DOCUMENT RESUME

ED 472 951 SE 067 194

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TITLE	The 4 Ws of Sustained Professional Development for Science Teachers.
PUB DATE	2003-01-31
NOTE	18p.; Paper presented at the Annual Meeting of the Association for the Education of Teachers of Science (St. Louis, MO, January 30-February 2, 2003).
PUB TYPE	Reports - Descriptive (141)
EDRS PRICE	EDRS Price MF01/PC01 Plus Postage.
DESCRIPTORS	Educational Change; Elementary Secondary Education; *Professional Development; *Science Instruction; *Science Teachers; Teacher Improvement

ABSTRACT

Sustained professional development is a program in which teachers receive over 100 contact hours for professional development purposes. Although the characteristics of sustained professional development programs are well defined, the questions that were not answered were: "What kind of teachers are attracted to these types of programs?" and "What kind of experiences do they look for?" This paper introduces the Texas Regional Collaborative for Excellence in Science Teaching (TRCEST) program, which sets an example and investigates the characteristics of teachers attracted to the program. (Contains 12 references.) (YDS)

The 4 Ws of Sustained Professional Development for Science Teachers

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A paper presented at the
2003 Annual International Meeting of the Association for the Education of Teachers of Science
January 30, 2003 – February 2, 2003
St. Louis, Missouri

THE 4Ws OF SUSTAINED PROFESSIONAL DEVELOPMENT FOR SCIENCE TEACHERS

Sustained professional development, where the participant receives over 100 contact hours, is the instrument a teacher can use to grow professionally. A teacher takes the knowledge gained from a sustained professional development program and uses that knowledge to become a better science teacher. The characteristics of a sustained professional development program that make it effective to science teachers to enhance professional growth are well known. What is not known is what kind of teacher is attracted to this kind of program. More importantly, what experiences are science teachers searching for when they decide to seek professional development outside of their school districts? These are questions that science educators have strived to answer.

Loucks-Horsley, et.al, (1998) describe seven principles found in effective professional development programs for science teachers. These principles promote and support overall systemic reform, rather than just teacher reform (Loucks-Horsley, et.al 1998). An effective professional development program for science teachers is: 1) driven by a well-defined image of effective classroom learning and teaching; 2) provides opportunities for teachers to build their knowledge and skills; 3) uses or models the strategies teachers will use with their students; builds a learning community; 4) builds a learning community5) supports teachers to serve in leadership roles; 6) provides links to other parts of the education system; and 7) continually assessing themselves. The seven principles described by Loucks-Horsley, et. al. are also supported in numerous other articles (Garet, M., et.al, 2001; Supovitz & Turner, 2000; Kennedy, 1999; and Darling-Hammond, 1997) on effective professional development for science teachers. By incorporating the qualities of effective professional development, a professional development provider can create a more meaningful experience for all involved and also address reform efforts called for by the science education community.

Context

The Texas Regional Collaboratives for Excellence in Science Teaching – An Effective Model

What does an effective science professional development program look like that meets the principles of effective professional development and also addresses the needs called for by the science education community? The Texas Regional Collaboratives for Excellence in Science Teaching (Texas Regional Collaboratives or TRC) provides an example of one.

The Texas Regional Collaboratives is a statewide professional development program housed in the Science Education Center at the University of Texas at Austin. The mission of the TRC is to provide Texas science teachers

with ongoing support systems of sustained, high-intensity professional development, to assist Texas science teachers in implementing the Texas Essential Knowledge and Skills through upgrading their knowledge of content and pedagogy and to engage ALL students in interesting, relevant, experiential, and meaningful science learning experiences. During the 2001 - 2002 school year, the Texas Regional Collaboratives provided over 700 science teachers, from all grade levels and diverse socioeconomic schools, with over 100 contact hours of professional development. For over ten years, the TRC has been providing effective professional development to science teachers. In 2000, the work of the Texas Regional Collaboratives was honored by being inducted into the Texas Science Hall of Fame as an exemplary education program that promotes science in Texas.

There are twenty collaborative sites that cover the state of Texas. As stated by Jbeily and Barufaldi (1998), each Texas Regional Collaborative site subscribes to important elements of professional development such as, 1) commitment to collaboration, high standards, alternative assessment, experiential learning, and constructivism, 2) the philosophy of bringing the real world into the classroom and, 3) integration of instructional and communication technology into their program. Each collaborative is a partnership of local businesses, school districts, region service centers and universities who are committed to science education reform (Barufaldi, 2000). Besides partnering with local agencies, each collaborative is supported through business partners at the state office. Major partners include: the National Science Foundation, Texas Education Agency, CASIO Inc., Delta Education, ExxonMobil Education Foundation, Frey Scientific, Holt, Rinehart and Winston, Shell Oil Company Foundation, Southwestern Bell Corporation, and Toyota USA Foundation. These partners provide support through cost-sharing, in-kind contributions, and human resources to enhance the professional development programs of the Texas Regional Collaboratives. Much of the success of the TRC can be attributed to the support of funders and business partners both at the national, state, and local levels.

The Texas Regional Collaboratives model of sustained professional development for science teaching is complex and multi-tired. The TRC model for professional development can be divided into three levels: the university level, the state office level, and the collaborative level. The TRC model is highly dependent upon the collaboration between the University of Texas at Austin, College of Education and Science Education Center (for more information on TRC model at the university level, please refer to Barufaldi, J.P., & Reinhartz, J., 2001). The university level provides support for the state office level of the professional development program (for more information on the TRC model at the state office level, please refer to Meyer, 2003). It is at the collaborative level

of the Texas Regional Collaborative professional development model where the impact of the professional development can be seen on both teachers and students.

Figure 1 shows the collaborative level of the TRC model of professional development for science teacher.

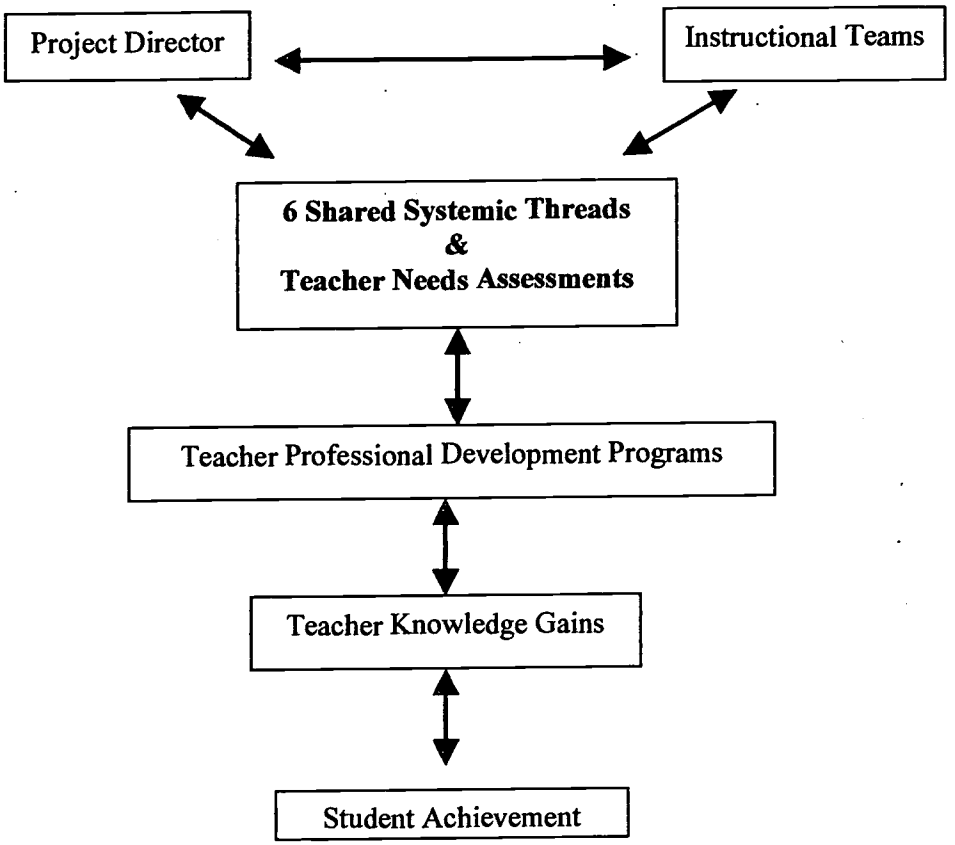

Figure 1: Collaborative Level of TRC Model

The Project Director directs each collaborative and serves as the link between the activities at the collaborative site and the Texas Regional Collaboratives State office. The Project Director works hand in hand with the Instructional Team. The Instructional Team can be composed of scientists, master teachers, education service center instructional specialists, informal educators and science educators (Barufaldi & Reinhartz, 2001). The actual make up of the Instructional Team can vary from collaborative to collaborative based on the specific needs of that site. It is the Instructional Team that is responsible for providing collaborative members with over 100 contact hours of professional development. To ensure that the Instructional Team grows professionally as well, the TRC office provides specific professional development opportunities to meet the needs of the instructional team (Barufaldi & Reinhartz, 2001).

The core of each of the collaboratives and what makes the Texas Regional Collaboratives professional development model so successful is the six shared systemic threads and teacher needs assessments. Having shared systemic threads in all of the collaboratives assists in reinforcing the shared vision of the TRC program. These strands are: Scientific Literacy, Technology, Standards, Equity, Assessment and Constructivism (Jbeily & Barufaldi, 1998). All twenty collaboratives use these strands to design their teacher needs assessments and professional development opportunities called Professional Development Academies.

One would think the easiest, most efficient method for a statewide professional development program is to have a standardized "kit" of activities for each collaborative to follow. That would make sense if teachers and students in Texas were all the same. However, Texas is one of the most diverse states, serving teachers who teach in every imaginable scenario. From rural, low socio-economic status, minority students to suburban, high socio-economic status, Anglo students, Texas teachers and students across the state have different needs. The Texas Regional Collaboratives has designed this model to meet these needs. Each year, needs assessments are administered to the participating teachers to determine the areas of science and pedagogy the teachers in that area need. Therefore, the collaborative activities in the Region 16 Collaborative in Amarillo will differ from those activities of the University of Texas at Pan-American Regional Collaborative in Edinburg on a yearly basis. This gives each collaborative the flexibility to serve the needs of the teachers in their region while still staying within the framework of the six shared systemic threads of the Texas Regional Collaboratives vision.

There are two outcomes of the TRC professional development model. The first is an increase in teacher content and pedagogical content knowledge. Effective professional development programs develop teacher understanding of science concepts and pedagogy (Garet et. al, 2001; Rhoton & Bowers, 2001; Loucks-Horsley, et.al, 1998; NSES, 1996). Through evaluation of the TRC program over the last ten years, significant gains in teacher content knowledge in science and pedagogical content knowledge have occurred (Fletcher, 2002). Texas Regional Collaboratives teachers report not only an increase in their understanding of science but also in their confidence and understanding in the teaching of science (Meyer, 2003).

The second outcome of the TRC model is student achievement in science. In a recent survey of science professional development programs conducted by Kennedy (1999), only 10 of the 93 programs surveyed reported evidence of student learning as an outcome of teacher professional development. Texas is recognized for the high stakes student assessment it administers each year known as the Texas Assessment of Academic Skills (TAAS) test.

Historically, science has not been an accountable content area in Texas. With the introduction of the new state accountability test, Texas Assessment of Knowledge and Skills (TAKS), in Spring 2003, students will be assessed as part of the accountability system in science at the end of grades 5 and 10 and will have to pass an exit level test before they can graduate high school. For the last four years, the Texas Regional Collaboratives office in Austin has been assessing the impact of teacher professional development in science on teacher knowledge and student achievement by administering content specific tests to collaborative teachers and their students. Outcomes have been positive (see Fletcher, 2002 for details) and it is anticipated that students of TRC teachers will receive passing scores on the new TAKS tests.

How is this model considered to be an effective professional development model for science teachers based on the principles described by Loucks-Horsley, et. al, 1998? Table 1 provides a comparison of Loucks-Horsley's seven principles to the Texas Regional Collaboratives professional development program.

Table 1

Principles of Effective Professional Development for Science Teachers

Loucks-Horsley, et. al	Texas Regional Collaboratives
1. Well defined image	1. Six shared systemic threads
2. Teachers building knowledge and skills	2. Professional Development Academies
3. Provides models teachers use with students	3. Teachers trained as they would teach their students
4. Builds a learning community	4. Network with local teachers
5. Teachers in leadership roles	5. Science Teacher Mentors
6. Links to other parts of the system	6. Access to up-to-date state and national information as well as experts in science and science education
7. Continually assessing	7. Pre & Post assessment each year

Loucks-Horsley, et.al, (1998) states that an effective professional development program for science teachers has: a well-defined image, builds teachers' knowledge and skills, and provides teachers with models they would use with their students. The Texas Regional Collaboratives program provides these principals in numerous ways. The well-defined image, as discussed earlier, is the six shared systemic threads that the entire collaborative embrace. The TRC uses Professional Development Academies (PDAs) to assist teachers in building the science content

knowledge and skills. During a PDA, teachers are "trained" as they would teach their own students. For example, if the PDA were a training using a Full Option Science System (FOSS) kit, the TRC teachers would go through the kit as if they were the students in the classroom so they can experience the program as their students would. Throughout the training though, the teachers would also learn related content and pedagogy necessary to teach the FOSS kit from the expert FOSS trainer.

The principles of effective professional development for science teachers also require a program to build a learning community, puts teachers in leadership roles and provides teachers links to other parts of the education system. The Texas Regional Collaboratives model provides these principles as well. The learning community of science teachers extends beyond the local collaborative of teachers but across the 20 collaborative sites. This statewide learning community is supported each year through the Annual Meeting, which brings all the collaboratives to Austin for three days of networking and collaboration. The Texas Regional Collaboratives program is also known for establishing teacher leaders in the state. Numerous teachers have taken leadership roles in their district as well as in their region. Many of the collaborative teachers have served on statewide committees and the ultimate statewide science education leadership role, director of science for the Texas Education Agency, is a former Texas Regional Collaboratives member. Through building a learning community and building leaders, the Texas Regional Collaboratives has also been able to provide teachers with links to other parts of the educational system. Through the networking opportunities, the TRC teachers stay current on national and statewide educational issues. Additionally, the TRC has provided Texas teachers opportunities to meet nationally known scientists, such as Massachusetts Institute of Technology Physicist Tom Hsu and University of Wisconsin Chemist Bassam Shakhashiri.

The last principle of effective professional development as described by Loucks-Horsley, et.al. (1998) is that the professional development program is continually assessing itself. As stated earlier, each year the Texas Regional Collaboratives program administers teacher needs assessments to determine the areas in which to focus the professional development. These teacher assessments are both formative and summative in nature and assess the impact of the program on both the teachers and students involved in the TRC program. Evaluation and assessment of the TRC program has uncovered many interesting research areas. Numerous research studies are now underway to investigate the impact of the Texas Regional Collaboratives program on the teachers and students of Texas. The study presented here is one such research investigation.

The purpose of this investigation was to identify and describe characteristics of teachers attracted to the Texas Regional Collaboratives professional development program and their motivation for participating in the program. The following research questions will be addressed in this study:

1. What are the characteristics that make up a teacher who joins a sustained professional development program? i.e. What does the "average" collaborative member look like?
2. What reasons do Texas science teachers provide for their decision to join the Texas Regional Collaboratives?
3. What reasons do Texas science teachers provide for their decision to remain the Texas Regional Collaboratives?
4. What reasons do Texas science teachers provide for their decision to leave the Texas Regional Collaboratives?

Methods

Participants

Participants for this study are members or former members of the Texas Regional Collaboratives for Excellence in Science Teaching. Since every collaborative is structured differently, criteria for participation in the study were created. Project Directors were asked if their collaborative: 1) allows collaborative members to return year after year, and 2) does not require participants to be enrolled in a graduate program as part of membership. These criteria were used to ensure that teachers had flexibility in their collaborative membership and were not members due to obtaining a graduate degree. From there, involvement in the study was narrowed even further. If the collaborative had submitted their 2001-2002 Participant Data Information Forms and met the above two criteria, then their members were selected. Of the 20 collaborative sites, six collaboratives were selected to partake in the study. From these six collaboratives, 185 teachers were sent the study questionnaire, 85 returning collaborative members and 100 non-returning members.

Data Collection and Analysis

Demographic data necessary to compile the characteristics of a teacher involved in sustained professional development were collected from the Texas Regional Collaboratives Participant Data Forms. Each year, participants of the TRC program complete the Participant Data forms, which include information about their

personal background as well as their school and classroom demographics. Each year the information requested changes due to requirements of the Texas Regional Collaboratives funders. Any additional demographic information needed was asked on the study questionnaire.

The 185 teacher participants of the study were sent a questionnaire that contained three closed-ended questions in which they had to rank their responses, ten likert-scale questions and two open ended questions. The questions were designed based on responses from a previously administered pilot study as well as Texas Regional Collaborative evaluation reports. There were two questionnaires designed, one for returning collaborative members and one for dropped collaborative members. This design was to ensure to draw out the necessary information needed from the two participant groups in the Texas Regional Collaboratives professional development program to assist in answering the research questions of this study. (For a copy of the questionnaire, please contact the authors). At the end of July, study participants were mailed the questionnaire and a self-addressed return envelope to their home addresses and given two weeks to respond. Of the 185 teachers sent questionnaires, 60 responded, for a 32.43% response rate.

For the purposes of this study, only the three closed-ended questions from the questionnaire were analyzed and will be reported. Responses to each of the ranked questions were tallied and weighted means were determined to ensure the appropriate rankings were uncovered. Teacher responses on the Texas Regional Collaboratives Participant Data Forms were also tallied and percentages were calculated to determine the composite characteristics of a teacher involved in the Texas Regional Collaboratives professional development program.

Findings

Characteristics of Teachers

What do teachers involved in sustained professional development look like? What demographic characteristics do these teachers hold? A teacher who is involved in the Texas Regional Collaboratives sustained professional development program is a white (72.5%), female (83%). She holds a bachelors degree (76%) and went through a traditional certification program (83%). The TRC teacher teaches in a Title 1(72%) elementary school (49%), has been teaching on average 13.4 years and has been involved in the TRC program for an average of 3.3 years. These demographics provide a composite profile of the teachers involved in the Texas Regional Collaboratives professional development program and are not reflective of true diverse nature of the TRC program.

Appendix A contains a detailed breakdown of each demographic category and shows how truly diverse the TRC teacher participants are.

Reasons for Joining, Returning and Leaving the Program

When asked the reasons for participating in the Texas Regional Collaboratives professional development program, the teacher participants ranked the survey responses in the following order (with the weighted average in parenthesis):

1. To enhance learning among my students (5.5)
2. Lessons/activities for the classroom (5)
3. To increase my science content knowledge (4.9)
4. The networking/collaboration provided by the collaborative (4.2)
5. Professional development/Continuing Education opportunities (3.7)
6. Equipment for my classroom (3.2)
7. Recommended by others (2.1)

The reasons for continuing their participation in the Texas Regional Collaboratives professional development program are not much different than those for joining the program. The teacher participants ranked the survey responses in the following order (with the weighted average in parenthesis):

1. Lessons/activities for the classroom (3.6)
2. The networking/collaboration provided by the collaborative (3.3)
3. To stay current on statewide changes/TAKS information (3.1)
4. Professional development/Continuing Education opportunities (2.8)
5. Friendships/Fellowship found in the collaborative (2.7)

When asked why they discontinued their participation in the Texas Regional Collaboratives program, the teacher participants cited the following reasons (with the weighted average in parenthesis):

1. Family reasons (3.8)
2. Time involved with the collaborative (3.3)
3. Amount of work involved with the collaborative (3.2)
4. Changed teaching assignment to a subject other than science (2.9)
5. Personality conflicts with others in the collaborative (2)

These findings offer professional development providers some interesting insights into the kinds of teachers involved in sustained programs and their reasoning for partaking in the professional development program.

Discussion

Why would a science professional development provider be interested in the kinds of teachers attracted to a sustained professional development program and their reasons for joining, remaining and leaving that program? First of all, this information provides valuable information to the kind of teacher seeking professional development opportunities outside of their school districts. In Texas, there are over 282,000 teachers (TEA, 2003). With a

teaching population so large, the state has a very diverse teaching pool with diverse needs. One would wonder if the Texas Regional Collaboratives program attracts the "cream of the crop" teacher. When you compare the demographics of the Texas Regional Collaborative teachers to the demographics of the teachers in Texas, the teachers who are participating in the Texas Regional Collaborative professional development program are no different than those in Texas in general. The TRC program attracts your "typical" Texas schoolteacher. This tells us that the kind of teacher attracted to a sustained professional development program is your "everyday" teacher who teachers in your "everyday" school. The TRC program does attract the outliers, teachers who teach in upper income schools, from different genders, ethnicities or have advanced degrees. In general, our teachers are very reflective of what you would find in any Texas school in any given day.

It is safe to assume that teachers engaged in sustained professional development programs, such as the Texas Regional Collaborative program, are not having their professional development needs met by their local school district. If the school district were meeting their needs, why would they look elsewhere? Teachers in the TRC make the 105 contact hour commitment to the program in addition to their commitment to their school district contract and to their family and other personal commitments. When looking at the responses for why teachers joined the Texas Regional Collaboratives professional development program, the top four responses provided by the teachers all focused on improving their practice as teachers. Teachers joined the TRC program to find ways to become a better teacher. They want to learn new pedagogy to assist in student understanding of science content. They are looking for new ways to teach science to their students.

At a more personal level, these teachers want to improve their own knowledge and understanding of science content. Science content changes everyday and the TRC teachers recognize the importance of staying current in the field of science. The TRC also provides them with a support system of other teachers who are actively engaged in improving their practice as well. They view the Texas Regional Collaboratives as a learning community committed to high standards of science teaching pushing them to be the best that they can be. It is through a sustained professional development program, one with a clearly defined vision, that a teacher can grow professionally. More importantly, meeting their need to improve their practice as teachers.

The remaining reasons for joining the Texas Regional Collaboratives professional development program were more extrinsic in nature. Obtaining equipment for their classrooms and obtaining professional development hours are both tangible items a teacher can take back to their school and show their principal. Those reasons really

do not necessarily aid a teacher in professional growth but are important for many of our teachers, especially in the rural areas of Texas where lack of funding and opportunities make it hard for teachers to purchase equipment and obtain professional development hours.

For those teachers who cited that they joined because others recommended the program, it was usually because their principal told them they will participate in the Texas Regional Collaboratives and they really had no choice in the matter. It was ranked last because it applies to very few of our teachers but it is still something for professional development providers to remember. There are many teachers involved in your programs that are there against their will and resent the fact they have to participate in the program. One can hope that the experience of the sustained professional development program is a positive one and can overcome the negative attitude that many of these teachers may bring with them.

Some of the most interesting conversations about experiences in the Texas Regional Collaboratives professional development program are with those who have been in the program for many years. These teachers are the ones who keep coming back year after year and are commonly referred to as the "die-hard" collaborative teachers. When you look at the reasons the returning teachers cite for coming back to the program, the majority of these reasons are intrinsic in nature. They return because they learn new ways to teach science in their classrooms. The returning teachers have support systems in the collaboratives that constantly engage them in professional dialog that many do not have in their school districts. The networking is extremely valuable for the teachers in rural school districts where the collaborative teacher may be the only science teacher in the district. They use their collaborative as a place to turn for support and help when they have nowhere else to turn. Along those same lines, the friendships they create through their participation in the collaboratives is important to many of the teachers and is a reason that many teachers return year after year.

The networking has also impacted the returning teachers in that it has enabled them to stay current on statewide educational issues. Texas is nationally known for it's high stakes testing. Beginning in 2003, science will be an "accountable" tested area for the first time. Texas Regional Collaboratives teachers cite that through their participation in the TRC program, they have stayed current on the new science test and feel very prepared for the test. Having access to this knowledge is one reason they keep coming back year after year, to keep them ahead of the testing game. Finally, they do receive professional development credit that fulfills certain requirements placed on them by their school district.

If the Texas Regional Collaboratives professional development program is so beneficial then why do teachers leave the program? Most of the reasons cited for leaving the TRC program have to do with the program taking away from a part of the teacher's life. For example, the number one reason cited for leaving the program was family reasons. Many teachers reported that they left the program because they had to take care of an elderly parent or they had a baby and the TRC program would not allow them to do both. The second reason cited, amount of time involved, goes hand in hand with the first reason. Many teachers stated that the TRC program just took too much time out of their personal life and or time away from their classroom. The teacher felt they could not provide what they needed to their students/family and to the collaborative due to the time commitment involved. 105 contact hours in addition to your normal workday is a huge time commitment for anyone, especially if you are teaching full time, have a family and the collaborative is meeting after school and on the weekend. In addition to the time commitment, many collaboratives offer graduate credit as part of the membership in the collaborative. When you add the workload of assignments related to graduate coursework to the time involved with the collaborative, it is just too much to handle for many teachers.

The remaining reasons teachers provided for leaving the Texas Regional Collaboratives had nothing to do with time or workload. Many teachers are no longer in the TRC program because they had their teaching assignment changed and they are no longer teaching science or had become an assistant principal, principal or school counselor. It is discouraging to find out that after receiving sustained professional development in science, that many teachers have their teaching assignments changed, many of them reporting they are now teaching social studies. On the other hand, uncovering that highly trained science professionals are now taking leadership roles at the campus levels is very encouraging. There are individuals in decision-making roles, such as principals and assistant principals, who are knowledge about science and understand the costs of having a quality science program. Also, by having a counselor with a science background, they are more likely to encourage ALL students to enroll in upper level science and math courses, not just those students who are college bound.

As with any program, where you bring more than two people together, you are bound to have personality conflicts among the participants and leaders of the program. The last reason teachers cited leaving the program was personality conflicts with others in the collaboratives. It is an unfortunate side effect of working with large groups of people. It is though, an important issue for professional development providers to be mindful of when designing

programs and training leaders of the programs. Differences in personalities and conflict management should be incorporated into the training to help leaders deal with any problems that may arise.

Conclusions

Teachers involved in sustained professional development programs, such as the Texas Regional Collaboratives for Excellence in Science Teachers are demographically no different than other teachers found in the state of Texas and in most regards nationally. Taking the demographic information into account along with why teachers join, remain, and leave professional development programs, professional development providers can create some outstanding opportunities for science teachers.

We know that teachers join the TRC program to improve their practice. They are searching for ways to become better teachers. We also know that teachers stay in the TRC program because of the intrinsic value they receive from the professional development. They benefit from the networking opportunities, the classroom lessons and activities, and staying abreast of statewide changes in education. When you evaluate these reasons deeper, you begin to see these relate to renewing their practice as science teachers. Most of these teachers are mid-career teachers who were tired of how they were teaching. Why else would they want to improve their practice? It is through a sustained professional development program, such as the Texas Regional Collaboratives, that these mid-career teachers are able to renew their interest in science teaching. They do not see teaching in the same old light. They have new ideas and teaching strategies to meet the needs of our ever-changing classrooms. They are armed with appropriate pedagogy, content, and lessons and have a network of other teachers in their local area who are trying to do the same thing in their classrooms.

What have we learned from those teachers who have left the Texas Regional Collaboratives program? We have learned that the time commitment of 105 contact hours is a negative to our dropped members. Although family reasons was the number one reason teachers cited for leaving, time does play a major part in why teachers leave a sustained professional development program. The 105 contact hours takes teachers away from their family, friends and their students. When asked if they could change one thing about the Texas Regional Collaboratives program, most teachers responded they would want less time involved and many of the dropped teachers said they would return to the program if it involved less of their time. One area that we are beginning to investigate is the optimal contact hour time for an effective collaborative. Research on effective professional development (Garet et. al, 2001; Rhoton & Bowers, 2001; Loucks-Horsley, et.al, 1998; NSES, 1996) states that the professional development must

be sustained for it to be effective. The question remains on what exactly is the optimal contact time for sustained professional development? Is it the 90 hours as required by the Teacher Quality Grants (formerly the Eisenhower Professional Development Grants) or is it 60 hours or 80 hours?

There are numerous other research areas under investigation at the Texas Regional Collaboratives office. Further study on the role of professional development on science teacher retention and renewal as well as the impact of the professional development on student achievement is under investigation. The TRC model of professional development is a replicable model for other states to use if one is considering creating a sustained professional development program. It is considered an effective model and meets the needs of diverse groups of teachers. By knowing the kinds of teachers attracted to a sustained professional development program, why they are joining, why they remain and why they leave, professional development providers can now create more effective opportunities for science teachers that meet their needs as teachers and as individuals.

REFERENCES

Barufaldi, J.P. (2000). The Dynamics of Collaboration is a State-wide Professional Development Program for Science Teachers. Paper presented for discussion in Contemporary Problems in Math and Science, February, 2001, Austin, TX.

Barufaldi, J.P., & Reinhartz, J. (2001). The dynamics of collaboration in a statewide professional development program for science teachers. *Models of Science Teacher Preparation – Theory into Practice. Kluwer Academic Publishers.* 89-104.

Darling-Hammond, L. (1997). *The right to learn*, Jossey-Bass Inc., San Francisco, CA.

Fletcher, C., Barufaldi, J.P., Bethel, L., & Blasingame, J. (2002). Paper presented at the annual meeting of the National Association for Research in Science Teaching, New Orleans.

Garet, M.S., Porter, A.C., Desimone, L., Birman, B.F., & Yoon, K.S. (2001). What makes professional development effective? Results from a national sample of teachers. *American Educational Research Journal.* 38(4), 915-945.

Jbeily, K.A., & Barufaldi, J.P. (1998). Texas regional collaboratives for excellence in science teaching. Unpublished paper. The University of Texas at Austin, College of Education.

Kennedy, M.M. (1999). Form and substance in mathematics and science professional development. *NISE Brief.* 3(2) 1-7.

Loucks-Horsley, S., Hewson, P.W., Love, N., & Stiles, K.E. (1998). *Designing professional development for teachers of science and mathematics.* Corwin Press, Inc., Thousand Oaks, CA.

Meyer, J.D. (2003). *The role of sustained professional development in science teacher retention and renewal.* Unpublished doctoral dissertation. The University of Texas at Austin.

Rhoton, J., & Bowers, P. (Eds.) (2001). *Professional development planning and design.* Arlington, VA: NSTA Press.

Supovitz, J.A., & Turner, H.M. (2000). The effects of professional development on science teaching practices and classroom culture. *Journal of Research in Science Teaching.* 37(9), 963-980.

Texas Education Agency. (2003). http://www.tea.state.tx.us.

Appendix A

Texas Regional Collaboratives for Excellence in Science Teaching Demographic Data

Gender	
Male	Female
17%	83%

Type of Certification	
Traditional	Alternative
83%	17%

Ethnicity					
White	African-American	Hispanic	Asian-American	Native American	Other
72.5%	5.7%	18.1%	.9%	1.0%	1.8%

Highest Degree Held		
Bachelors	Masters	Doctorate
76%	23.3%	.7%

Receive Title 1 Funds	
Yes	No
72%	28%

Teaching Level		
Elementary	Secondary	Other
49%	45%	6%

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