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ABSTRACT

An academic year-long teacher research initiative was implemented in an alternative education school in a large school district in the southwestern United States. Quantitative and qualitative methodologies were used to examine participatory teacher research as an active, collaborative means of professional development for teachers, including its effect on teacher efficacy and empowerment. Participants were eight teachers and three instructional assistants who remained with the teacher research project until is was completed. Results indicate growth in both general and personal teaching efficacy from pretest to posttest. Collaboration was consistently related to general teaching efficacy. Perceptions of school climate were related to personal teaching efficacy at posttest. No relationship was observed between empowerment and efficacy. (Contains 3 tables and 64 references.) (Author/SLD)

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The Effect of Participation in Teacher Research Professional Development on Teacher Efficacy and Empowerment

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Abstract

An academic year-long teacher research initiative was implemented in an alternative education school in a large school district in the southwest United States. Quantitative and qualitative methodologies were utilized to examine participatory teacher research as an active, collaborative means of professional development for teachers, including its effect on teacher efficacy and empowerment. Results indicated growth in both general and personal teaching efficacy from pre to posttest. Collaboration was consistently related to general teaching efficacy. Perceptions of school climate were related to personal teaching efficacy at posttest. No relationship was observed between empowerment and efficacy.

The Effect of Participation in Teacher Research Professional Development on Teacher Efficacy and Empowerment

School restructuring movements have increased scrutiny of how teachers are trained and developed as professionals in their field. The elevation of teaching to a "more respected" and "responsible" position, as suggested by Shulman (1987, p. 3), requires the participation of schools and districts in the facilitation of such professionalism. Educators have argued that providing meaningful professional development for inservice teachers is central to this goal (cf. Eisner, 1992; Fullan, 1993; Lieberman, 1995; Little, 1993). Traditionally, teachers' professional development has consisted of short-term or "one-shot" workshops and inservices conducted by outside experts. Some educators and researchers are now attempting to fundamentally alter methods of teacher professional development so teachers assume control of classroom decisions and actively participate in their own instructional improvement on an ongoing basis (cf., Knight & Boudah, 1995).

Participatory teacher research has been suggested as one means of fostering meaningful professional development for teachers (Cochran-Smith & Lytle, 1990, 1999; Noffke, 1997). Participatory teacher research is a collaborative process by which teachers themselves critically examine their classrooms, develop and implement educational interventions, and evaluate the effectiveness of those interventions (Knight, Boudah, & Groce, 1998). These activities allow teachers to actively participate in the development of practical knowledge about teaching.

Not only does the professionalization of teaching call for meaningful professional development, but it also requires teachers to foster self-regulatory, motivational mechanisms by which to achieve desired educational outcomes. Teacher self-efficacy is one such mechanism

that has consistently been linked with both positive teacher behavior and student achievement (Tschannen-Moran, Woolfolk Hoy, & Hoy, 1998). Given the need for self-regulatory, professional teachers and the link between teaching effectiveness and self-efficacy, some researchers have focused on the effects of professional development and/or educational interventions on teacher efficacy (Ohmart, 1992; Ross, 1994, 1995). Furthermore, educators have also argued for mechanisms that would facilitate teacher empowerment, or the opportunity for teachers to increase decision-making capacity and autonomy (Short & Rinehart, 1992a, 1992b).

While some instructional interventions, such as teacher action research, generally attempt to positively impact instructional strategies and the professional nature of teaching, they also can be conceptualized as providing fertile ground in which to cultivate teacher efficacy and empowerment (Boudah & Knight, 1998; Knight & Boudah, 1998a). Teacher research initiatives, for example, provide abundant opportunities for teachers to collaborate with peers, make critical instructional decisions, and assume control of the implementation of strategies in their classrooms. Such collaborative professional development has been found to foster the motivational constructs of teacher efficacy and empowerment (Ross, 1994; Short, Greer, & Michael, 1991). Considering the activities characteristic of teacher research, the possible effects of teacher research initiatives on teacher efficacy and empowerment are promising.

Purpose

The purpose of the present study was to examine the motivational effects of a teacher research initiative that was implemented in an alternative and special education school. More specifically, the present study investigated the self-efficacy, empowerment, collaboration, and perceptions of school climate of teachers who participated in teacher research. The study also

provided a unique look at these constructs by exploring them in an alternative and special educational setting. Both quantitative and qualitative methods were used to provide a detailed picture of the constructs associated with teacher research.

The study addressed the following research questions concerning the potential impact of teacher empowerment, collaboration, and perceptions of school climate on teacher efficacy in the context of participatory teacher research.

1. Is there a difference in teachers' general teaching efficacy, personal teaching efficacy, empowerment, collaboration, and perceptions of school climate after participating in an academic year-long teacher research initiative?
2. Do teachers differ on these variables by level of implementation of their individual and/or group teacher research projects?
3. What are the relationships between teacher empowerment, collaboration, and perceptions of school climate as predictors of general and personal teaching efficacy?

Theoretical Framework

Cochran-Smith and Lytle (1990) broadly defined teacher research as "systematic and intentional inquiry carried out by teachers" (p. 3). It is a process of actively engaging teachers in the reflective investigation and critical evaluation of their own practice (see e.g., Lewin, 1946; Stenhouse, 1971, 1975). Importantly, teachers also assume organizational power to implement curriculum and instruction based on their findings. Dewey (1903) argued a century ago that every teacher should have "some regular and representative way in which he or she can register judgment upon matters of educational importance, with the assurance that this judgment will somehow affect the school system" (p. 199).

As a movement, teacher research includes a variety of action research approaches that differ in terms of teacher roles and research purposes. These approaches evolved from separate but related sources, including British, Australian, and American origins. Generally, the British and Australian efforts centered on critical social science and the democratization of teaching and learning processes (see e.g., Carr & Kemmis, 1986; Cousins & Earl, 1995). Also generally, U.S. initiatives held a stronger teacher education and professional development focus toward the end of knowledge generation that challenges school functioning, often with the intent of bridging the theory-to-practice gap (see e.g., Cochran-Smith & Lytle, 1990; Tikunoff & Ward, 1983).

Carr and Kemmis (1986) provided a useful interpretive framework for describing and classifying teacher research agendas based on roles of participants, focus of the research, and outcomes intended by the process. Technical action research addresses concerns and issues by persons outside of the school, typically university researchers, and almost solely uses effectiveness of practice as its focal point. Practical action research encourages collaborative interactions among teachers and facilitators toward mutually determined goals. Emancipatory action research engages teachers in a social-construction of ideas in effort to transform educational institutions. Institutional redefinition is more important than traditional outcomes. Noffke (1997) provided a similar framework with her professional, personal, and political dimensions of action research. Cochran-Smith and Lytle (1999) also described the historical development of teacher research and the various international traditions.

Of the approaches described by Carr and Kemmis (1986), the teacher research model used in the present study is best considered as practical action research, although certain elements of the model may reasonably fall into other categories. The model actively engages teachers in a collaborative process to critically explore their own classroom contexts and is

consistent with the orientation of researchers such as Cochran-Smith and Lytle (1990). In doing so, however, the approach still allows for examination of traditional student outcomes and jointly engages school and university researchers toward mutually established, classroom-driven goals.

Current interest in teacher research is often embedded in other, more broadly defined, reform efforts such as site-based management, teacher empowerment, and university-school collaboration which are collectively aimed at instructional effectiveness and school restructuring. Central to these approaches is an emphasis placed on collaborative relationships among school personnel. Knight, Wiseman, and Smith (1992) noted, for example, that collaboration between university and teacher researchers can serve to reduce the perceived tension between the worlds of research and practice.

Teachers involved in participatory teacher research may experience professional and personal growth and a decrease in feelings of frustration and isolation (see e.g., Goswami & Stillman, 1987; Maloy & Jones, 1987; Noffke, 1997; Oja & Pine, 1987; Reason, 1994). These outcomes are typically attributed to the collaborative nature of teacher research. Firestone and Pennell (1993) argued that collaboration becomes an intrinsically reinforcing activity that builds commitment to teaching.

Boudah and Knight (1996) reported positive effects from participation in teacher research in terms of improved teacher attitudes toward research, increased feelings of self-efficacy related to low achieving students, and increases in positive interactions with students. Students also improved in strategy use and mastery. Knight and Smith (in press) reported group differences between 244 teacher research participants and 100 non-participants, with teacher researchers reporting greater satisfaction with teaching, professional interest, and general efficacy. The

teacher researchers also reported greater perceived influence (efficacy) on the listening skills, homework, and class work of students.

While these studies at least partially used quantitative methodology, most research in this area relies on more purely qualitative designs (see e.g., Black, 1996). Consistent themes, however, exist in the qualitative studies, which suggest participatory teacher research facilitates critical thought (Black, 1996), teacher collaboration (Tieg, Bailey, Arllen, & Gable, 1993), and professional growth (Burns, 1994). Teacher research processes may also help create a positive school culture - one that is supportive of teacher reflection and experimentation (Francis, Hirsch, & Rowland, 1994).

Teacher Research and Teacher Efficacy

Given its focus on active, collaborative intervention development toward instructional effectiveness, teacher research may also be a means to positively impact teacher efficacy. Several studies have already suggested this possibility (Boudah & Knight, 1996; Knight & Smith, in press; Knight et al., 1998). Bandura (1997) proposed that one's self-efficacy beliefs are the primary mechanism of behavioral change and self-regulation and defined self-efficacy as perceived ". . . beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (p. 3).

Teacher efficacy as a construct has primarily stemmed from Bandura's (1977) social cognitive theory (cf. Tschannen-Moran et al., 1998), which suggests that one's efficacy beliefs are impacted by two important components: human agency and triadic reciprocal causation. The assumption of human agency holds that people are capable of choice and intentional pursuit of courses of action, and can actively shape their lives (Bandura, 1982). However, the mechanism through which human agency works is triadic reciprocal causation, a multi-directional model in

which behavior, internal personal factors (e.g., cognition, affect, attitudes), and the environment exert causal influence on each other (Bandura, 1997). The interplay between these symbiotic influences results in actual behavior and thought in the individual. In this model, social context, perception, and behavioral action all impact a teacher's judgment about whether she or he will be able to execute the actions necessary to positively impact student learning (self-efficacy). For example, assume that a teacher has a student transferred to her class who has a history of being extremely oppositional to teacher directives. When the teacher greets this student, her behavior (e.g., manner of greeting him, nonverbal demeanor) interacts with her internal personal factors (e.g., emotional reaction, memory of similar students) and the environment (e.g., other students watching, nature of school climate). This combination of factors subsequently impacts the teacher's perceived ability to interact positively with this student in the future.

Ashton and Webb (1982) were among the first to extend Bandura's (1977) study of self-efficacy to teachers and, along with others (e.g., Gibson & Dembo, 1984), argued for two elements of teacher efficacy: general teaching efficacy and personal teaching efficacy. These constructs have dominated the study of teacher efficacy for twenty years. For a complete discussion of the development of teacher efficacy as a construct, as well as alternative formulations of teacher efficacy, the reader is referred to Tschannen-Moran et al. (1998).

Teacher efficacy has been consistently related to a myriad of positive teaching behaviors and student outcomes (cf. Tschannen-Moran et al., 1998). Unfortunately, experimental (or quasi-experimental) and/or long term designs are near absent in the literature, leaving cross-sectional snapshots of teacher perceptions of their capabilities. As Ross (1994) noted, "In the absence of interventions it is difficult to tell whether teacher efficacy is a cause or a consequence of the adoption of more powerful teaching techniques" (p. 382). The limited number of studies

in this area does suggest that teacher efficacy can be impacted by meaningful, active interventions (see e.g., Ross, 1994).

Based on prior research (Boudah & Knight, 1996; Knight & Smith, in press; Knight et al., 1998), teacher research promises to facilitate teachers' perceptions of self-efficacy, collaboration, positive student-teacher interactions, and professional growth and interest. The model of teacher research used in the present study was highly participatory and teacher-driven, thereby providing professional development of an active nature as suggested by Ross (1994) and Little (1984). Accordingly, the current model capitalized on human agency toward mastery experiences, which may lead to bolstered efficacy beliefs (Bandura, 1997).

Using the triadic reciprocal causation model of social cognitive theory as a framework, the present study examined the relationship between a teacher's sense of empowerment, a common theme in school restructuring (Klecker & Loadman, 1996), and teacher efficacy. Although definitions of empowerment vary (see e.g., Dunst, 1991; Lightfoot, 1986; Melenyzer, 1990), most suggest empowerment involves teachers' perceptions of whether they have a sense of control over their work in the classroom and the opportunity to pursue meaningful courses of action. Importantly, teacher research attempts to provide such classroom control and is teacher-driven. Because the empowerment construct is closely related to human agency, social cognitive theory would suggest that perceptions of empowerment are necessary to focus internal personal factors such as goal directed cognition and affective responses toward teachers' work. Therefore, the relationship between empowerment (as a cognitive element of social cognitive theory's reciprocal causation) and teacher efficacy was explored.

The second element of reciprocal causation is individual behavior. Effective teacher behavior can lead to mastery experiences, which in turn may impact efficacy. In particular,

teacher research facilitates collaboration when addressing instructional challenges. Consistent with social cognitive theory, collaborating to increase instructional effectiveness can impact teachers' efficaciousness (Knight & Smith, in press). As such, teacher collaboration was examined in the present study as a behavioral element of social cognitive theory.

Finally, perceptions of school climate were examined as an environmental element of reciprocal causation. As suggested by social cognitive theory, a school's cultural context may impact individual self-efficacy. For example, research suggests that school climate, or "teachers' perceptions of psychosocial dimensions of the environment of the school" (Rentoul & Fraser, 1983, p. 21), may be positively related to teachers' feelings of effectiveness (Hoy, 1996) and negatively related to burnout (Trent, 1997) and absenteeism (Norton, 1998). Teachers' reported perceptions of school climate (as a measure of the environmental factor in Bandura's (1997) triadic model) was used in the present study as a potential predictor of teacher efficacy.

In sum, then, the present study examined the relationship between teacher efficacy and teachers' reported sense of empowerment (as a cognitive element of social cognitive theory), level of collaboration (behavioral element), and perceptions of school climate (environmental element). Unlike the majority of the literature in this area, the present study utilized a dominant/non-dominant mixed methods approach with quantitative methods as a primary investigational tool. Accordingly, the present study served to address both the content and methods of the literature on teacher research.

Methods

Setting

The study was conducted in an alternative education school in a large southwestern city in the United States. The school district enrolled approximately 20,000 students on 20

campuses. The alternative school served around 600 students at all levels referred from home campuses either for excessive behavioral disruptions or severe learning/emotional disabilities. This site was selected due to the impact that extreme student populations may have on teacher efficacy.

Due to the alternative nature of the school, the teachers worked largely with self-contained classrooms, typically with several grade levels combined. Class size tended to be small (M = 8.10, SD = 3.54) with alternative classrooms slightly larger (M = 10.75, SD = 2.06) than the adaptive behavioral classrooms (M = 6.33, SD 3.27). The teacher research study was initiated at the request of the school's principal and took the form of a university-school collaborative effort to facilitate teachers' critical thought, collaboration, and instructional effectiveness.

Participants

Teachers were recruited during a regularly scheduled faculty meeting and were asked to indicate level of interest on a demographic form. Fifteen teachers volunteered participation at the initial meeting with three persons withdrawing after the meeting due to a lack of time. In addition, one participating teacher was terminated from employment shortly after the start of the project. The participating sample consisted of eight teachers and three instructional assistants that remained with the project until completion. Since instructional assistants were highly active in both instruction and behavioral management, they were grouped with the lead teachers throughout the project.

The average age of the teachers was 44.18 (SD = 9.10). They averaged 9.91 (SD = 8.50) years taught and 4.55 (SD = 2.46) years at the alternative school. One of the teachers was male. Elementary, middle, and high school instructional levels were represented as well as both the

alternative and adaptive behavioral programs. In addition to teachers, the school's principal and assistant principals for the alternative and adaptive behavioral programs were included for administrative perspectives.

Instrumentation

Data were collected from multiple sources which are described below.

Teacher Efficacy Scale. The Teacher Efficacy Scale (TES; Gibson & Dembo, 1984) was used to measure general teaching efficacy (GTE) and personal teaching efficacy (PTE). GTE refers to one's belief about whether teachers, in general, can overcome negative barriers to positively influence student learning (e.g., "Even a teacher with good teaching abilities may not reach many students."). As the name suggests, PTE is more self-referent and indicates a teacher's belief about whether she or he can perform actions necessary to positively influence student learning (e.g., "When a student does better than usual, many times it is because I exerted a little extra effort."). The TES has been so frequently used in the measurement of teacher efficacy that Ross (1994, p. 382) called the TES a "standard" measure in the field (cf. Henson, Kogan, & Vacha-Haase, in press).

The TES consists of 16 items in 6-point Likert format anchored from strongly disagree (1) to strongly agree (6). In addition to these items, two items from Rand Corporation studies of teacher efficacy were added to the TES – one item for each subscale (cf. Berman et al., 1976). Six of the GTE items and the one Rand item that corresponded to the GTE subscale were reverse scored so that high scores were indicative of high efficacy. High PTE scores also indicated strong efficacious beliefs. Separate GTE and PTE scores were obtained by averaging participants' responses to items in the respective scales.

School Participant Empowerment Scale. The School Participant Empowerment Scale (SPES; Short & Rinehart, 1992a) was employed to assess teacher empowerment (EMP). The SPES is a 38 item instrument in 5-point Likert format anchored from strongly disagree (1) to strongly agree (5). The instrument consists of six subscales: Decision Making, Professional Growth, Status, Self-Efficacy, Autonomy, and Impact. All items are written from a self-referent perspective concerning the teacher's perceived role in certain functions of the classroom and/or school (e.g., Autonomy: "I am able to teach as I choose."). While the SPES contains a Self-Efficacy subscale, this subscale does not correspond to the GTE and PTE constructs noted above and, instead, measures an affective response to one's teaching (e.g., "I feel that I am involved in an important program for children"). Scores were averaged across all subscales to yield one composite empowerment score for participants with high scores indicating high empowerment.

School-Level Environment Questionnaire. The School-Level Environment Questionnaire (SLEQ; Rentoul & Fraser, 1983) was used as a measure of teacher perceptions of school climate. The SLEQ contains 56 items in 5-point Likert format anchored at strongly disagree (1) and strongly agree (5). All eight subscales (Student Support, Affiliation, Professional Interest, Staff Freedom, Participatory Decision Making, Innovation, Resource Adequacy, and Work Pressure) were averaged to yield a composite school climate score.

Project implementation. An internal rating was conducted to determine to what degree the teachers implemented the teacher research project. Prior to making ratings, the mentor teachers (described below) and this researcher jointly developed context specific criteria by which to judge the implementation of participants (e.g., "The teacher collected data in his/her classroom."). This qualitative approach to criteria development was used to strengthen the internal validity of rating scores. Ten items were created and each teacher was rated on a 5-point

Likert scale anchored at strongly disagree (1) and strongly agree (5). A final implementation score was obtained by averaging scores of all three raters.

Level of collaboration. Collaboration was measured by a single item that read: "(Teacher's name) works with other teachers to address instructional and behavioral challenges." The item was used in conjunction with a 7-point Likert scale anchored at strongly disagree (1) and strongly agree (7). A teacher's level of collaboration was examined from multiple perspectives to support rating validity. Teachers rated themselves and all participating teachers independently rated each participating teacher. In addition, each teacher was rated by the head principal and her or his departmental principal. All responses were then averaged to yield a composite collaboration score from three perspectives: self, peer, and administrator.

Interviews and field notes. Each teacher was formally interviewed at the beginning and end of the project. The interviews served as qualitative means of assessing teacher efficacy, empowerment, collaboration, and other relevant variables. The interviews were guided by eight pre-established questions concerning these variables (e.g., "What are your primary sources of motivation?") but were allowed to vary considerably in order to allow for a rich description of the teacher's perspectives. The school principal, the two assistant principals, and two mentor teacher researchers were also interviewed. Interviews lasted for approximately 30 minutes and were audiotaped. Typed transcripts were developed for analysis.

Process observations and field notes were made concerning the teachers' evolution through the project, the group dynamics that formed and impacted the teachers' work, the effects of innovation on current practice, and other relevant points of data. In general, field notes were made during or directly after time of observation. When dynamics of the group or logistic

problems prohibited immediate documentation, appropriate notes were made at the first opportunity. Field notes were also submitted to qualitative analysis.

Item analysis. Because factor analysis was prohibited by the sample size, the TES, SPES, and SLEQ were submitted to item analysis to examine score reliability. Given the pre and posttest nature of the study, all item decisions were made while examining both pre and posttest results to ensure reasonable score reliability at both times of measurement (cf. Thompson & Daniel, 1996). Item retention and deletion decisions were made at the level of use of the scale or instrument and were guided by two criteria. First, items with negative discrimination coefficients on either the pre or posttest were deleted from further analysis. Second, items with excessively low discrimination coefficients (less than .15) on both the pre and posttest were deleted. These decision rules were used as an iterative process with new item statistics calculated after each round of deletions. Coefficient alpha was computed after neither rule applied.

The TES retained all items and yielded reliable scores on both the GTE and PTE subscales (.83 and .89 for pretest, respectively; and .85 and .89 for posttest, respectively). The teacher empowerment measure (SPES) retained 29 of 38 original items at the composite level and the scores maintained adequate internal consistency (.90 pretest, .95 posttest). The school climate measure (SLEQ) was more problematic with only 28 of 56 original items retained at the composite level. Retained items, however, yielded strong score reliability (.94 for both pre and posttest). Collaboration and project implementation ratings also yielded reliable scores. Table 1 reports descriptive statistics and Cronbach's alpha for all scales at the level of use.

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Procedures

The Participatory Research and Development (PR&D) model of teacher research (Knight et al., 1998) was implemented in September of the school year and concluded in May. The PR&D model represents a practical action research agenda (cf. Carr & Kemmis, 1986) and consists of six formal study team meetings (lasting two to three hours each) and small group meetings as needed. Following the model, teachers first brainstorm to identify instructional challenges that are relevant to them in the instruction and/or behavioral management of their students. Teachers then devise data-based methods with which to corroborate or refute their perception of these challenges. Following group discussion of the verified challenges and a brief review of the applicable literature, the teachers develop intervention studies in an attempt to remedy or positively impact student achievement, behavior, or other elements of the classroom that they have identified.

In the present study, these studies took the form of teacher research, and as such, a) addressed the research question of interest, b) specified the research design, c) developed the intervention for the identified challenge, d) determined outcome measures, e) delineated the data collection procedures, and f) suggested the methods (qualitative and/or quantitative) of analyzing the data obtained (Knight et al., 1998). After implementation of the studies, the teachers met and evaluated the effectiveness of their interventions. This included a review of the research procedures and an interpretation of the data obtained.

Because the current setting was an alternative school, the teachers were highly focused on behavioral management issues. Accordingly, the teachers in the present study tended to develop

interventions aimed at reducing disruption or facilitating on-task behavior. For example, one team developed a token economy to reduce negative student-teacher interactions and another developed a means for students to self-monitor their aggressive comments. Other interventions were more cognitively based, including the development of a peer tutoring system and use of verbal expression to facilitate reading comprehension. All but one of the interventions noted positive effects upon final data collection. The teacher-determined study team agendas were clearly influenced by the teachers' perceptions of the students as an extreme population.

Group work and meetings were facilitated by two mentor teacher researchers from a nearby high school with the intent of allowing the teachers themselves to eventually take the lead in group facilitation. The mentor teachers were recruited based on their teacher research experience in a PR&D project at their high school. In addition to the six formal meetings, the teachers also met frequently in small groups throughout the year as they worked together to design, implement, and evaluate their interventions. The program was designed to allow for collaboration among participating teachers around instructionally relevant issues.

All instruments, with the exception of project implementation, were given at the beginning and end of the project. Teacher research implementation ratings occurred only at the conclusion of the teacher research process. Participants were given the surveys in envelopes marked only with an assigned identification number. All surveys were completed and returned within a week at both pre and posttest. Interviews of participating teachers and administrators were also conducted at the beginning and end of the project.

Data Analysis

Data were examined for convergence on the three primary data sources noted above: quantitative indices, qualitative interviews, and process observations and field notes. As noted, all surveys were submitted to item analysis and examined for score reliability. Repeated measures analyses were used to examine change in general and personal teaching efficacy, empowerment, collaboration, and perceptions of school climate from pre to posttest. Gain scores for these variables were predicted by level of implementation to determine effects attributable to implementation of the teacher research projects. Regression analyses were also used to examine the relationships between the variables according to the social cognitive model, using teacher empowerment, collaboration, and perceptions of school climate as predictors of general and personal teaching efficacy. These analyses occurred on two levels. First, predictor gain scores were used to predict gain in efficacy from pre to posttest. Second, predictor pre and posttest measures were used separately to examine potential relationships with the efficacy gains. The second analyses were necessary to address the question of whether efficacy gains were similarly predictable by independent variable scores at pre and posttest.

Qualitative data (i.e., interviews and field notes) were submitted to a constant comparative analysis. Thematic trends were allowed to emerge into meaningful categories (Lincoln & Guba, 1985). The data were grouped according to the categories and interpreted in light of the study's overall focus on teacher research and efficacy to provide a rich description of the experiences of participating teachers. Prolonged engagement allowed for the establishment of credibility with participants and maintenance of continuous field note data. Triangulation of data was sought through field note observations, individual interviews, and quantitative

instrumentation. Qualitative data and interpretations underwent peer debriefing with an expert in qualitative research to facilitate internal validity (Erlandson, Harris, Skipper, & Allen, 1993).

Results

The first research question concerned change in teachers' general teaching efficacy, personal teaching efficacy, empowerment, collaboration, and perceptions of school climate across time of the teacher research project. Table 1 reports gain score descriptive statistics determined by subtracting the teachers' posttest from pretest scores. Both general and personal teaching efficacy showed large average gains across time. Both empowerment and school climate showed little improvement and collaboration exhibited a moderate gain. Repeated measures analyses supported the descriptive gains. The occasion source of variance for general teaching efficacy yielded a 28.79% eta^2 effect and was statistically significant, $F(1, 10) = 35.03$, $p < .001$. As expected, the personal teaching efficacy occasion variance also yielded a large effect ($eta^2 = 56.69\%$) and was statistically significant, $F(1, 10) = 302.47$, $p < .001$. Neither empowerment nor school climate scores changed by time of measurement over variance attributable to subjects. Descriptive statistics suggested a moderate gain for collaboration scores. Repeated measures analysis of collaboration scores indicated a minimal but statistically significant effect ($eta^2 = 3.76\%$) for the occasion source of variance, $F(1, 10) = 29.22$, $p < .001$.

Qualitative interview data supported these findings in terms of self-efficacy gains. During pretest interviews, many teachers indicated a desire to increase their effectiveness, with several stating that they had some trouble with the extreme population of students they taught. One teacher, for example, stated that ". . . we need all the help we can get. There is always something we can use to our benefit, especially with the problems we face." During posttest interviews, 8 of 11 teachers indicated increased efficaciousness resulting from the project. One

teacher stated that she was "happy to report that Greg is making the most constant progress he's had the whole year. He needed that. He feels better about himself and I feel better about my being able to help him." Teachers varied, however, in the degree they felt their skills improved. Generally, more experienced teachers expressed less impact than newer teachers.

All teachers reported increased levels of collaboration with others, even outside the teacher research study team meetings. Importantly, though, 8 of 11 teachers indicated during pretest interviews that teacher collaboration already occurred with some frequency at the school. However, it was clear that much of this initial collaboration focused on topics other than instructional challenges and was not as widespread as teachers would have liked. The following statements illustrate this perspective: "We do [collaborate], but not as much as we should. We have regular meetings monthly where we go over kids and stuff like that. Mostly, though, we are here for emotional support." "Certain teachers [collaborate] with each other. I wouldn't say the whole group."

Posttest interview data suggested that all teachers felt their collaboration during the teacher research project was more serious in nature. One teacher summed up her collaborative benefit nicely: "One of the things I came away with, and I think others did as well, is that your growth comes from understanding the real problems you are dealing with. This approach helps us, me at least, to understand some things about my kids that I really did not know before." Interestingly, those teachers that indicated that they already participated in collaboration during pretest interviews generally reported greater impact on their belief that they can successfully educate children (efficacy).

Although quantitative indices did not indicate gains in empowerment, 5 of 11 teachers suggested empowerment as a project benefit. For these teachers, empowerment consisted largely

of gaining new information that allowed them to try new things in the classroom. This definition differs slightly from the operationalization of empowerment with the SPES, which measures issues related to teacher autonomy and decision making. Gains reported in interviews seem to tap a different perspective on empowerment than that measured by the SPES.

At the conclusion of the project, teachers were asked about the advantages and disadvantages of the experience. Their collective responses supported an overall positive appraisal of teacher research and specific support for its impact on empowerment, collaboration, and skill development (which is closely related to self-efficacy). Primary disadvantages centered on the time commitment necessary and tailoring the project to fit the specific needs of the teachers in a special education setting.

The second research question asked whether gains in the variables were attributable to level of implementation of the teacher research projects. Gain scores were calculated for all pre and posttest measures (see Table 1). Prior to analysis, two concerns were addressed that are relevant when using gain scores. First, distributional statistics were examined to determine whether pre and posttest distributions were reasonably comparable. In general, distributions became more normal (as regards kurtosis) and less skewed from pre to posttest. However, given the current sample ($\underline{n}$ = 11), a small gain by only a person or two may have accounted for the varying distributional statistics. As such, the risk of meaningfully biasing the data by using gain scores was within reasonable limits. Second, the potential amplification of measurement error was attenuated by the previously noted item analysis procedures. Score reliabilities were maximized and of sufficient magnitude to justify use of gain scores (α = .83 to .97).

To evaluate the second research question, general and personal teaching efficacy, empowerment, collaboration, and school climate scores were individually regressed on teachers'

implementation scores. Results indicated that implementation was not predictive of any variable and statistical significance was not obtained for any analysis. All adjusted $\underline{R}^2$ values were negative. These findings indicated that the effects observed for the first research question are not predictable by level of implementation. Since all persons reasonably implemented their teacher research projects (M = 3.39, SD = .73; 5-point scale), the findings suggest that implementation was important but that there was no relationship between degree of implementation and gains in any of the variables.

Qualitative observations also indicated that all teachers reasonably implemented their research studies. All teachers collected data on a potential instructional challenge, developed an intervention, and then collected data to evaluate the effectiveness of their studies. These data were presented and interpreted during the final study team meeting.

The third research question examined social cognitive theory as an explanatory model with empowerment (cognitive element), collaboration (behavioral element), and school climate (environmental element) as possible predictors of teacher efficacy. Two levels of analyses were conducted. First, gain scores for these three variables were used to predict gains in general and personal teaching efficacy. Table 2 presents results from these analyses. Second, pre and posttest empowerment, collaboration, and school climate scores were used as separate predictors of efficacy gains. Table 3 reports these results. The second level analyses were conducted to examine potential relationships not captured in the gain score analyses.

INSERT TABLES 2-3 ABOUT HERE

Empowerment gains were not predictive of efficacy gains; nor were pretest and posttest empowerment scores related to efficacy gain. As noted in Table 1, there was little, if any, gain in

empowerment scores from pre to posttest so little variance existed to predict efficacy, despite qualitative reports of empowerment gain from about half of the teachers. Quantitative empowerment gains were not observed largely due to the teachers' relatively high empowerment levels at the beginning of the project (see Table 1). A ceiling effect apparently attenuated the gain scores. Interview and field note data indicated clearly that the majority of teachers already possessed considerable autonomy and decision-making control in their classrooms (i.e., empowerment as operationalized by the SPES). Nine of 11 teachers reported considerable freedom to structure their classrooms as they saw fit. Such freedoms were driven by the student population served, which was perceived as requiring highly individualized instruction and great flexibility to manage behavior.

Among predictor variables, only gains in collaboration were associated with gains in efficacy (see Table 2). Specifically, collaboration was related to general teaching efficacy but not personal teaching efficacy. While statistical significance was not obtained ($\underline{F}(1,9) = 3.26$, $p > .05$), the analysis was under powered (by four persons) due to the small sample size. However, the magnitude of effect (Adj. $\underline{R}^2 = 18.44\%$) was meaningful even after shrinkage when correcting for sample size, model specification error, and the theoretical population effect. The finding indicated that as teachers collaborated more, they reported greater confidence in other teachers' ability to overcome negative barriers and positively impact learning (general teaching efficacy). While the teachers showed the greatest change from pre to posttest in their personal teaching efficacy scores, none of the predictor variable gains were related to personal efficacy gains.

Additionally, both pre and posttest collaboration scores were predictive of general teaching efficacy gains (see Table 3). The pretest effect was meaningful and statistically

significant. The posttest effect was also meaningful although statistical significance was not obtained (under powered by three persons at .05 level). Interestingly, though, both collaboration effects for the general teaching efficacy criterion were negative as reflected by the beta weights. Those rated with the lowest levels of collaboration showed the greatest gains in general efficacy at both occasions. However, collaboration gain scores were positively related to general teaching efficacy gains as noted in Table 2 (beta = .52). Jointly these findings suggest that those persons rated lowest in collaboration had the most room for improvement in collaboration and showed higher gains, accordingly, that were positively related to their general efficacy gains. However, in reference to the sample as a whole, these teachers were still ranked lowest at the beginning and end of the study, thereby retaining their relative position in the score distribution. It appears, therefore, that those low collaborators were better served by the teacher research project (at least in reference to collaboration gains) but not to the point of overtaking those that were already active collaborators.

Qualitative data also indicated a link between collaboration and efficacy. Teachers spoke of these two issues together, indicating that collaboration is important for fostering instructional effectiveness. Better methods led to increased perceptions of the teachers' ability to be successful with students (i.e., efficacy). Unlike the quantitative indices, qualitative data did not reveal a pattern regarding high and low collaborators. What was clear, however, is that all teachers reported benefit from collaboration and most (7 of 11) viewed collaboration as a means of positively impacting student learning and behavior.

School climate gains were not related to efficacy gain (Table 2). In addition, neither pre nor posttest school climate scores were related to general teaching efficacy gains (see Table 3). Pretest school climate scores, though, did positively predict the personal teaching efficacy

criterion. A substantial effect was observed (Adj. R^2 = 29.37%) despite the lack of statistical significance (under powered by one person at .05 level). This relationship, however, dissipated when using posttest school climate scores, suggesting that perceptions of school climate leveled somewhat during the teacher research project. Gains in school climate were varied across participants and apparently did not occur in linearly predictable form across time. This is evidenced as well by the moderate correlation between pre and posttest school climate scores (r = .54). By contrast, scores for the other constructs maintained higher test-retest reliability (GTE, r = .770; PTE, r = .934; empowerment, r = .785; collaboration, r = .975). The low test-retest reliability for school climate scores was further investigated in the qualitative analyses.

Qualitative data indicated that the participating teachers had conflicted attitudes toward the school and its administration. Eight of 11 teachers indicated either conflicted feelings or utter dislike for how the school was being administered during pretest and posttest interviews. While many persons indicated concern about the school's leadership during pre interviews, most were adamant in their opinion at the end of the school year. This finding helps explain the lack of prediction of personal teaching efficacy gains by posttest school climate scores. Several contextual issues contributed to these dynamics. First, the head principal was new to the school and followed a well-liked, long-term principal. Second, the head principal announced plans to resign during the middle of the present project. These issues also help to explain why the SLEQ yielded many internally inconsistent scores (28 of 56 items were deleted). The teachers were inconsistent in their own responses to the SLEQ, suggesting internal conflict about how a given teacher perceived the school climate.

In addition to positive effects on teaming and collaboration and teacher efficacy, qualitative analysis also suggested positive impact of the teacher research project on teacher

motivation and professional development. Motivation for the teachers was largely defined as a desire to help children learn and become productive citizens. This desire was coupled with the challenge of achieving success with the present student population. In other words, the teachers perceived the successes of their students as potential reinforcers for their own motivation. Most teachers reported that small successes were important to them, but that these successes were few and far between. Apparently, having become accustomed to limited success, the effectiveness of their data-based research projects was a meaningful experience and positively impacted reported motivation and self-efficacy. Regarding sources of efficacy-building information, Bandura (1997) has argued that mastery experiences such as these potentially have the greatest impact on building self-efficacy. This context may also help explain the rather dramatic impact on general and personal teaching efficacy scores as reflected in the repeated measures analyses.

Teachers also came to view teacher research as a preferred means of professional development over more traditional inservices. Importantly, despite the fact that the teachers ended up spending more time in professional development activities, all of the teachers noted that it was worth the effort. Furthermore, 10 of 11 teachers expressed a desire to continue the project into the next academic year. One teacher characterized the teacher research project as "how professional development is supposed to work." Another teacher stated that the "administration should look at doing more of this kind of thing for teachers. I bet they would get higher [student] test scores!"

Discussion

The observed change in teacher efficacy during the teacher research project is compelling given the nature of the construct. Bandura (1997) cautioned that positive changes in self-efficacy only come through "compelling feedback that forcefully disrupts the preexisting

disbelief in one's capabilities" (p. 82). Although there is consistent evidence that efficacy is most malleable in the preservice years (cf. Housego, 1990; Hoy & Woolfolk, 1990), efficacy tends to be resistant to change for experienced teachers such as those in the present study (cf. Anderson, Greene, Loewen, 1988; Ohmart, 1992; Tschannen-Moran et al., 1998). Ross (1994), for example, found that general teaching efficacy increased after an eight month training on cooperative learning. Personal teaching efficacy, however, was stable across time. Personal teaching efficacy appears to be particularly difficult to impact in experienced teachers since it is an internally held belief about oneself that solidifies with experience and time. As such, positively impacting teachers' efficacy beliefs is unlikely outside of longer-term professional development that compels teachers to think critically about their classrooms and behave actively in instructional improvement. The teacher research model used in the present study occurred over one academic year and capitalized on critical thought and data-based action; social cognitive theory upholds such human agency as foundational to self-efficacy growth (Bandura, 1997).

There are at least two explanations for the efficacy gains. First, teacher research may be a particularly powerful method of professional development that can impact teacher efficacy. One purpose of the present study was to examine this possibility. The PR&D model of teacher research used here emphasized the implementation of teacher-driven interventions toward instructional and/or classroom management effectiveness. This form of professional development gives teachers opportunity to exercise human agency, which impacts efficacy judgments, rather than expecting implementation of interventions that are received in more sterile environments (e.g., workshops, lectures). What makes the PR&D model unique from many other less active professional development initiatives is its focus on collaborative

intervention development and empirical verification of intervention effectiveness. Targeted collaboration can be intrinsically reinforcing for teachers and can build commitment to teaching (Firestone & Pennell, 1993). Empirical verification of intervention effectiveness provides explicit feedback regarding mastery experiences, arguably the most powerful form of efficacy building information (Bandura, 1997; Tschannen-Moran et al., 1998). When these methods are used in a context allowing for the exercise of human agency toward self-determined goals, an environment is created that can be very fertile for efficacy growth, based on both social cognitive theory and the findings of the present study.

A second explanation for the observed efficacy gains suggests that the alternative school setting may have provided extraordinary opportunity for the teachers to perceive success in their teacher research projects. In a climate of few successes (as evidenced by the teachers' interviews and their perceptions of motivation), the process of developing an intervention that works may have been particularly salient for the participating teachers. In reality, some combination of these explanations is most likely. While the teachers were probably positioned for efficacy growth, the teacher research project facilitated it. Of course, it cannot be concluded from the present study whether the observed efficacy gains will be maintained or decline with time. A follow-up assessment would be important to evaluate this possibility.

The present study's findings must ultimately be held tentatively, however. No randomized control group was used nor was a comparison group administered the surveys or interviewed. Accordingly, the present study does not account for variables that may have influenced the results beyond participation in teacher research. Unfortunately, the practical logistics of this type of research (i.e., long-term, considerable time commitment for teachers, small sample size) hamper experimental or more quasi-experimental designs. Despite this threat

to design integrity, the gains noted in general and personal teaching efficacy are of such magnitude that it is likely the teacher research project contributed to them, at least in part.

The results also suggested that the observed gains (in efficacy and in collaboration) were not due to varying levels of project implementation. Implementation ratings were not related to gains in any of the variables. Given that all teachers implemented, this finding provides additional support for the ability of teacher research to actively engage participants.

Collaboration was consistently related to general teaching efficacy improvement but not to personal teaching efficacy. While collaboration was also expected to predict personal teaching efficacy, the finding is consistent with the general teaching efficacy construct and parallels results of another eight month study of teacher collaboration and efficacy (Ross, 1994). By definition, general efficacy is "other" oriented and concerns a teacher's belief in teachers' ability (in general) to overcome negative barriers to affect student learning. The collaborative nature of teacher research may have provided otherwise unknown feedback concerning the effectiveness (or lack thereof) of other teachers. Teaching is largely a solitary occupation, at least in regards to teachers' access to see other teachers in action (Rosenholtz, 1989). The present results also suggested that those rated lowest in collaboration gained the most during the project. This finding is encouraging, since it is often those teachers who do not collaborate with others that appear to have the greatest need for professional development. The present teacher research project was able to engage low collaborators, resulting in moderate increases in collaboration scores and corresponding gains in general efficacy.

Quantitative measures of empowerment and teacher perceptions of school climate were not consistently related to efficacy. However, a ceiling effect appeared to limit empowerment variance and potential score increases. Qualitative data indicated that teachers felt empowered

(in terms of autonomy and decision-making) at the start of the project. However, five teachers specifically noted empowerment (in terms of gaining new information for use in the classroom) as a project benefit in interviews. Perceptions of school climate also had measurement difficulties, as evidenced by an unusual number of inconsistent responses to the instrument. Again, contextual variables may have influenced teachers' conflicted attitudes toward the school and administration. Given these measurement problems, it is premature at this point to assume no relationship between efficacy and teacher empowerment and perceptions of school climate.

Social cognitive theory appeared to be a relevant framework to examine the relationships between the above variables. Bandura (1997) argued that self-efficacy is the primary means of behavioral change and self-regulation and is activated by human agency. Teacher research explicitly fosters human agency and choice while examining multiple sources of information. Teacher research's impact in this regard is evidenced by the large gains in both general and personal teaching efficacy in the present study. The use of teachers' sense of empowerment, collaboration, and perceptions of school climate as elements of the triadic reciprocal causation model and as predictors of efficacy growth was only partially supported by the present findings. Although collaboration was related to efficacy as expected, empowerment and school climate perceptions were hindered by the measurement problems as noted. Qualitative data, however, were critical in informing the meaning of the obtained scores for these measures as well as providing explanation of contextual reasons for the difficulties.

While the present findings supported a positive relationship between teacher researcher and efficacy growth for inservice teachers, a possible extension of the study could examine the potential implications of teacher research models on preservice teacher education. As noted above, efficacy may be more easily influenced during the formative years of preservice teacher

education (cf. Housego, 1990; Hoy & Woolfolk, 1990). Teacher education programs provide opportunities for mastery experiences, experiential learning, and social feedback (Bandura, 1997; Henson, Stephens, & Grant, 1999). However, for efficacy to be impacted, such experiences must actively engage students around personally relevant challenges and skills. Teacher research may provide a vehicle to do just that.

On a positive note, a recent survey of American Association of Colleges for Teacher Education (AACTE) member institutions suggested that many schools, colleges, and departments of education do indeed engage in collaborative action research with local schools (Henderson, Hunt, & Wester, 1999). However, the study is not clear regarding the degree to which such activities are used in the actual teacher education programs and whether preservice teachers themselves are involved in teacher research. In a recent review of the teacher research movement, Cochran-Smith and Lytle (1999) argued that "part of what makes the current wave of interest in teacher research a movement and not just the latest educational fad is that teacher research stems from several different, but in some ways compatible, intellectual traditions and educational projects" (p. 15). One of these trends is the presence of teacher research in teacher education programs. Indeed, they noted, "Teacher research has become prominent in teacher education, professional development, and school reform. . ." (p. 17). Future investigations should examine the extent of the movement's current influence in teacher education and exactly how teacher research can be integrated into teacher education curriculum.

Beyond implications for teacher education, future research in teacher research should strive toward more quasi-experimental designs to more conclusively determine teacher research's effects. In lieu of experimental control, however, there is no substitute for replication, perhaps in varied settings and at different instructional levels (e.g., elementary). Examinations

of other motivation related constructs, such as locus of control and self-concept, would broaden our understanding of teacher research effects on motivation.

Furthermore, any observed effects from teacher research, including efficacy gains, certainly are the result of how teachers have first cognitively processed their experiences and social world. As Tschannen-Moran et al. (1998) noted, "Cognitive processing determines how the sources of [efficacy building] information will be weighed and how they will influence the analysis of the teaching task and the assessment of personal teaching competence" (p. 230). Attribution theory (Weiner, 1979) may provide a useful framework to explain how teachers assign meaning to their experiences during a teacher research process.

The value of mixed methods in the present study should not be underestimated. Both quantitative and qualitative results contributed to overall findings that would not have been known otherwise (e.g., the high level of teachers' sense of empowerment before the study began and the subsequent impact on empowerment scores). As such, the present research contributed to both the content and methods of inquiry into teacher research. Future studies may also wish to invoke varied means of data collection and analysis. Multiple perspectives of a phenomenon can enhance our understanding it; mixed methods can be useful in viewing teacher research from varied points of view in the same study.

In sum, it appears that teacher research may be a powerful form of professional development that can impact teacher efficacy and collaboration. Teacher research's impact on teacher empowerment and perceptions of school climate is inconclusive based on the present results. Importantly, teacher research actively engages teachers in instructional improvement concerning issues relevant to the teachers. As such, teacher research fits well with current

movements in educational reform. It provides of model of teaching critical thinking and targeted action with both inservice and preservice teachers.

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Table 1

Descriptive Statistics and Score Reliabilities (Coefficient alpha) for Pre and Posttest Measures and Gain Scores

	Pretest			Posttest			Gain	
Scale	M	SD	α	M	SD	α	M	SD
GTE	3.71	.68	.83	5.06	.55	.85	1.18	.66
PTE	2.77	.95	.89	3.96	1.00	.89	1.36	.26
EMP	3.85	.39	.90	3.98	.46	.95	.12	.29
CLIM	3.64	.57	.94	3.76	.48	.94	.12	.51
COLL	4.36	1.15	.97	4.78	1.09	.97	.42	.26
IMP	--	--	--	3.39	.73	.95	--	--

Note. GTE = general teaching efficacy, 6-point scale; PTE = personal teaching efficacy, 6-point scale; EMP = teacher empowerment, 5-point scale; CLIM = teacher perceptions of school climate, 5-point scale; COLL = teacher collaboration, 7-point scale; IMP = level of project implementation, 5-point scale.

Table 2

Regression Results Predicting GTE and PTE Gains with EMP, COLL, and CLIM Gains

Predictor	F	beta	R^2 (%)	Adj. R^2 (%)
		General Teaching Efficacy		
EMP	.16	.13	1.74	-9.18
COLL	3.26	.52	26.59	18.44
CLIM	.04	-.06	.40	-10.66
		Personal Teaching Efficacy		
EMP	.45	-.23	4.82	-5.77
COLL	.88	.23	8.94	-1.18
CLIM	1.28	-.35	12.43	2.70

Note. EMP = teacher empowerment gain scores, COLL = teacher collaboration gain scores, CLIM = teacher perceptions of school climate gain scores.

Table 3

Regression Results Predicting GTE and PTE Gains with EMP, COLL, and CLIM Pre and Posttest Scores

Predictor		F	beta	R^2 (%)	Adj. R^2 (%)
			General Teaching Efficacy		
EMP	Pre	.63	-.26	6.25	-3.86
	Post	.16	-.13	1.76	-9.15
COLL	Pre	5.67*	-.62	38.65	31.83
	Post	3.65	-.54	28.88	20.97
CLIM	Pre	.28	-.17	3.01	-7.77
	Post	.72	-.27	7.39	-2.91
			Personal Teaching Efficacy		
EMP	Pre	.99	.31	9.89	-.12
	Post	.15	.13	1.64	-9.29
COLL	Pre	.61	-.25	6.38	-4.02
	Post	.36	-.20	3.89	-6.79
CLIM	Pre	5.16	.60	36.44	29.37
	Post	1.15	.34	11.36	1.52

* $p < .05$

Note. EMP = teacher empowerment; COLL = teacher collaboration; CLIM = teacher perceptions of school climate.

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