SELF-EFFICACY, AN ORENTIAL TWIST

This paper presents the results of a case study involving Taiwanese elementary teachers who teach science at the elementary grade school level. It advocates the position that a teacher's personal science efficacy belief influences his or her science teaching outcome expectations. It also points to an important metamorphosis that is taking place within the ranks of the elementary school system. It is believed that this transformation is related to the success Taiwan has experienced in being rated number 1 in science education (NCES 1999).

Brady M. Jack, Chia-Ju Liu, Hoan-Lin Chiu
National Kaohsiung Normal University, Taiwan

Introduction

Metamorphosis of Change

Democratic changes in Taiwan have not only brought about a shift in the way citizens view government but also in the way they view education. Moving away from an autocratic style of educational leadership and toward an egalitarian approach has paved safe communication pathways for not only parents but also educators in bringing about academic advancement and renewal. And with the enactment of the nine-year nation-wide integrated curriculum plan in 1998, the Ministry of Education (MOE) in Taiwan has encouraged teachers in Grades 1-9 toward a more innovative and creative teaching practice (MOE) in Taiwan has encouraged teachers in Grades 1-9 toward a more innovative and creative teaching practice (Education 2003). With this goal in mind, the 3rd mandate of the nine-year nation-wide integrated curriculum plan seeks to renovate teacher education and in-service training programs.

Importance of Such Change

The attention of this study focuses upon education professionals who teach science in grades 1-6. It is during these formative years of education that students are exposed to the important elementary building blocks of mathematical and scientific concepts and processes (Enochs 1990; NSB 1999; NSF 1999). Throughout Asia, researchers have discovered a lack of preparatory science instruction (Appleton 1977; Appleton 1991; Roth 1992; Appleton 1995; Appleton 2003). In Australia, Appleton discovered that large numbers of primary school teachers either avoided teaching science or taught it from a "gimmicks" approach (Appleton 1991). Appleton stated that the main problem was that very few teachers practiced engaging their students as active participants in the study of science because they felt themselves intimidated by the subject matter or inept in its teaching.

Research Questions

This study sought to answer two questions: 1) How does the personal science efficacy belief of a teacher influence his or her teaching outcome expectations? 2) What is the current state of education professionals who teach science in grades 1-6?

Theoretical Framework

Self-efficacy

Current research has discovered that teacher self-efficacy is the key toward positive student learning (Wenner 2001; Cakioglu 2003). The conceptualization of teacher efficacy has two points of origin. The first is Bandura's social cognitive theory and his construct of self-efficacy (Bandura 1977; Bandura 1997). Bandura postulates efficacy as the "belief in their [teachers] ability to have a positive effect on student learning" (Ashton 1985). The key to positively effecting student learning is the teachers' mental acceptance and conviction in his or her ability to guide and instruct.

Outcome Expectations

The second conceptualization is found in Rotter's "Locus or Control" (LOC) model (Wenner 2001; Cakioglu 2003). The LOC bipolar psychological construct theory states that an individual's beliefs "an individual's beliefs about the control he or she has over his or her life, whether internal or external, has a direct result upon achievement" (Bratton-Jeffery 1997). Spicer's article "Self-belief a First Step to Success" renamed self-efficacy to academic self-belief. She said that a student's academic self-belief needed to be matched with his or her performance abilities. Without a proper match between the two, negative effects would results (Spicer 2003). The hypothesis of this study is that a teacher's academic self-belief is directly tied to his or her outcome expectations (i.e. student achievement).

Method

Instrument Selection, Translation and Collection

In order to test the above hypothesis, the Elementary Teacher's Science Teaching Efficacy Belief Instrument (STEBI) was selected. The items in this instrument were science-specific and focused upon the elementary science classroom (Enochs 1990). These items also reflected the teacher's personal science efficacy belief (Sescale) and the teacher's science teaching outcome expectation (Oescale). The STEBI was translated into Chinese and submitted to two referees. It was checked for content accuracy and validity. After modifications, it was passed out to 30 science education graduate students. After they checked it for readability and content clarity, 150 copies were sent to grade school teachers teaching in the Kaohsiung City area. Respondents were asked to respond to 25 items by answering according to amount of agreement or disagreement. 80 questionnaires were satisfactorily completed and used in this study.

Results

Demographic Characteristics and Scale Score Analysis

After running t-tests and one-way Anova tests on these characteristics, not only showed no significant differences were found with regards to Sescale or Oescale (see *Table 1*).

Table 1: Demographic Characteristics and Scale Score Analysis

Variable	*N*	%	Mean Sescale (13 items)	Mean Oescale (12 items)
Gender:				
Male	26	32.5	2.86	2.83
Female	54	67.5	2.80	2.82
Grade:				
First	6	7.5	2.85	2.82
Second	6	7.5	2.80	2.78
Third	23	28.8	2.90	2.83
Fourth	20	25.0	2.81	2.84
Fifth	28	35.0	2.84	2.90
Sixth	29	36.3	2.69	2.70
Years Taught:				
1 – 5	24	30.0	2.85	2.82
6 – 10	19	23.8	2.80	2.78
11 – 15	10	12.5	2.90	2.83
16 – 20	11	13.8	2.81	2.84
21 – 25	11	13.8	2.84	2.90
26 – 30	3	3.8	2.51	2.72
>30	2	2.5	2.69	2.70

Discussion

Item Correlation Analysis (self-efficacy & expected outcome)

A 2-tailed Pearson's Correlation was conducted on 6 areas: years of teaching experience (YTE), years of teaching science (YTS), hours of teaching science weekly (HSW), science background (SBKD), Sescale, and Oescale (see table 1). This table reveals an inverse relationship between 2 kinds of teacher: Group 1) a more experienced and less educated in science education and Group 2) a less experienced and more educated in science education.

Table 2: Correlations: N = 80

	Age	Gender	YTE.	YTS.	HSW.	SBKD.	Sescale	Oescale
Age		-.009	.772(**)	.559(**)	.309(**)	-.199	-.016	.94
Gender			.167	.137	-.063	-.267	-.149	-.009
YTE.				.666(**)	.220	-.290(**)	-.169	.016
YSI.					.147	-.227(*)	.008	-.077
HSW.						-.043	.186	.176
SBKD.							.268(*)	.108
Sescale								.518(**)

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Group 1 - findings

In table 2, the older (.309) or more years of teaching experience (.220) a teacher had increased his or her number of science teaching hours per week. The teachers who were older and more experienced reflected a lower amount of science training background (-.199), a lower self-belief (confidence / efficacy) in teach science (-.016), and a lower student expectations (.094).

Group 2 - findings

The younger less experienced teachers had a greater background in science education (-.227*) and greater outcome expectations of their students (-.077). The significance of this finding reveals that universities are requiring elementary education majors to take more science education related classes. The data also showed that those had more of a science background taught fewer hours of science (-.043).

Conclusion

The data (.518**) in table 2 clearly shows that personal science efficacy belief directly affects teaching outcome expectations. It also revealed that there is a significant transition taking place among elementary teacher education programs in Taiwan universities. These universities are producing elementary teachers who are confident and highly motivated in their teaching of science. The data also revealed that there needs to be a greater 'Changing of the Guard' within Taiwan's elementary school system. More hours of science instruction need to be handed over to those who have a greater science education background.

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