit 14. Familiarity with the CAHCE Website



Of the 60 individuals who were familiar with the website, 51 (85.0%) reported that they had visited the CAHCE website and nine (15.0%) reported that they had not visited the website. The 51 respondents who visited the CAHCE website were asked whether they visited the website with a particular question or need in mind. Twenty-eight percent ( $n = 14$ ) of the educators stated that they went to the website with a particular question or need in mind. The respondents who did not go to the site with a particular question or need in mind (72.5%;  $n = 37$ ) also commented on what prompted them visit the site (see Exhibit 15). The two most common responses were “someone recommended that I check it out” and “I was simply curious about the website.” Two of the respondents who chose “other” indicated that they used to be members of CAHCE and two respondents reported that they heard about the website at a conference.

*Exhibit 15. Reasons for Visiting the CAHCE Website*

	Percentage	<i>n</i>
Someone recommended that I check it out	45.9%	17
I was simply curious about the website	37.8%	14
It sounded like a worthwhile website to know for future use	21.6%	8
I discovered it while conducting a random Internet search	5.4%	2
Other	10.8%	4

Note: Only the 37 respondents who indicated that they visited the website without a particular question or need in mind reported on what prompted them to visit the website. The educators were allowed to select more than one reason.

The 51 respondents who indicated that they visited the CAHCE website provided a range of responses to an additional question regarding what they gained from their visit to the website (see Exhibit 16). The three most typical responses [i.e., “Information about Health Occupations Students of America (HOSA),” “Information about Career Technical Education (CTE),” and “Useful information about resources”] were provided by 47% to 55% of the individuals who indicated that they visited the CAHCE website. Only one individual did not gain anything from visiting the website. Overall, these numbers indicate that the individuals who visited the website were provided with useful information. However, it should be noted that this finding is based on a relatively small subset of the survey respondents and the findings may not have been as positive if the full survey sample had visited the website.

*Exhibit 16. Types of Information Obtained from the CAHCE Website*

	Percentage	<i>n</i>
Information about Health Occupations Students of America (HOSA)	54.9%	28
Information about Career Technical Education (CTE)	49.0%	25
Useful information about resources	47.1%	24
Information about curriculum and best practices	37.3%	19
Other	5.9%	3
Nothing, it was not useful	2.0%	1

Note: Only the 60 respondents who visited the CACHCE website reported on the types of information they obtained. The educators were allowed to select more than one type of information.

All of the educators identified the information they would be most interested in seeing on the CAHCE website. In general, the respondents were interested in seeing a range of information

on the website. The two most frequent responses were “academic resources that are current and relevant to my students” (81.1%;  $n = 257$ ) and “curriculum alignment activities” (73.2%;  $n = 232$ ). Further research would be needed to identify the specific content that falls into these two categories. As shown in Exhibit 17, the other types of information were selected by a large number of educators as well.

*Exhibit 17. Information that the Educators Would Like to See on the CAHCE Website*

	Percentage	$n$
Academic resources that are current and relevant to my students	81.1%	257
Curriculum alignment activities	73.2%	232
Occupation-specific information	50.2%	159
Evidence-based literature or research	47.0%	149
Opportunities to be a member of a community of teachers and share best practices with other educators	44.2%	140
Opportunities for teachers and students to publish work	27.1%	86
Other	3.5%	11

Note: The educators were allowed to select more than one type of information.

From a practice perspective, a website tailored to the Health Science Capacity Building Pathway programs can function as an infrastructure from which subgroups (i.e., secondary, post-secondary and the industry sector) readily share proven best practices that impact student motivation and learning. Although there are many other website choices that teachers mentioned, such a website can be an interactive adjunct that can be offered as a link to other professional associations and marketed through them. Finally, such a website could be dedicated to networking and curriculum sharing and give teachers, especially those who have worked in isolation for many years, a voice and provide an opportunity to feel good about their teaching. When teachers feel part of a professional learning community, their self-efficacy will likely increase (Hoy & Woolfolk, 1993; Goddard, Hoy, & Hoy, 2000).

***Research Question 4: What is the association between health science teachers’ characteristics and their reported levels of collegiality?***

The teachers’ reported levels of collegiality were assessed with the 15 item collegial support scale and the seven item collective efficacy scale. The mean response on the collegial support scale was 4.04 ( $SD = 0.55$ ), which indicates that the average teacher “agreed” with the

statements describing a collegial working environment in his/her programs. Additionally, the mean response on the collective efficacy scale was 4.03 ( $SD = 0.52$ ). The mean response on the collective efficacy scale indicates that the typical respondent also “agreed” with the statements describing efficacy for obtaining support from his/her colleagues. The means, standard deviations, and ranges for the individual items that comprised the two scales are shown in Appendix A and Appendix B.

The teacher characteristics investigated were: (1) ethnicity; (2) gender; (3) subject area taught; and (4) the number of years as an educator. To examine the association between the teachers’ reported levels of collegiality and ethnicity, gender, and subject area taught, the researchers conducted an analysis of variance (ANOVA) for each subscale. The ANOVAs tested whether there were mean differences across the groups (e.g., females and males) on the scales. For purposes of the analysis, ethnicity as coded was White and non-White. Due to the small number of non-White teachers, it was not possible to make comparisons between ethnic groups, such as Hispanic/Latinos and African Americans. In addition, the teachers’ subject areas were coded as CTE health science, science, and other. The ANOVAs revealed that there were no significant differences on the two subscales across the two ethnic groups, gender, and the three subject areas (all  $F_s < 0.62$ , all  $p_s > .05$ ). The means and standard deviations for each group are displayed in Exhibit 18. Correlations were calculated in order to examine the association between the teachers’ number of years of experience as educators and their reported levels of collegial support and collective efficacy, which were both continuous measures. The correlations revealed that years of experience was not significantly related to the teachers’ collegial support ( $r = .01$ ,  $ns$ ) or their collective efficacy ( $r = .03$ ,  $ns$ ).

Overall, the results showed that the four teacher characteristics were not significantly associated with the reported levels of collegiality. These non-significant differences are an important finding because they demonstrate that the different ethnic groups, females and males, teachers with different amounts of experience, and teachers in different subject areas all reported high levels of collegial support. Incentives can be one way of recognizing pathway programs that demonstrate continuous improvement (Council of Economic Advisors, 2009), enhance their teachers’ networking capabilities and demonstrate a direct link between their collegial practices with students’ academic achievement.

*Exhibit 18. Means and Standard Deviations on the Collegial Support and Collective Efficacy Scales Disaggregated by Ethnicity, Gender, and Subject Area*

	Collegial Support		Collective Efficacy	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
<b>Ethnicity</b>				
White (76.1%)	4.05	0.53	4.03	0.50
Non-White (23.9%)	4.03	0.64	4.05	0.55
<b>Gender</b>				
Female (63.5%)	4.02	0.54	4.01	0.52
Male (36.5%)	4.08	0.57	4.05	0.50
<b>Subject area</b>				
CTE health science (31.4%)	4.04	0.53	3.97	0.51
Science (25.1%)	4.05	0.53	4.07	0.55
Other <sup>1</sup> (43.5%)	4.03	0.59	4.04	0.50

Note: <sup>1</sup>Other includes a variety of subjects, such as English, social studies, math, and drama. Items were rated on a five point Likert scale that ranged from 1 (*strongly disagree*) to 5 (*strongly agree*).

***Research Question 5: What is the association between program and school factors and health science teachers’ reported levels of collegiality?***

Finally, the researchers examined the association between program and school factors and the teachers’ reported levels of collegiality. The program and school factors of interest were: (1) the number of teachers in the program; (2) the number of students in the program; (3) the number of students at the school site; and (4) the amount of time the teachers spend working on interdisciplinary projects in a typical week.

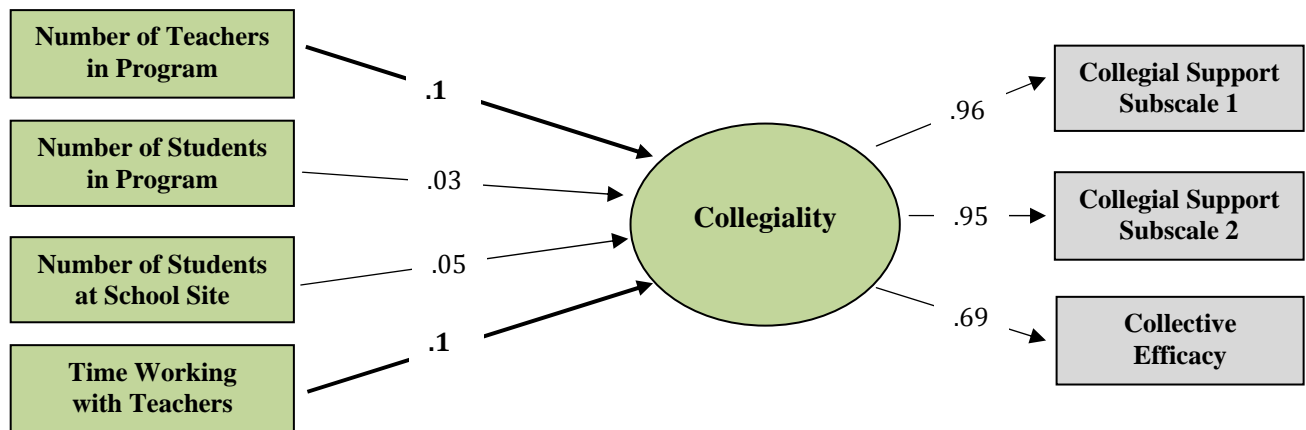
The number of teachers in the program was based on an open-ended question. The responses ranged from 1 to 40 teachers with a mean of 8.74 (*SD* = 6.59). The teachers reported on the number of students in their program using a scale ranging from 1 (*100 or fewer*) to 6 (*301 or more*). Seventy-four percent of the teachers reported that there were less than 200 students in their programs. The teachers reported on the number of students at their school site using a scale ranging from 1 (*500 or fewer*) to 7 (*3,001 or more*). Fifty-six percent of the teachers reported that there were between 1,001 and 2,500 students at their school sites. Finally, the amount of time the teachers spend working on interdisciplinary projects in a typical week was measured with a scale ranging from 1 (*less than 1 hour*) to 5 (*7 or more hours*). The majority of the teachers (82.1%) indicated that they worked on interdisciplinary projects less than 3 hours in a given week.

The researchers utilized structural equation modeling (SEM; Loehlin, 2004) to examine the association between the four predictors and the teachers' reported levels of collegiality. Structural equation modeling (SEM) is a statistical technique that allows researchers to test whether the data they have collected provides support for hypothesized models. One of SEM's strengths is the ability to construct latent variables or variables that are not measured directly, but can be estimated in a model from other directly measured variables. The model of interest in the current study was that the program and school factors were simultaneous predictors of a latent variable based on the collegial support scale and the collective efficacy scale. The model used in the analysis is shown in Exhibit 19. The program and school factors were simultaneous predictors of a latent variable based on the collegial support scale and the collective efficacy scale, which were manifest variables. The collegial support scale and the collective efficacy scale were strongly correlated ( $r = .67, p < .05$ ) and were used to index the broader construct termed collegiality. Models are more stable when latent variables are estimated with three or more manifest variables. Consequently, two collegial support measures were formed by randomly selecting seven of the items for one manifest variable and eight of the items for a second manifest variable.

The model provided an excellent fit to the data as shown by the following SEM fit indices:  $\chi^2(8, N = 217) = 10.87, ns, \chi^2/df = 1.36$ , Root Mean Square Error of Approximation = .04, Comparative Fit Index = .99. The model showed that the number of teachers in the program ( $\beta = .19, p < .05$ ) and the time spent working with other teachers ( $\beta = .16, p < .05$ ) were significantly related to the collegiality factor. The size of the regression weights indicate that for every one standard deviation increase on the number of teachers in the program and the time spent working with other teachers, there was slightly less than a fifth of a standard deviation increase in teacher collegiality. In other words, respondents who reported that they had more teachers in their program were more likely to report higher levels of collegial support and collective efficacy. Similarly, teachers who reported working more with other educators on interdisciplinary curriculum projects tended to report higher levels of collegial support and collective efficacy. On the other hand, the model did not show that the number of students in the program and at the school site was significantly related to the collegiality factor after accounting for the other predictors.

While research suggests that smaller schools may lead to more collaboration among teachers (Bryk, Camburn, & Louis, 1999), the current results showed that having more teachers in a program was related to higher levels of collegiality. These conflicting findings are likely due to the fact that all of the programs were relatively small in size in comparison to traditional high schools. In fact, some of the programs may have had too few teachers to adequately promote collaboration among the teachers. Fifteen percent of the teachers ( $n = 30$ ) reported that there were three or less teachers in their program. As such, within the context of the Health Science Capacity Building Pathway programs, having more teachers is related to higher levels of collegiality. Moreover, CDE should place more emphasis on encouraging programs to increase their interdisciplinary efforts. In other words, it could be a requirement that programs direct grant resources toward having teachers spending more time working together on interdisciplinary projects and aligning health science curriculum across more academic courses.

*Exhibit 19. Path Model with the Program and School Factors Predicting Collegiality*



Note: Standardized parameter estimates are shown. The bolded paths predicting the collegiality factor were significant at  $p < .05$ .

A limitation of the SEM analyses is that all of the variables included in the model were based on self-reported data. In general, there was moderate, but not perfect, agreement among the teachers in each program regarding the number of teachers and students in their programs. As a result, the predictor variables may be better conceptualized as, for example, the teachers' perceptions of the number of students in their program.

## **Conclusions and Future Directions**

The present study examined how teachers in Health Science Capacity Building Pathway programs obtain the most current knowledge about their field and collaborate with their colleagues to enhance their classroom instruction. There were a number of key findings from the survey results. First, the majority of the teachers reported that they had access to a teacher network that provides support and resources. Additionally, the CTE teachers reported positively on their knowledge of health science curriculum, but the non-CTE teachers generally reported lower levels of knowledge of health science curriculum. Regardless of the teachers' level of knowledge of health science curriculum, the teachers generally indicated that they engaged in a number of activities to try to stay up-to-date on health science curriculum. Using Internet resources and interactions with teachers in their schools were the most commonly reported methods that teachers employed to obtain information about health science curriculum. Finally, the SEM analysis showed that teachers reported higher levels of collegiality when they had more teachers in their program and when they reported working more with other educators on interdisciplinary curriculum.

The direct impact of the Health Science Capacity Building Pathway programs on student outcomes was not the focus of the current study. However, the teachers and non-teachers did report on the student outcomes that they perceived to have been improved by their health science programs. There was general consensus among both groups of educators who indicated their health science programs helped improve students' "interest in a health-related career" and "motivation/academic engagement." As shown in Exhibit 20, over 80% of the teachers and non-teachers identified "interest in a health-related career" and over 70% of teachers and non-teachers identified "motivation/academic engagement." Much smaller numbers of both groups of educators named improved "graduation rates" and "CAHSEE scores" as student outcomes that were helped by their program. Future research could obtain student-level data from participants of the health science programs and their peers not participating in health science programs to investigate further the impact the programs have on the students who participate in them.

*Exhibit 20. Student Outcomes Perceived to be Improved by the Health Science Programs*

	Teachers		Non-Teachers	
	Percentage	<i>n</i>	Percentage	<i>n</i>
Interest in a health-related career	87.6%	190	81.0%	81
Motivation/academic engagement	78.3%	170	72.0%	72
School attendance	62.2%	135	56.0%	56
Grade point averages (GPA)	56.2%	122	44.0%	44
California Standards Test (CST) scores	46.1%	100	42.0%	42
Graduation rates	41.5%	90	37.0%	37
California High School Exit Exam (CAHSEE) scores	39.2%	85	40.0%	40

Health science teachers are being called on by the CDE and Health Science Capacity Building Pathway grant committee to increase networking and collegiality practices and to employ collaborative strategies that address issues of knowledge about health science curriculum, motivation, and organizational school structures. Therefore, the CDE would likely benefit from a comprehensive teacher networking strategy that ensures that its funded pathway programs are effective in preparing students for jobs in the health field. While the current Health Science Capacity Building Pathway structure has shown to provide financial support to participating school sites, it could be more effective at encouraging more collaboration and information sharing. Overall, this study indicates that there are high levels of networking and collegiality within individual schools. However, there does not seem to be as much networking occurring across schools on a statewide level. Furthermore, this study shows that more needs to be done in the area of interdisciplinary/curriculum alignment in order to ensure an inclusive process where teachers from all subject areas benefit from the collaboration.

The researchers also encourage education policy makers at the CDE to design a website with specific networking features that would allow teachers across the state to access other professional learning communities and share best practices with each other. Approximately 68% of the respondents indicated that a professional website was one of their preferred methods to network with other teachers. An effective Health Science Capacity Building Pathway teacher networking system would consist of an interactive adjunct website dedicated to networking and curriculum sharing among health science professionals that can be offered to already existing

teacher associations as a link. Such a website would enhance teachers' professional identity and provide them with a venue to establish close collaboration with colleagues from other health science pathway programs. This notion is consistent with Niesz's (2007) study that found effective teacher associations to be an influential tool in giving teachers a voice, especially for teachers who feel alienated within their school. Being recognized as a professional can increase teachers' sense of efficacy and engagement in teacher networks, and can make them more accountable for results. Finally, having such a website as a link to other professional associations can be an effective marketing strategy and can be crucial in increasing awareness of its existence and increasing teachers' perceptions of this as a valuable networking tool.

## Appendix A

Items Adapted from Davis et al.'s (1999) Collegial Teaching and Learning Scale

Item	<i>M</i>	<i>SD</i>	Range
1. Teachers in my program have an understanding of how to support each other.	3.98	0.69	1 – 5
2. I am receptive to advice from my fellow teachers about my teaching.	4.24	0.57	2 – 5
3. Teachers in my program frequently communicate with each other about the quality of their teaching.	3.63	0.93	1 – 5
4. Teachers in my program make an effort to maintain positive relationships with colleagues.	4.19	0.71	1 – 5
5. Teachers in my program recognize and praise colleagues who have done something special at the school or who have received awards.	4.16	0.77	1 – 5
6. Teachers in my program feel comfortable providing suggestions to colleagues about ways to improve teaching and learning in their classrooms.	3.77	0.85	1 – 5
7. Teachers in my program personally acknowledge my efforts and endeavors.	3.92	0.79	1 – 5
8. Teachers in my program learn from one another.	4.08	0.71	1 – 5
9. Teachers in my program trust their own judgments to make decisions that have important consequences for students.	4.08	0.60	2 – 5
10. Teachers in my program share classroom experiences with each other to improve their understanding of student learning.	4.07	0.64	2 – 5
11. Teachers in my program encourage each other to use professional judgment when making decisions.	4.06	0.66	1 – 5
12. Teachers in my program are willing to help each other when problems arise.	4.31	0.63	2 – 5
13. Teachers in my program accept the need for support from their fellow teachers.	4.08	0.71	1 – 5
14. Teachers in my program openly share problems with each other.	4.04	0.79	1 – 5
15. Teachers in my program spend time together informally discussing ways to improve the school/program.	4.05	0.80	1 – 5

Note: Items were rated on a five point Likert scale that ranged from 1 (*strongly disagree*) to 5 (*strongly agree*). The scale showed excellent reliability ( $\alpha = .95$ ).

## Appendix B

Items Adapted from Clark's (n.d.) Teacher Collective Efficacy Scale and Caprara et al.'s (2003) Perceived Efficacy Scale

Item	<i>M</i>	<i>SD</i>	Range
1. I am capable of reaching out to other teachers whenever I need help with my teaching skills.	4.22	0.62	2 – 5
2. I am able to earn the trust and appreciation of my fellow teachers.	4.32	0.55	2 – 5
3. I am able to earn the trust and appreciation of my principal.	4.20	0.73	1 – 5
4. I get teaching ideas from talking to other teachers in my school.	4.19	0.63	1 – 5
5. I have no hesitation about discussing teaching issues with teachers in my school.	3.96	0.80	1 – 5
6. I feel I must handle most of my problems by myself, without the help of my fellow teachers. <sup>1</sup>	2.59	1.04	1 – 5
7. I feel encouraged to talk to anyone in my school about any educational issue.	3.73	0.93	1 – 5

Note: <sup>1</sup>Item 6 was reverse coded. Items were rated on a five point Likert scale that ranged from 1 (*strongly disagree*) to 5 (*strongly agree*). The items showed good reliability ( $\alpha = .81$ ).

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