

Teacher Self-Efficacy

Project STAIR

Technical Report #03

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Purpose

The purpose of this technical report is to examine teachers' change on self-efficacy in their ability to teach mathematics before and after the implementation of Project STAIR.

Method

Participants

A total of 13 teachers participated in Teacher Self-Efficacy survey, 10 of whom were in treatment group and three were in control group.

Measures

The *Teacher Self-Efficacy Scale* included a total of seven items on a Likert scale. We adapted this measure from Powell et al. (2019) and featured questions similar to those studied in the Gibson and Dembo (1984) self-efficacy paper, along with Boyd et al. (2014) and Giles et al. (2016). The questions covered confidence teaching mathematics, understanding of mathematical concepts, and knowledge and comfort around teaching and explaining mathematical concepts in the classroom. Teachers typically answered all questions on the measure in 1 minute.

Procedures

We administered the survey to teachers prior to implementation of Project STAIR and at the end of implementation.

Results

First, we present descriptive statistics of teacher self-efficacy survey at pre- and posttest for the treatment and control groups (see Table 3.1).

Table 3.1*Descriptive Statistics of Teacher Self-Efficacy Survey*

Question	Treatment group (<i>n</i> = 10)		Control group (<i>n</i> = 3)	
	Pre	Post	Pre	Post
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)
1. I am confident in my ability to teach math to the students in the grade I currently teach	2.70 (0.48)	2.50 (0.71)	2.67 (0.58)	2.67 (0.58)
2. I like to teach math	2.60 (0.52)	2.60 (0.70)	3.00 (0.00)	2.67 (0.58)
3. I can effectively teach math	2.80 (0.42)	2.40 (0.70)	2.67 (0.58)	2.33 (0.58)
4. I am confident that I can answer questions about math that my students ask	2.70 (0.48)	2.40 (1.07)	2.67 (0.58)	2.33 (0.58)
5. I would be confident if my supervisor wanted to observe me teaching a math lesson	2.60 (0.52)	2.40 (1.07)	2.67 (0.58)	2.67 (0.58)
6. I know how to do the math, but I am not comfortable explaining how I got the answer	0.20 (0.42)	0.30 (0.48)	0.33 (0.58)	0.33 (0.58)
7. I understand the concepts in math, but may not be able to do the steps to solve the problem	0.20 (0.42)	0.40 (0.97)	0.33 (0.58)	0.67 (0.58)

3- Strongly agree, 2- Agree, 1- Disagree, 0 - Strongly disagree.

Second, to evaluate whether treatment and control group differed significantly on teacher self-efficacy at pre- and posttest, we conducted a nonparametric paired *t*-test. Note, we used a nonparametric *t*-test because the data did not meet the assumption about normal distribution. Before the analysis, to test the assumptions of homogeneity of variance, we conducted a nonparametric independent *t*-test (see Table 3.2). The significance value of all the items in teacher self-efficacy survey at pre-test was greater than .05,

so we accepted the null hypothesis for the assumption of group's variance and concluded there was no significant difference between the treatment and control group.

Table 3.2

Nonparametric Independent t-test for Comparing the Means at Pre-test of Treatment and Control group to Test Homogeneity on Teacher Self-Efficacy Survey

Question	Treatment group (n = 10)	Control group (n = 3)	z	p
	Pre			
	M (SD)	M (SD)		
1	2.70 (0.48)	2.67 (0.58)	-0.10	.91
2	2.60 (0.51)	3.00 (0.00)	-1.26	.20
3	2.80 (0.42)	2.67 (0.57)	-0.46	.64
4	2.70 (0.48)	2.67 (0.57)	-0.10	.91
5	2.60 (0.51)	2.67 (0.57)	-0.20	.84
6	2.80 (0.42)	2.67 (0.57)	-0.46	.64
7	2.80 (0.42)	2.67 (0.57)	-0.46	.64

3- Strongly agree, 2- Agree, 1- Disagree, 0 - Strongly disagree.

Table 3.3 and Table 3.4 present the results of nonparametric paired *t*-test on teachers' self-efficacy for treatment group and control groups, respectively. For the treatment group (see Table 3.3), the difference between pre- and posttest scores was not significant on all the items in teacher self-efficacy survey ($p > .05$). For control group (see Table 3.4), the difference between pre- and posttest scores was significant on all the items in teacher self-efficacy survey ($p > .05$).

Table 3.3

Nonparametric Paired T-test on Teacher Self-Efficacy Survey for Treatment Group

Question	Treatment group		z	p
	Pre (n = 10)	Post (n = 10)		
	M (SD)	M (SD)		
1	2.70 (0.48)	2.50 (0.70)	-0.81	.41
2	2.60 (0.51)	2.60 (0.69)	0.00	1.00
3	2.80 (0.42)	2.40 (0.69)	-1.63	.10

4	2.70 (0.48)	2.40 (1.07)	-0.73	.46
5	2.60 (0.51)	2.40 (1.07)	-0.73	.45
6	2.80 (0.42)	2.70 (0.48)	-1.00	.31
7	2.80 (0.42)	2.60 (0.96)	-1.00	.31
Total	1.97 (0.17)	1.85 (0.47)	-0.54	.58

Note. Item 6 and 7 are reverse coded.

3- Strongly agree, 2- Agree, 1- Disagree, 0 - Strongly disagree.

Table 3.4

Nonparametric Paired T-test on Teacher Self-Efficacy Survey for Control Group

Question	Control group		z	p
	Pre (n = 3)	Post (n = 3)		
	M (SD)	M (SD)		
1	2.67 (0.58)	2.67 (0.57)	0.00	1.00
2	3.00 (0.00)	2.67 (0.57)	-1.00	.31
3	2.67 (0.57)	2.33 (0.57)	-1.00	.31
4	2.67 (0.57)	2.33 (0.57)	-1.00	.31
5	2.67 (0.57)	2.67 (0.57)	0.00	1.00
6	2.67 (0.57)	2.67 (0.57)	0.00	1.00
7	2.67 (0.57)	2.33 (0.57)	-1.00	.31
Total	2.04 (0.16)	1.95 (0.21)	-0.44	.65

Note. Item 6 and 7 are reverse coded.

3- Strongly agree, 2- Agree, 1- Disagree, 0 - Strongly disagree.

Lastly, we conducted a nonparametric independent sample *t*-test to evaluate whether the treatment and control groups differed significantly on teacher self-efficacy survey (see Table 3.5). Although treatment and control group posttest scores did not differ significantly on all the items in teacher self-efficacy survey ($p > .05$), an examination of means indicated that treatment group teachers, compared to control group teachers, had higher self-efficacy on their ability to teach math effectively (Q3), to answer questions about math that their students ask (Q4), to explain how they get the answer (Q6), and to do the steps to solve the problem as well as understand the concepts in math (Q7).

Table 3.5*Nonparametric Independent t-test at Post-test for Treatment and Control Group*

Question	Treatment group	Control group	<i>z</i>	<i>p</i>
	(<i>n</i> = 10)	(<i>n</i> = 3)		
	Post	Post		
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)		
1	2.50 (0.70)	2.67 (0.57)	-0.29	.76
2	2.60 (0.69)	2.67 (0.57)	0.00	1.00
3	2.40 (0.69)	2.33 (0.57)	-0.28	.77
4	2.40 (1.07)	2.33 (0.57)	-0.67	.49
5	2.40 (1.07)	2.67 (0.57)	-0.10	.91
6	2.70 (0.48)	2.67 (0.57)	-0.10	.91
7	2.60 (0.96)	2.33 (0.57)	-1.24	.21
Total	1.85 (0.47)	1.95 (0.21)	-0.17	.86

Note. Item 6 and 7 were reverse coded.

3- Strongly agree, 2- Agree, 1- Disagree, 0 - Strongly disagree.

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