A LONGITUDINAL EXAMINATION OF TEACHING EFFICACY OF AGRICULTURAL SCIENCE STUDENT TEACHERS AT FOUR DIFFERENT INSTITUTIONS

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Abstract

The purposes of this study were to determine changes in teaching efficacy of student teachers over the course of the student teaching semester and to determine if similar trends occur at different institutions. The population of interest for this study was agricultural science student teachers at Tarleton State University, Texas A&M University, Texas Tech University, and Oklahoma State University. The accessible sample of the population was student teachers during the Spring 2005 at Tarleton, Texas A&M, and Texas Tech Universities and the Fall 2005 semester at Texas A&M and Oklahoma State Universities (n = 99). Using the Teachers' Sense of Efficacy Scale instrument (Tschannen-Moran & Woolfolk Hoy, 2001), efficacy in student engagement, efficacy in instructional strategies, and efficacy in classroom management, and overall teaching efficacy were measured: 1) the first day of the 4-week on-campus portion of the student teaching semester; 2) the last day of the 4-week on-campus block; 3) the middle of the 11-week student teaching experience; and 4) the final day of the student teaching experience. It was concluded that overall teaching efficacy changed. Student teachers had "Quite a Bit" of teaching efficacy at the beginning of the semester, which increased slightly 4-weeks later, then decreased to its lowest level at the middle of the 11-week student teaching experience, and then increased to its highest levels at the end of the experience.

Introduction

> The demands on teachers are increasing. Not only do teachers need to be able to keep order and provide useful information to students, they also need to be increasingly effective in enabling a diverse group of students to learn ever more complex material and to develop a wider range of skills (Bransford, Darling-Hammond, & LePage, 2005, p. 2).

During student teaching, preservice teachers are faced with complex decisions, without the benefit of professional experience to rely on. It can be assumed that successes and failures during student teaching ultimately impact decision to teach, but is this assumption confirmed? In 2001, 20% of newly qualified agricultural science teachers did not want to take a teaching job (Camp, Broyles, & Skelton, 2002). An additional 20% of new graduates wanted to teach but did not take teaching jobs. With 40% of newly qualified agricultural science teachers choosing not to take teaching positions and an anticipated growth of 14% in the number of agricultural science programs between 2001 and 2013 (Camp et al.), the need for qualified teachers with a desire to teach is absolutely necessary. Is there something that can be done at the preservice level to improve initial decisions to teach?

Theoretical Framework

This study was framed using previous research by Roberts, Harlin, and Ricketts

(2006) and was based on two complementary theories: self-efficacy (Bandura, 1997) and experiential learning (Kolb, 1984). This study focused on the specific form of self-efficacy, teaching efficacy. Teaching efficacy is a teacher's belief in their abilities to produce desired student learning (Tschannen-Moran & Woolfolk Hoy, 2001). Teaching efficacy is often delineated into sub-constructs. Tschannen-Moran and Wookfolk Hoy suggest that overall teaching efficacy is composed of teaching efficacy: student engagement, instructional strategies, and classroom management. Student engagement is the ability to persuade students to want to learn, while instructional strategies refers to the mechanics of teaching, and classroom management skills refer to the ability of the teacher to maintain an orderly learning environment.

Experiential learning theory suggests that learning is cyclical in nature whereby learners interact with their environment, reflect on their experiences, develop generalizations, and test generalizations through additional experiences (Kolb, 1984; Roberts, 2006). Student teaching provides numerous opportunities for student teachers to put experiential learning theory into practice as they have experiences with students both in and out of the classroom and interact with teachers, administrators, and parents over the course of a semester long experience (Figure 1).

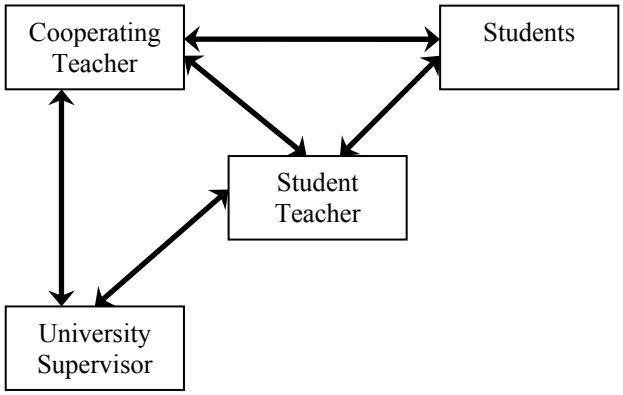

Figure 1. Model of interactions in the student teaching experience (Roberts, 2006).

The model used to guide this inquiry was first utilized by Roberts et al. (2006) (Figure 2). The model indicates that teaching efficacy is not a stagnant issue, but rather a dynamic indicator of teachers' beliefs at a particular point in time. This assumption has been supported previously by Harlin, Edwards, and Briers (2002) and Knobloch (2001).

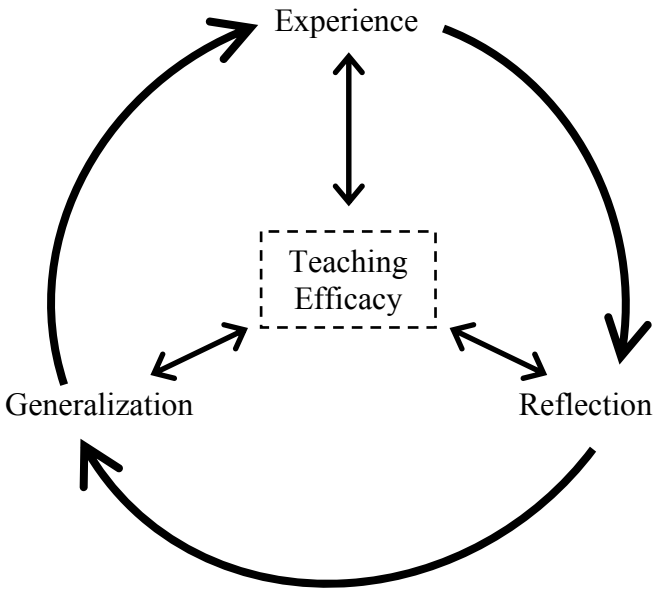

Figure 2. Conceptual model to study teaching efficacy during the student teaching semester (Roberts et al., 2006).

According to Knobloch and Whittington (2003), teaching efficacy is also tied to career commitment. Their study found that teachers who experienced no decrease in their sense of teaching efficacy during the first ten-weeks of the school year were also teachers with high levels of career commitment. Research on student teachers revealed a fluctuation of teaching efficacy over the course of an 11-week student teaching experience with a slight gain from beginning to end (Roberts et al., 2006). Knobloch (2002) found similar changes in teaching efficacy in student teachers in Ohio and Illinois.

Teaching efficacy has been found to be a powerful predictor of teacher effectiveness, teacher commitment, and teacher behavior (Darling-Hammond, 2006). In *Powerful Teacher Education*, Darling-Hammond cited teaching efficacy as an impact on many facets of successful teaching including: student motivation, student learning, willingness to try new instructional techniques, and persistence in solving learning problems. The author also attributed sense of teaching efficacy to commitment to teaching, stress levels, preparedness to teach, and attrition from teaching.

Purposes and Objectives

The purposes of this study were to determine changes in teaching efficacy of student teachers over the course of the student teaching semester and to determine if similar trends occur at Tarleton State University, Texas A&M University, Texas Tech University, and Oklahoma State University. Three objectives guided this inquiry.

1. Describe the sample of agricultural science student teachers;
2. Describe the teaching efficacy of student teachers at four institutions and overall; and
3. Describe changes in teaching efficacy of student teachers.

Methodology

This study was a replication of the work of Roberts et al. (2006). The population of interest for this study was agricultural science student teachers at Tarleton State University, Texas A&M University, Texas Tech University, and Oklahoma State University. The accessible sample of the population was student teachers at Tarleton State University, Texas A&M University, and Texas Tech University in spring 2005, and Texas A&M University and Oklahoma State University in fall 2005. One-hundred-twenty-two student teachers initially started the study, but because of the multiple data points, complete data were collected from 99 student teachers in the sample. Data were analyzed using SPSS, and appropriate statistics were presented. Demographic data and anecdotal evidence confirmed that this sample was representative of the population. Therefore, this research team's position is congruent with that of Gall, Gall, and Borg (2003, p. 176), who asserted that, "inferential statistics can be used with data collected from a convenience sample if the sample is carefully conceptualized to represent a particular population." Readers are encouraged to examine the description of the sample and make their own judgment about generalizing the findings to other populations of agricultural science student teachers.

This ex post facto study captured teaching efficacy using the Teachers' Sense of Efficacy Scale instrument (often referred to as the Ohio State Teacher Efficacy Scale), which measures efficacy in student engagement, instructional strategies, and classroom management (Tschannen-Moran & Woolfolk Hoy, 2001). The instrument consisted of 24 items (8 items per construct), with a 9 point rating scale, framed around the question, "How Much Can You Do?" (1 = Nothing, 3 = Very Little, 5 = Some Influence, 7 = Quite a Bit, and 9 = A Great Deal). Scores for each construct were calculated by using the grand mean for the items within the construct. Overall teaching efficacy scores were determined by the mean of all 24 items in the instrument. Tschannen-Moran and Woolfolk Hoy reported that content validity was established by an expert panel and consultation of existing literature. Construct validity was verified by factor analysis and comparison to existing instrumentation. Face validity was established through a series of pilot tests, which also established reliability, as a measure of internal consistency. Cronbach's alpha values for each construct were 0.87 for student engagement, 0.91 for instructional strategies, and 0.90 for classroom management.

Data were collected during the 15 week student teaching semester at Tarleton State, Texas A&M, Texas Tech, and Oklahoma State Universities, which consisted of a 4-week block held on campus, where student teachers received instruction in and applied a variety of pedagogical and technical content. The remaining portion of the semester consisted of an 11-week student teaching experience. Data were collected at four points: 1) the first day of the 4-week on-campus portion of the semester, referred to as the 'block'; 2) the last day of the block; 3) the mid-point conference; and 4) the final day of the experience (Figure 3).

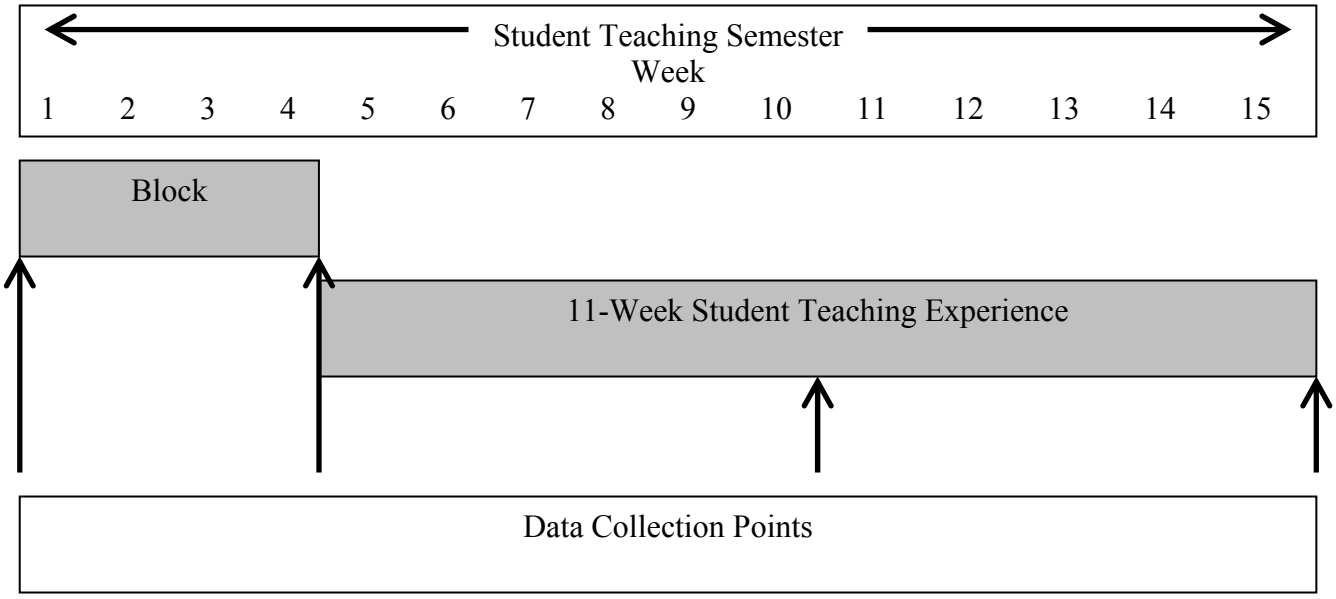

Figure 3. Data collection points.

Results

Objective One: Describe agricultural science student teachers.

Data were collected from 122 student teachers with 99 providing complete data for all four data collection points (81%). Participants with incomplete data were excluded from analysis. Sixty-eight (68.7%) participants student taught in the spring 2005 semester with 31 (31.3%) student teaching in the fall 2005 semester. Sixty-four (64.6%) of the participants were female. Ninety-six (97%) classified themselves as white, 2 (2%) as Hispanic, and 1 (1%) as Native American. Ages ranged from 21 to 36 years, with an average age of 22 years (SD = 2.12). A large majority (n = 84, 84.8%) of participants were undergraduate students. The remaining participants were either post-baccalaureate or graduate students. An overwhelming majority (n = 87, 87.8%) had taken agricultural science courses in high school. When asked to describe their previous agricultural work experience, 72 (72%) indicated either part-time or full-time employment in agriculture. An additional 24 (24%) indicated they occasionally helped others "feed cows" or had a backyard garden. Three (3%) indicated no agricultural experience.

Objective Two: Describe the teaching efficacy of student teachers at four institutions and overall.

As described in the methods section, teaching efficacy of student teachers was examined at four different points during the student teaching semester with five samples at four different institutions. The average score for efficacy in student engagement on the first day of the block was 6.91 (SD = .80), with a lowest observed score of 4.50 and a highest of 8.60 (Table 1). Four weeks later, at the end of the block, the mean student engagement score had risen to 7.09 (SD = .81). Scores ranged from 4.88 to 8.75. Roughly five weeks later, during the middle of the student teaching experience, the average student engagement score fell to 6.74 (SD = .94) and the greatest variation was observed (4.25 to 9.00). When finished with the student teaching experience, the average preservice teacher's student engagement score had risen to 7.42 (SD = .79), the highest level observed. At this time, student engagement scores ranged from 5.00 to 9.00.

Table 1.
Descriptives of Teaching Efficacy Student Engagement Scores

Time/Sample	*n*	Min	Max	*M*	*SD*
First Day of 4-week Block					
Sample 1	43			6.77	.82
Sample 2	10			7.54	.91
Sample 3	15			6.68	.82
Sample 4	6			7.00	.93
Sample 5	25			7.03	.51
Overall	99	4.50	8.60	6.91	.80
Last Day of 4-week Block					
Sample 1	43			7.26	.78
Sample 2	10			7.11	.92
Sample 3	15			7.10	.81
Sample 4	6			6.85	.89
Sample 5	25			6.84	.80
Overall	99	4.88	8.75	7.09	.81
Middle of 11-week Experience					
Sample 1	43			6.74	1.05
Sample 2	10			6.94	.94
Sample 3	15			6.94	.79
Sample 4	6			6.54	1.41
Sample 5	25			6.60	.73
Overall	99	4.25	9.00	6.74	.94
End of 11-week Experience					
Sample 1	43			7.31	.86
Sample 2	10			7.65	.86
Sample 3	15			7.36	.78
Sample 4	6			7.63	1.04
Sample 5	25			7.51	.56
Overall	99	5.00	9.00	7.42	.79

Note. Scale: 1=Nothing, 3=Very Little, 5=Some Influence, 7=Quite A Bit, 9=A Great Deal

Average instructional strategies scores on the first day of the block were 6.95 (*SD* = .91), with a lowest observed score of 4.50 and a highest of 9.00 (Table 2). Four weeks later, the mean instructional strategies score had risen to 7.31 (*SD* = .82). Scores ranged from 5.00 to 9.00. Roughly 5 weeks later, the average instructional strategies score fell to 7.17 (*SD* = .88) with a range of 5.10 to 9.00. When finished with the student teaching experience, the average preservice teacher's instructional strategies score had risen to 7.64 (*SD* = .81), the highest level observed with a range of 5.00 to 9.00.

Table 2
Descriptives of Teaching Efficacy Instructional Strategies Scores

Time/Sample	*n*	Min	Max	*M*	*SD*
First Day of 4-week Block					
Sample 1	43			6.88	.83
Sample 2	10			7.60	.84
Sample 3	15			6.97	1.31
Sample 4	6			7.00	1.01
Sample 5	25			6.80	.67
Overall	99	4.50	9.00	6.95	.91
Last Day of 4 -week Block					
Sample 1	43			7.44	.75
Sample 2	10			7.46	.88
Sample 3	15			7.52	1.01
Sample 4	6			7.21	.91
Sample 5	25			6.90	.70
Overall	99	5.00	9.00	7.31	.82
Middle of 11-week Experience					
Sample 1	43			7.22	.91
Sample 2	10			7.22	.90
Sample 3	15			7.40	.96
Sample 4	6			6.79	1.14
Sample 5	25			7.01	.70
Overall	99	5.10	9.00	7.17	.88
End of 11-week Experience					
Sample 1	43			7.68	.85
Sample 2	10			7.84	1.03
Sample 3	15			7.53	.81
Sample 4	6			7.90	1.02
Sample 5	25			7.51	.59
Overall	99	5.00	9.00	7.64	.81

Note. Scale: 1=Nothing, 3=Very Little, 5=Some Influence, 7=Quite A Bit, 9=A Great Deal

Average classroom management scores on the first day of the block were 7.23 (*SD* = 1.06), with a lowest observed score of 4.50 and a highest of 9.00 (Table 3). At the end of the block, the mean classroom management score had risen to 7.35 (*SD* = .81). Scores ranged from 5.00 to 9.00. During the middle of the student teaching experience, the average student engagement score fell to 7.07 (*SD* = 1.01) and the greatest variation was observed (3.63 to 9.00). When finished with the student teaching experience, the average preservice teacher's classroom management score had risen to 7.59 (*SD* = .82), the highest level observed. At this time, classroom management scores ranged from 5.00 to 9.00.

Table 3
Descriptives of Teaching Efficacy Classroom Management Scores

Time/Sample	*n*	Min	Max	*M*	*SD*
First Day of 4-week Block					
Sample 1	43			7.17	1.06
Sample 2	10			7.60	.96
Sample 3	15			7.38	1.16
Sample 4	6			7.17	1.09
Sample 5	25			7.12	.69
Overall	99	4.50	9.00	7.23	.98
Last Day of 4 -week Block					
Sample 1	43			7.45	.76
Sample 2	10			7.33	.99
Sample 3	15			7.57	.83
Sample 4	6			7.17	.95
Sample 5	25			7.11	.79
Overall	99	5.00	9.00	7.35	.81
Middle of 11-week Experience					
Sample 1	43			7.14	1.01
Sample 2	10			6.85	1.27
Sample 3	15			7.43	.80
Sample 4	6			7.13	.66
Sample 5	25			6.82	1.09
Overall	99	3.63	9.00	7.07	1.01
End of 11-week Experience					
Sample 1	43			7.58	.94
Sample 2	10			7.86	.88
Sample 3	15			7.39	.85
Sample 4	6			7.77	.96
Sample 5	25			7.57	.49
Overall	99	5.00	9.00	7.59	.82

Note. Scale: 1=Nothing, 3=Very Little, 5=Some Influence, 7=Quite A Bit, 9=A Great Deal

Average overall efficacy scores on the first day of the block were 7.03 (*SD* = .80), with a lowest observed score of 4.83 and a highest of 8.83 (Table 4). Four weeks later, at the end of the block, the mean overall efficacy score had risen to 7.25 (*SD* = .76). Scores ranged from 5.00 to 8.83. Roughly five-weeks later, during the middle of the student teaching experience, the overall efficacy score fell to 6.99 (*SD* = .84) and the greatest variation was observed (3.63 to 9.00). When finished with the student teaching experience, the average preservice teacher's overall efficacy score had risen to 7.55 (*SD* = .74), the highest level observed with a range of 6.00 to 9.00.

Table 4
Descriptives of Teaching Efficacy Overall Scores

Time/Sample	*n*	Min	Max	*M*	*SD*
First Day of 4-week Block					
Sample 1	43			6.94	.79
Sample 2	10			7.58	.87
Sample 3	15			7.01	1.02
Sample 4	6			7.06	.99
Sample 5	25			6.98	.53
Overall	99	4.83	8.83	7.03	.80
Last Day of 4-week Block					
Sample 1	43			7.39	.67
Sample 2	10			7.30	.90
Sample 3	15			7.40	.85
Sample 4	6			7.08	.87
Sample 5	25			6.95	.73
Overall	99	5.00	8.83	7.25	.76
Middle of 11-week Experience					
Sample 1	43			7.03	.86
Sample 2	10			7.00	1.00
Sample 3	15			7.25	.76
Sample 4	6			6.81	1.03
Sample 5	25			6.81	.74
Overall	99	3.63	9.00	6.99	.84
End of 11-week Experience					
Sample 1	43			7.52	.79
Sample 2	10			7.78	.90
Sample 3	15			7.43	.77
Sample 4	6			7.76	1.00
Sample 5	25			7.53	.49
Overall	99	6.00	9.00	7.55	.74

Note. Scale: 1=Nothing, 3=Very Little, 5=Some Influence, 7=Quite A Bit, 9=A Great Deal

Objective Three: Describe changes in teaching efficacy of student teachers.

Repeated Measures Analysis of Variance was used to determine if a statistical difference in mean teaching efficacy scores existed over time. Sphericity assumptions were tested using Mauchley's W and were met for all but student engagement and overall efficacy, so adjustments to degrees of freedom were made only to those. As reported in Table 5, results revealed that all mean scores were statistically different and the effect size for the observed difference was small to negligible (Cohen, 1988).

Table 5
Repeated Measures Analysis of Variance of Teaching Efficacy Scores

Teaching Efficacy	1st Day of Block *M*	Last Day of Block *M*	Middle of 11-Week Experience *M*	End of 11- Week Experience *M*	*F*	*p*	η^2
Student Engagement	6.91	7.09	6.74	7.42	17.98**	.00	.15
Instructional Strategies	6.95	7.30	7.17	7.64	18.97**	.00	.16
Classroom Management	7.23	7.35	7.07	7.59	8.98**	.00	.08
Overall Teaching Efficacy	7.03	7.25	6.99	7.55	17.13**	.00	.15

Note. Bonferroni adjustments used when determining *p* values
* $p < .05$. ** $p < .01$.

Pairwise comparisons confirmed that teaching efficacy scores were statistically lower during the middle of the 11-week experience for student engagement, instructional strategies, and overall teaching efficacy (Table 6). Classroom management scores were lower, but not significantly different until the end of the student teaching experience.

Table 6
Pairwise Comparisons of Teaching Efficacy Scores during the Middle of the 11-week Field Experience with Other Observed Points

	Student Engagement		Instructional Strategies		Classroom Management		Overall Teaching Efficacy	
	Diff	*p*	*Diff*	*p*	*Diff*	*p*	*Diff*	*p*
1st Day of the Block	-.17	.54	.21	.17	-.16	.83	-.04	1.00
Last Day of the Block	-.35	.01*	-.14	.99	-.28	.06	-.26	.04*
End of 11-Week Experience	-.68	.00*	-.48	.00*	-.52	.00*	-.56	.00*

Note. Bonferroni adjustments used when determining p values
* $p < .05$

A visual representation of teaching efficacy scores reveals a general trend (Figure 4). Scores in all three constructs and overall teaching efficacy increased during the four-week block, then decreased by the mid point of the student teaching experience, and finally increased again at the conclusion of the student teaching experience. Please note that the scale in Figure 4 is expanded to increase readability and does not show the full range (1 to 9) of possible scores.

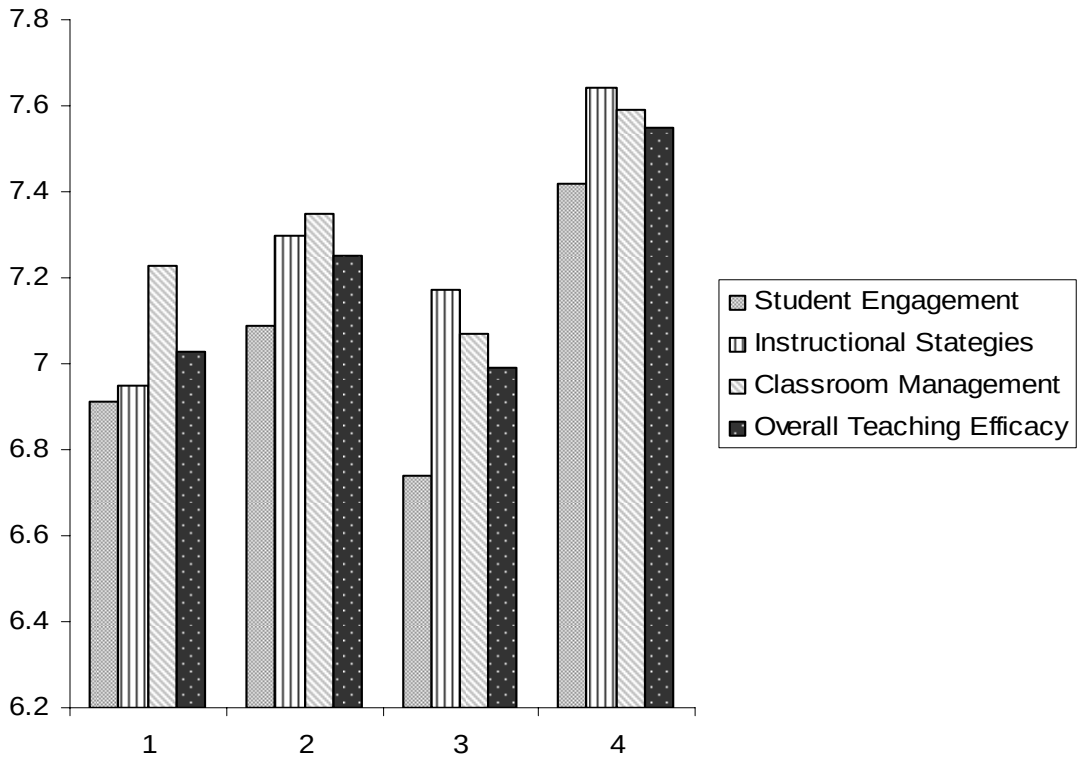

Figure 4. Student engagement, instructional strategies, classroom management, and overall teaching efficacy.

Conclusions

Objective One: Describe agricultural science student teachers.

Based on the findings of this inquiry, several conclusions were made. The typical student teacher was a 22-year old white female, had enrolled in agricultural science courses in high school, and was now completing an undergraduate degree. This was consistent with what Roberts et al. (2006) found but differed with Camp et al. (2002), who reported that nationally 57% of student teachers were male.

Objective Two: Describe the teaching efficacy of student teachers at four institutions and overall.

Student teachers exhibited "Quite a Bit" of teaching efficacy throughout the student teaching semester. Teaching efficacy increased during the 4-week "block," then slightly decreased by the middle of the 11-week field experience, and then increased to its highest level at the end of the field experience. Regardless of institution, similar patterns in teaching efficacy were observed. This conclusion is consistent with the findings of Knobloch (2002) and Roberts et al. (2006).

Objective Three: Describe changes in teaching efficacy of student teachers.

Student teachers exhibited lower teaching efficacy scores at the middle of the 11-week field experience than at any other time. This is consistent with findings of Knobloch (2002) and Roberts et al. (2006).

Implications and Recommendations

Student teachers at Tarleton State University, Texas A&M University, Texas Tech University, and Oklahoma State University continue to be predominantly female, which contradicts national data and demographics of inservice agricultural science teachers in the states involved in this

study (Camp et al., 2002). Is this an indication of changing demographics for these particular institutions? This phenomenon is worthy of further investigation.

Although student teachers exhibited "Quite a Bit" of teaching efficacy, they were least efficacious during the middle of the 11-week field experience. It is recommended that strategies be developed and implemented to help increase teaching efficacy of student teachers during this time period of their field experience. Additionally, it is recommended that further research be conducted to see if a similar trend occurs at additional points throughout the student teaching semester and to determine ways to increase teaching efficacy at points throughout the student teaching experience. This study was unable to correlate teaching efficacy scores to ultimate decisions to teach. Does higher teaching efficacy result in decisions to teach? Does a similar pattern exist for first year teachers and does the pattern influence their decision to remain in the teaching profession?

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