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Abstract

The purpose of this study was to evaluate the changes in the teacher efficacy levels of teachers exposed to an instructional model referred to as FOCUS. The analysis revealed that a majority of the participants had pre-treatment efficacy scores that corresponded to higher post-treatment efficacy scores, on at least one of the two efficacy scales, for the participants who were exposed to the FOCUS model. These finds, although they should only be considered preliminary due to the nature of the research design employed in this study, do suggest the need for further study of the FOCUS model's impact on teacher efficacy.

Introduction

In some of the earliest work on teacher efficacy, the Rand Corporation researchers defined teacher efficacy as "the extent to which the teacher believes he or she has the capacity to affect student performance" (McLaughlin & March, 1978, p. 84). Considerable researcher effort has been given to the appropriate conceptualization and measurement of this teacher efficacy construct. As noted by Ross (1994) "the majority of teacher efficacy researchers derive their conceptions from Bandura's (1977) theory of self-efficacy (p. 3). Bandura suggests that self-efficacy consists of two components: Outcome expectations and efficacy expectations. The outcome expectations are an individual's belief that certain behaviors will produce particular outcomes. On the other hand, the efficacy expectations are an individual's belief about his or her own ability to bring about an expected outcome.

Ashton and Webb (1982, 1986) extended Bandura's theoretical framework of self-efficacy to teachers. They suggested that one of the two components of a teacher's sense of efficacy is a belief that certain actions undertaken by teachers in general will lead to student learning. This type of efficacy, which Ashton and Webb (1982) and Webb (1982) referred to as teaching efficacy, is close to Bandura's outcome expectations. The second dimension of a teacher's sense of efficacy, as discussed by Ashton and Webb (1982), is a teacher's belief that he or she will be able to bring about student learning. This dimension, which Ashton and Webb labeled personal teaching efficacy, relates to Bandura's efficacy expectations.

Gibson and Dembo (1984) developed an instrument that would measure the two dimensions of a teacher's sense of efficacy that were discussed by Ashton and Webb (1982). Their work resulted in an instrument that contained 16 statements. The instrument could be self administered with the respondents reacting to each statement by using a 6-point Likert scale. Gibson and Dembo stated that one set of nine statements that reflect the teacher's sense of personal responsibility in student learning corresponds to Bandura's efficacy expectations. The other seven statements measure a teacher's view concerning the limitations that teachers in general encounter in their abilities to influence the education levels of students because of external factors. These seven statements corresponded to Bandura's outcome expectations.

A number of other instruments have been designed by researchers to measure a teacher's sense of efficacy (Armor, Conry-Oseguera, Cox, King, McDonnell, Pascal, Pauly, & Zellman, 1976; Berman, McLaughlin, Bass, Pauly, & Zellman, 1977; Rose & Medway, 1981; Guskey, 1988; Riggs & Enochs, 1990; Vitali, 1993). As noted by Benz, Bradley, Alderman, & Flowers (1992), the use of these various instruments has created a problem in interpreting the results of teacher-efficacy studies, at least insofar as drawing study-to-study conclusions.

In spite of this measurement problem, considerable and consistent evidence exists that teacher efficacy influences teacher and student outcomes (Ross, 1994). A number of studies have found relationships between efficacy levels of teachers and dimensions of current conceptions of good teaching practices. Riggs and Enochs (1990) and Guskey (1987) found that teachers with high levels of efficacy were more inclined to use activity-based methods and mastery learning, respectively. Guskey (1988) reported that teachers with higher levels of efficacy expressed more positive attitudes towards curriculum implementation. A study by Schriver (1993) indicated that teachers with higher efficacy levels were more knowledgeable of developmentally appropriate curricula. A study by Korevaar (1990) found that teachers with high personal teaching efficacy scores were more likely to confront student management problems.

Other studies have reported positive relationships between teacher efficacy levels and student cognitive achievement and affective growth. Armor et al. (1976) reported that teachers' sense of efficacy was strongly and statistically significantly related to students' increases in reading achievement. Ashton and Webb (1986) reported that teaching efficacy and personal efficacy were significantly related to student mathematics and language achievement, respectively. Moore and Esselman (1992) and Ross and Cousins (1993) also found significant positive relationships between teacher efficacy and student achievement in mathematics.

A number of studies have reported significant positive relationships between a teacher's sense of efficacy and the students' affective development. Ashton and Webb (1986) and Roeser, Arbreton and Anderman (1993) found that teacher efficacy was positively related to student motivation. Miskel, McDonald and Bloom (1983) found a positive link between teacher efficacy and the students' increased self-esteem was discussed in a study conducted by Borton (1991).

Since relationships have been reported between the levels of efficacy expressed by teachers and their performances as educators and the academic performances of their students, an important issue to investigate is whether teachers' efficacy levels can be changed through educational programs. As noted by Ross (1994) in his review of 88 studies conducted on efficacy of teachers, "the results of attempts to change teacher efficacy have been mixed" (p. 17). Ross suggests that, as proposed by Vosniadou and Brewer (1987), in order to change efficacy levels of teachers, a radical restructuring in conceptions about students, teachers and learning may be required.

We also believe that these mixed results could be, at least in part, due to the lack of testing for the existence of an interaction effect between the participants' pre-treatment efficacy levels and the methods of instruction to which the participants were exposed. That is, the ability of a method of instruction to change a participant's efficacy level may be affected by that participant's pre-exposure efficacy level. Without the use of appropriate analytical techniques to investigate this interaction effect, the ability of the method to change the efficacy levels of participants may not be revealed through the data analysis.

The purpose of this field study was to determine whether the personal and teaching efficacy data of the participants exposed to the instructional model called FOCUS, which was developed by Russell (1992, 1994), indicate that the model may have an effect on the efficacy levels of participants. In addition, the analyses conducted in this study placed special emphasis on the interaction effects between the methods of instruction and the participants' two types of pre-treatment efficacy scores.

Research Method

A nonequivalent control group quasi-experimental design, as discussed by Campbell and Stanley (1963), was employed to assess the ability of the FOCUS model to impact the efficacy levels of participants. The paradigm for this design is as follows:

$$\begin{array}{c} O_{1,2} \;\; X_F \;\; O_{3,4} \\ \text{-----------------} \\ O_{1,2} \;\; X_C \;\; O_{3,4} \end{array}$$

where:

1. $O_{1,2}$ represents the pre-treatment personal efficacy and teaching efficacy measurements.
2. X_F represents the participants exposed to the FOCUS method of instruction.
3. X_C represents the participants not exposed to the FOCUS model, which constituted the Control Group.
4. $O_{3,4}$ represents the post-treatment personal efficacy and teaching efficacy measurements.

The 68 study participants, who were part of either the Control Group or the FOCUS Group, were teachers who were enrolled in graduate level classes offered by the Education Department of Ashland University during a summer term. Ashland University is located in north-central Ohio, which contains rural, suburban, and urban school systems. Twenty-nine of the 68 participants were not exposed to the FOCUS model during or prior to the summer term in which the study was conducted. These 29 participants, who taught in grade levels that ranged from kindergarten to the twelfth grade, served as the Control Group. The other 39 participants were exposed to the FOCUS model in a curriculum course during the same academic summer term. These 39 participants, who also taught in grade levels that ranged from kindergarten through the twelfth grade, constituted the treatment group. This treatment group was referred to as the FOCUS Group.

As noted by Campbell and Stanley (1963), "Design 10 [the nonequivalent control group design] should be recognized as well worth using in many instances in which Designs 4,5, and 6 [true experimental designs] are impossible" (p. 47). The manner in which the groups were formed and treated in this study, however, requires one to be aware of certain internal validity problems that may provide alternative explanations for any differences found between the post-treatment efficacy levels of the groups. These internal validity concerns include possible differences between the groups with respect to the following: (a) relevant characteristics of the participants including pre-treatment efficacy levels, age, years of experience, gender, and motivation, (b) the instructors to whom the groups were exposed during the summer term in which the study was conducted, and (c) the number and combination of graduate classes that the participants completed during the summer term.

With respect to relevant characteristics of the participants, various studies (Anderson, Greene and Loewen, 1988; Raudenbush, Rowan and Cheong, 1992; Beady and Hansell, 1981; and Chester, 1991) indicated that a participant's gender, number of years of experience, and age may effect participants' efficacy levels. A summary statistics of these

Table 1
Mean and Standard Deviation Values for Age, Yerars of Experience, Gender and Efficacy Scores

	Groups	
Variable	Control Group	FOCUS Group
Age[a]	35.4 (7.94)	42.3 (7.56)
Years of Experience[b]	10.5 (6.56)	14.2 (7.59)
Gender	.55[c]	.69[c]
Pretest Personal Efficacy Scores	39.31 (7.16)	38.9 (6.93)
Pretest Teaching[d] Efficacy Scores	23.24 (4.50)	24.71 (4.48)

[a]One educator in the FOCUS Group failed to indicate his or her age.

[b]Two educators in the Control Group failed to indicate their years of teaching experience.

[c]The gender value represents the proportion of female educators.

[d]The final scores for one teacher in the FOCUS Group were identified as outliers and, therefore, excluded from these figures.

variables for the participants in the Control and FOCUS Groups are contained in Table 1.

Although all of the participants in this study were teachers who were enrolled in graduate-level courses, the participants differed on various characteristics and experiences other than their exposure to or lack of exposure to the FOCUS model. Although the differences between the gender composition of the two groups and the mean pre-treatment personal and teaching efficacy scores were not statistically significant at the .05 level, the differences between the ages and years of experience of the participants in the two groups were statistically significant. The importance of these differences were somewhat ameliorated by the fact that subsequent regression analyses revealed that age, years of experience, and the two-way interaction effects between those variables and the group variable did not account for a statistically significant amount of unique variation in either of the post-treatment efficacy scores. These regression results, as well as the lack of statistically significant differences between the groups with respect to gender and the mean pre-treatment teaching and personal efficacy scores, increases the plausibility of the comparable-groups assumption. In spite of this fact, it is important to note that due to the lack of control over the other internal validity concerns, the findings presented in this study should be considered as preliminary.

The type of participant included in this study should be noted when evaluating its external validity. The 68 participants in this study were teachers who were enrolled as part-time students in graduate level classes offered by Ashland University, which is located in north-central Ohio. The grade levels taught by these participants ranged from kindergarten to twelfth grade.

Instruments

As previously mentioned, various instruments have been used to measure the level of a participant's sense of efficacy. In this study, the Teacher Efficacy Scale, which was devised by Gibson and Dembo (1984), was used. As indicated by the research paradigm, each educator who participated in this study completed the Teacher Efficacy Scale at the beginning and end of the summer academic term. This instrument required each participant to rate each of 16 statements on a 1 (strongly disagree) to 6 (strongly agree) scale. The ratings obtained from the first nine statements were summed to obtain a personal efficacy score for each participant. A high score on these nine statements was interpreted to mean that the participant had a high level of personal efficacy, and a low score would indicate that the participant had a low level of personal efficacy. The mean and standard deviation values for the pre-treatment personal efficacy scores for the participants in the Control and FOCUS groups are listed in Table 1.

The other seven statements were used to measure a participant's teaching efficacy score. The total score on these seven items for each participant was subtracted from 42. This procedure produced a teaching efficacy score that would be high for a participant who had a high level of teaching efficacy, and the score would be low for a participant who had a low level of teaching efficacy. The mean and standard deviation values for the pre-treatment teaching efficacy scores for the participants in the Control and FOCUS groups are also listed in Table 1.

Gibson and Dembo (1984) reported in their study that an analysis of internal consistency reliability values produced Cronbach's alpha coefficient values of .78 and .75 for the personal efficacy scores and teaching efficacy scores, respectively. An internal consistency analysis of the pre-treatment personal and teaching efficacy scores recorded for the participants in this study produced Cronbach alpha values of .88 and .56, respectively.

With respect to validity of the personal and teaching efficacy scales, Gibson and Dembo (1984) stated that a multitrait-multimethod analysis supported both convergent and discriminant validity of the instrument. Although an analysis of the efficacy instrument's validity was not conducted in this study, it should be noted that both the validity study conducted by Gibson and Dembo and this study involved teachers.

Control and FOCUS Groups

Teachers who were enrolled in graduate-level classes and who had never been exposed to classes that specifically employed the FOCUS model as the basis of instruction served as the Control Group. Teachers who were enrolled in two sections of a graduate-level curriculum course were exposed to the FOCUS model of instruction. This course was a survey course in curriculum development that encompassed the elementary, the middle, and the high school levels. These classes constituted the experimental group, which was identified as the FOCUS Group. The participants in the FOCUS Group were exposed to 36 hours of instruction during a summer term.

Participants in the FOCUS Group were exposed to a relaxed classroom environment where they were treated as valuable participants in the learning process. Each topic in the curriculum course was approached from a receiver-oriented perspective as suggested by Ausubel, Novak, and Hanesian (1978). Once the participants' levels of knowledge were determined, course topics were further explored by using activities and instructional strategies, which were designed to match the participants' various learning styles as described by Kolb (1984), McCarthy (1981), and Dunn, Dunn, and Price (1977). After a given topic was explored, the course facilitator demonstrated how the various instructional and/or classroom management practices could be used in the participants' classrooms. The participants were then asked to design their own plans from this information. In addition, they were also expected to write journal entries throughout the course. The facilitator collected the journals and gave feedback to the participants prior to the next session. This activity allowed the participants, as well as the course instructor, to track their progress throughout the course.

All of the activities experienced by the participants in the FOCUS Group were based on the systematic use of the FOCUS behavioral model (Russell, 1992, 1994). Thus, the participants were not only learning the model, they were also experiencing it. This exposure to the FOCUS model was designed to enhance each participant's sense of belonging and acceptance. Since the purpose of this article is to report on the analysis of the post-treatment efficacy scores of the participants rather than provide the readers of this article with a detailed description of the FOCUS model, we encourage them to refer to Russell (1992, 1994) for a more detailed description of the FOCUS model.

Hypotheses

Even though we believed that the exposure to the FOCUS model would increase the participant's levels of personal and teaching efficacy, we were not willing to assume that those increases would be constant across the pre-treatment levels of efficacy. That is, when compared to the Control Group, the gains in the personal and teaching efficacy scores for the participants in the FOCUS Group may not be consistent across the range of pre-treatment scores. Thus, it was essential to test for the existence of pre-treatment-efficacy-scores-by-group-interaction effects. The null hypotheses that were designed to test for these two-way interaction effects were as follows:

1Ho: The interaction effect between the pre-treatment personal teaching efficacy scores and group membership does not explain some of the variation in the post-treatment personal teaching efficacy scores.

2Ho: The interaction effect between the pre-treatment teaching efficacy scores and group membership does not explain some of the variation in the post-treatment teaching efficacy scores.

It should be noted that these two null hypotheses did not include the ages and the years of experience of the participants as variables as well as the two-way interaction effects between the groups and each of those variables. These variables were not included due to the fact that, in preliminary analyses, they accounted for less than 3% of unique variation in either of the post-treatment efficacy scores, which was not statistically significant. Thus, those variables were excluded from the two null hypotheses and the corresponding statistical analyses in order to increase the statistical power of the analyses and to simplify the interpretation of the results.

The two null hypotheses were statistically tested with regression models (McNeil, Newman & Kelly, 1996). The SPSS/PC+ subprogram REGRESSION (SPSS, 1990) was used to generate the regression analyses for these two models. The dependent variable for Model 1, which was used to statistically test $1H_0$, consisted of the participants' post-treatment personal efficacy scores. This model contained three independent variables. One of the independent variables included in Model 1 consisted of the participants' pre-treatment personal efficacy scores. This variable was labeled Pre- Treatment Personal Efficacy. The second independent variable, which was identified as the Group variables, consisted of the values of zero and one. A value of one indicated that the participant was in the FOCUS Group, and a zero value meant that the participant was in the Control Group. The third variable included in Model 1 was formed by multiplying the Pre-Treatment Personal Efficacy Scores variable by the Group variable. The inclusion of this variable, which was labeled Pre-Treatment-Personal Efficacy X Group, enabled the difference between the slopes of the regression lines of the Control and FOCUS groups to be estimated.

The teaching efficacy scores served as the dependent variable in the regression model used to statistically test $2H_0$. Similar to Model 1, this model, which is referred to as Model 2, included three independent variables. One of these independent variables consisted of the participants' pre-treatment teaching efficacy scores. This variable was labeled Pre-Treatment Teaching Efficacy. A second independent variable was the same Group variable that was used in Model 1. The third independent variable was generated by multiplying the Pre-Treatment Teaching Efficacy variable by the Group variable. This variable, which was labeled Pre-Treatment Teaching Efficacy X Group, was used to estimate the difference between the slopes of the regression lines for the Control and FOCUS groups.

The *t* values of the regression coefficients for the Pre-Treatment Personal Efficacy X Group variable and the Pre-treatment Teaching Efficacy X Group variable were used to statistically test $1H_0$ and $2H_0$, respectively. If a null hypothesis was rejected, the Johnson-Neyman (1936) nonsignificance region between the two regression lines was calculated. It should be noted that Chou and Wang (1992) suggest that the Johnson-Neyman technique can be used to make simultaneous inferences provided that the assumption of homogeneity of regression slopes was rejected. The Johnson-Neyman nonsignificance regions were calculated by a program written by Fraas and Newman (1997), which was used in conjunction with SPSS/PC+ software.

Two analytical procedures used in conjunction with the analyses of the regression models should be noted. First, since this study involved the two dependent variables of personal efficacy and teaching efficacy, a Bonferroni corrected alpha level was used to maintain the experimentwise alph level at the .05 level. That is, the alpha level for each *t* test used to statistically test each interaction effect was set at .025, which is equal to .05 divided by 2. Second, before each null hypothesis was tested, the data utilized in each model were tested for possible outlier values with a test of Cook's distance measures (Neter, Wasserman and Kutner, 1985). As suggested by Neter et al., the magnitude of Cook's distance measure for each observation was declared an outlier if its corresponding *F* value exceeded the 50th percentile of the *F* distribution with numerator and denominator degrees of freedom of 4 and 64, respectively. Any value that appeared to distort the regression analysis was reviewed for possible elimination.

Results

The test results of Cook's distance measures obtained from Model 1 indicated that none of the participants was identified as having scores that could be considered as outlier values. Thus, the data for all 68 participants were included in an analysis of Model 1. The *t* test of regression coefficient for the Pre-Treatment Personal Efficacy X Group variable ($t = -2.44$, $p = .0175$) indicated that the difference between the slopes of the regression lines of the FOCUS and Control groups was statistically significant at the .025 level, that is, $1H_0$ was rejected (Table 2). Thus, the differences between the post-treatment personal efficacy scores of the FOCUS and Control groups were not constant across the range of pre-treatment personal efficacy scores.

Table 2
Regression Results for Model 1

	Model 1		
Variable[a]	Regression Coefficient	*t* Test Value	*p* Value
Pre-Treatment Personal X Group	-.538	-2.44	.018
Pre-Treatment Personal Efficacy Scores	.852	5.17	<.001
Group[b]	25.124	2.87	.006
Constant	6.362	.97	.338
$R^2 = .370$			
Adjusted $R^2 = .341$			
N = 68			

[a]The dependent variable consisted of the teachers' post-treatment personal efficacy scores.

[b]The values for the Group variable are zero and one for teachers in the Control and FOCUS groups, respectively.

This interaction effect between the Pre-Treatment Personal Scores variable and the Group variable, which is diagramed in Figure 1, was disordinal with the regression lines intersecting at 46.7. The regression line for the FOCUS Group was higher than the regression line for the Control Group below the pre-treatment personal efficacy score of 46.7. The regression line for the Control Group, however, was higher than the regression line for the FOCUS Group for pre-treatment personal efficacy scores higher than 46.7.

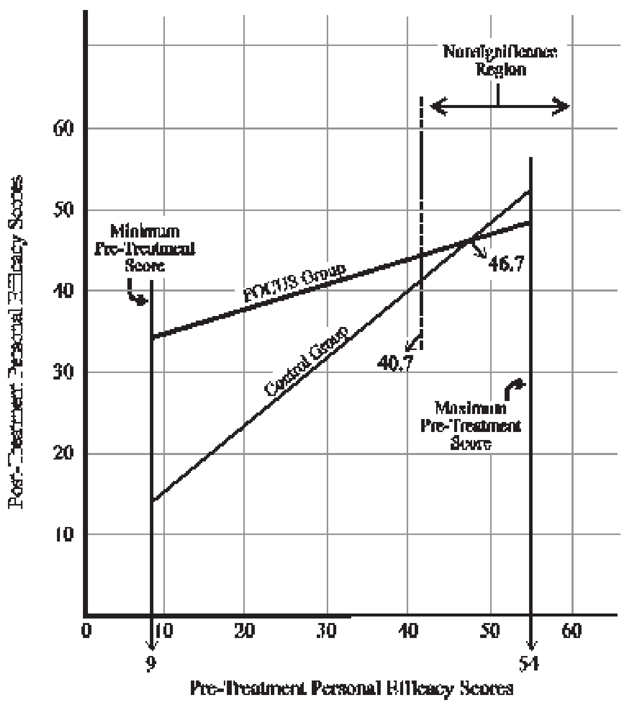

Figure 1. Pre-Treatment-Personal-Efficacy-Scores-By-Group Interaction

The Johnson-Neyman confidence limits were calculated to determine the nonsignificance region between the two regression lines. The upper limit for the 95% confidence limits was 81.8 points, which was above the maximum score of 54 for the personal efficacy section of the instrument. The lower limit was 40.7 points. Thus, the post-treatment personal efficacy scores of the participants in the FOCUS Group were statistically significantly higher than the corresponding scores of the participants in the Control Group when their pre-treatment personal efficacy scores were less than 40.7. The post-treatment personal efficacy scores for the participants in the Focus and Control groups were not statistically significantly different, however, when the regression line for the Control Group was higher than the regression line for the FOCUS Group. That is, the post-treatment personal efficacy scores were not statistically significantly different when the participants' pre-treatment personal efficacy scores were greater than 40.7.

The test results of Cook's distance measures obtained from Model 2 indicated that the data recorded for one participant had a distorting influence on the results obtained from the regression analysis. A review of this participant's teaching efficacy scores revealed that the scores changed from the minimum score on the pre-treatment measurement to the maximum score on the post-treatment measurement. Since this extreme change far exceed the change recorded for any other participant, this participant's data were eliminated from the data set used to statistically test $2H_0$. Thus, the data for 38 participants, rather than 39 participants, were included in the FOCUS Group when $2H_0$ was tested.

The *t* test of the coefficient for the re-Treatment-Teaching-Efficacy X Group variable ($t = 2.742$, $p = .008$) indicated that this interaction effect was statistically significant at the .025 level (see Table 3). As indicated by the two regression lines contained in Figure 2, the interaction effect between the pre-treatment teaching efficacy scores and the groups was disordinal. The pre-treatment score located at the intersection point of the two regression lines was 20.7. The regression line for the Control Group was higher than the regression line for the FOCUS Group below the pre-treatment teaching efficacy score of 20.7 points. The regression line for the FOCUS Group, however, was higher than the regression line for the Control Group for pre-treatment teaching efficacy scores greater than 20.7.

The lower limit of the 95% Johnson-Neyman confidence limits for the regression lines diagramed in Figure 2 was equal to 10.0. It should be noted that even though 10.0 points was above the minimum score of 7 points that a participant could receive on this section of the Teacher Efficacy Scale, none of the participants included in this study had a score below 13 points. Thus, none of the participants had a score below the lower limit of the nonsignificance region. The upper confidence limit was equal to 23.8. Thus, the post-treatment teaching efficacy scores of the participants in the FOCUS and Control groups were not statistically significantly different when their pre-treatment teaching efficacy scores were below 23.8 points, except for extremely low pre-treatment scores, which no one in the study group received. The post-treatment teaching efficacy scores of the participants in the FOCUS Group were statistically significantly higher than the corresponding scores of the participants in the Control Group, however, when their pre-treatment teaching efficacy scores were greater than 23.8.

To understand the implications of the nonsignificant regions as well as the significant regions for the two sets of regression lines, it is important to note that the location of the participants' pre-treatment efficacy scores along those regression lines. Twenty-one of the study's 67 (31%) participants who were included in both analyses had pre-treatment efficacy scores that corresponded to points on the regression lines where the post-treatment efficacy scores of the participants in the FOCUS Group were statistically significantly higher than the scores of the participants in the Control Group on both efficacy scales. Twenty-eight (42%) of the participants had pre-term efficacy scores that corresponded to points on the regression lines where the post-term efficacy scores of the participants in the FOCUS Group

Table 3
Regression Results for Model 2

	Model 2		
Variable[a]	Regression Coefficient	*t* Test Value	*p* Value
Pre-Treatment Personal X Group	.703	2.742	.008
Pre-Treatment Personal Efficacy Scores	.153	.790	.433
Group[b]	-14.569	-2.339	.023
Constant	19.800	4.331	<.001
R^2 = .347			
Adjusted R^2 = .316			
N = 67			

[a]The dependent variable consisted of the teachers' post-treatment teaching efficacy scores.

[b]The values for the Group variable are zero and one for teachers in the Control and FOCUS groups, respectively.

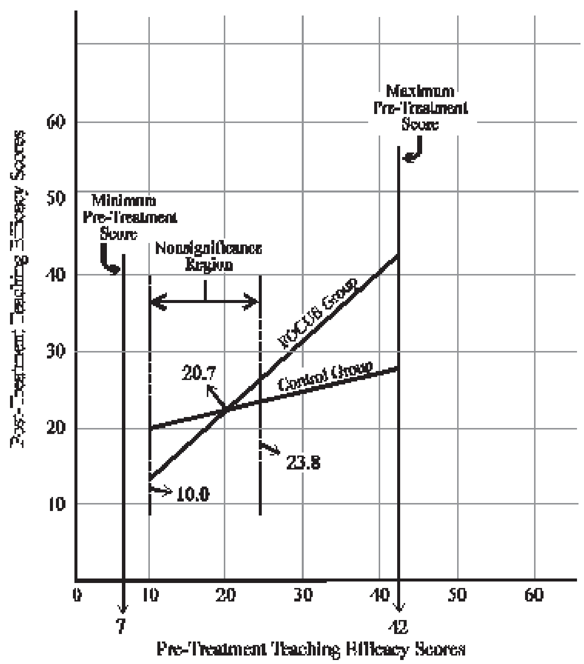

Figure 2. Pre-Treatment-Teaching-Efficacy-Scores-By-Group Interaction

were statistically significantly higher than the scores of the participants in the Control Group on one of the two efficacy scales. The remaining 18 (27%) participants had pre-treatment efficacy scores that corresponded to points on the regression lines where the post-treatment efficacy scores of the two groups were not statistically significantly different on either efficacy scale.

Thus, a total of 73% had pre-treatment efficacy scores that were located at points on the regression lines where the post-treatment efficacy scores of the participants in the FOCUS Group were statistically significantly higher than the post-treatment efficacy scores of the participants in the Control Group on at least one of the two efficacy scales. None of the participants had pre-treatment efficacy scores that were located at points on the regression lines where the post-treatment efficacy scores of the participants in the Control Group were statistically significantly higher than the post-treatment efficacy scores of the participants in the FOCUS Group on either of the two efficacy scales.

Discussion

The regression analysis of the participants' post-treatment efficacy scores indicated that disordinal pre-treatment-efficacy-by-group-interaction effects were present. The investigation of these interaction effects was a critical element in the understanding of the effect of the FOCUS model on the efficacy levels of the participants. An analysis of these disordinal interaction effects revealed that a majority of the participants (73%) had pre-treatment efficacy scores that corresponded to levels at which the post-treatment efficacy scores were statistically significantly higher for the FOCUS Group than the Control Group on at least one of the two efficacy measures. The remaining group of participants (27%) had pre-treatment efficacy scores that corresponded to points on the regression lines where the post-treatment efficacy scores of the two groups were not statistically significantly different on either of the efficacy scales.

Thus, teachers who appear to benefit from exposure to the FOCUS model are those participants with initial personal efficacy levels that are average and below average and those participants with initial teaching efficacy levels that are average or above average. The finding with respect to the personal efficacy levels is not unexpected in light of the purpose of using the FOCUS model and the findings reported by Bolinger (1988). Bolinger reported that the personal efficacy increased in a training program that provided participants with effective teaching skills. A goal of the FOCUS model is to have the participants, through experiences encountered in the class, become sensitized to the different learning styles of students and to learn various pedagogical methods that will increase the changes of maximizing those students' academic achievements. Thus, exposure to FOCUS may well increase a teacher's pedagogical knowledge and skill level. It can be argued that exposing the teachers to the FOCUS model may well have the greatest impact on those participants who had the lowest initial feelings of being able to affect the education of their students, that is, low personal efficacy levels.

Possible reasons why participants with average and above average initial levels of teaching efficacy recorded the gains in post-term teaching efficacy are not as clear. One possible explanation for that finding may lie in the connection between changes in the participants' personal efficacy levels and their changes in teaching efficacy levels. Investigation into such a connection may provide insight into why the participants with average and above average initial teaching efficacy levels recorded gains in post-treatment teaching efficacy levels when they were exposed to the FOCUS model.

Keeping in mind the internal validity limitations of this field study, which were previously discussed, a number of issues need to be addressed by future research on the FOCUS model and teacher efficacy if one is to have confidence that the FOCUS model does indeed have the positive effects suggested by the results of this study. First, it is important to determine if our findings can be replicated in studies which employ research designs that reduce the number of internal validity concerns contained in this study. Second, future studies need to determine if the type of changes in the personal efficacy and teaching efficacy levels of the participants exposed to the FOCUS model, such as the changes reported in this study, are sustained or only temporary. Third, future studies should determine if the changes in the efficacy levels of the participants exposed to the FOCUS model lead to changes in the academic performances of their students. Fourth, an investigation of the relationship between the changes in personal and teaching efficacy may provide important information regarding the interrelationship between such changes.

References

Anderson, R., Greene, M., & Loewen, P. (1988). Relationships among teachers' and students' thinking skills, sense of efficacy, and student achievement. *Alberta Journal of Educational Research*, *34* (2), 148-165.

Ashton, P. & Webb, R. (1986). *Making a difference: Teachers' sense of efficacy and student achievement*. New York: Longman.

Ashton, P., & Webb, R. (1982, March). Teachers' sense of efficacy: Toward an ecological model. Paper presented at the annual meeting of the American Educational Research Association, New York.

Armor, D., Conry-Oseguera, P., Cox, M., King, N., McDonnell, L., Pascal, A., Pauley, E., & Zellman, G. (1976). *Analysis of the school preferred reading program in selected Los Angeles minority schools*. Santa Monica, CA: Rand Corporation.

Ausubel, D.P., Novak, J.D., & Hanesian, H. (1978). *Educational psychology: A cognitive view* (2nd ed.). New York: Holt, Rhinehart, & Winston.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, *84*, 191-215.

Beady, C., & Hansell, S. (1981). Teacher race and expectations for student achievement. *American Educational Research Journal*, *18* (2), 191-206.

Benz, C., Bradley, L., Alderman, M., & Flowers, M. (1992). Personal teaching efficacy: Developmental relationships in education. *Journal of Educational Research*, *85* (5), 274-286.

Berman, P., McLaughlin, M., Bass, G., Pauly, E., & Zellman, G. (1977). *Federal programs supporting educational change. Vol. 8. Factors affecting implementation and continuation*. Santa Monica, CA: Rand Corporation.

Bolinger, R. (1988). The effects of instruction in the Hunter instructional model on teachers' sense of efficacy. Unpublished doctoral dissertation, Montana State University, Bozeman, Montana. UMI 8820177.

Borton, W. (1991, April). Empowering teachers and students in a restructuring school: A teacher efficacy interaction model and the effect on reading outcomes. Paper presented at the American Educational Research Association, Chicago.

Campbell, D.T., & Stanley, J.C. (1963). *Experimental and quasi-experimental designs for research*. Chicago, IL: Rand McNally College Publishing Co.

Chester, M. (1991). Changes in attitudes toward teaching and self-efficacy beliefs within first-year teachers in urban schools. Unpublished doctoral dissertation, Harvard University, Boston, MA. UMI 9132334.

Chou, T., & Wang, L. (1992, April). Making simultaneous inferences using Johnson-Neyman technique. Paper presented at the annual meeting of the American Educational Research Association, San Francisco, CA.

Dunn, R., Dunn, K., & Price, G. (1977). *Identifying individual learning styles and the instructional methods and/or resources to which they respond*. New York: American Research Association.

Fraas, J.W., & Newman, I. (1997, February). The use of the Johnson-Neyman confidence bands and multiple regression models to investigate interaction effects: Important tools for educational researchers and program evaluators. Paper presented at the annual meeting of the Eastern Educational Research Association, Hilton Head, SC.

Gibson, S., & Dembo, M.H. (1984). Teacher efficacy: A construct validation. *Journal of Educational Psychology*, *76*, 569-682.

Guskey, T. (1988). Teacher efficacy, self-concept, and attitudes toward the implementation of instructional innovation. *Teaching and Teacher Education*, *4* (1), 63-69.

Guskey, T. (1987, April). Teacher efficacy, self-concept, and attitudes toward the implementation of mastery learning. Paper presented at the annual meeting of the American Educational Research Association, San Francisco.

Johnson, P.O., & Neyman, J. (1936). Tests of certain linear hypotheses and their application to some educational problems. In J. Neyman & E.S. Pearson (Eds.), *Statistical Research Memoirs*: Vol. 1 (pp. 57-93). London: University College, University of London, Department of Statistics.

Klob, D.A. (1984). *Experiential learning*. Englewood Cliffs, NJ: Prentice-Hall.

Korevaar, G. (1990, April). Secondary school teachers' courses of action in relation to experience and sense of self-efficacy. Paper presented at the annual meeting of the American Educational Research Association, Boston.

McCarthy, B. (1981). *The 4MAT system: Teaching to learning styles with right/left mode techniques*. New York: Excel.

McLaughlin, M.W., & Marsh, D.D. (1978). Staff development and school change. *Teachers College Record*, *80*, 70-94.

McNeil, K., Newman, I., & Kelly, F. J. (1996). *Testing research hypotheses with the general linear model*. Carbondale, IL: Southern Illinois University Press.

Miskel, C., McDonald, D., & Bloom, S. (1983). Structural and expectancy linkages within schools and organizational effectiveness. *Educational Administration Quarterly*, *19* (1), 49-82.

Moore, W., & Esselman, M. (1992, April). Teacher efficacy, empowerment, and a focused instructional climate: Does student achievement benefit? Paper presented at the annual meeting of the American Educational Research Association, San Francisco.

Neter, J., Wasserman, W., & Kutner, M.H. (1985). *Applied linear statistical models* (2nd ed.). Homewood, IL: Irwin.

Raudenbush, S., Rowen, B., Cheong, Y. (1992). Contextual effects on the self-perceived efficacy of high school teachers. *Sociology of Education*, *65*, 150-167.

Riggs, I., & Enochs, L. (1990). Toward the development of an elementary teachers' science teaching efficacy belief instrument. *Science Education*, *74*, (6) 625-637.

Roeser, R., Arbreton, A., & Anderman, E. (1993, April). Teacher characteristics and their effects on student motivation across the school year. Paper presented at the annual meeting of the American Educational Research Association, Atlanta.

Rose, J., & Medway, F. (1981). Measurement of teachers' belief in their control over student outcomes. *Journal of Educational Research*, *74*, 185-190.

Ross, J.A. (1994, June). Beliefs that make a difference: The origins and impacts of teacher efficacy. Paper presented at the meeting of the Canadian Association for Curriculum Studies, Calgary, Canada.

Ross, J.A., & Cousins, J.B. (1993). Enhancing secondary school students' acquisition of correlational reasoning skills. *Research in Science & Technological Education*, *11* (3), 191-206.

Russell, G. (1992, October). FOCUS: An explanation of the human behavioral system. Paper presented at the annual meeting of the Mid-Western Educational Research Association, Chicago.

Russell, G., & Shoare, L. (1994, October). Interactive perceptual psychology: The human psychology that mirrors the naturalness of human behavior. Paper presented at the annual meeting of the Mid-Western Educational Research Association, Chicago.

Schriver, M. (1993, April). A comparison of middle and junior high science teachers' levels of efficacy, and knowledge of developmentally appropriate curriculum and instruction. Paper presented at the annual meeting of the National Association for Research in Science Teaching, Atlanta.

SPSS, Inc. (1990). SPSS/PC+ (Version 4.0) [Computer software]. Chicago: SPSS Inc.

Vitali, G. (1993). Factors influencing teachers' assessment and instructional practices in an assessment-driven educational reform. Unpublished doctoral dissertation, University of Kentucky, Lexington, Kentucky.

Vosniadou, S., & Brewer, W. (1987). Theories of knowledge restructuring in development. *Review of Educational Research*, *57* (1), 51-68.

Webb, R. (1982, March). Teaching and the domains of efficacy. Paper presented at the annual meeting of the American Educational Research Association, New York.