Science Teaching Self-Efficacy and Outcome Expectancy Beliefs of Secondary School Teachers in UAE

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Abstract: The purpose of this study was to determine the effect of three levels of subject matter taught, three levels of years of experience, and two levels of gender on two levels of self-efficacy beliefs, namely, personal science teaching efficacy belief, and science teaching outcome expectancy belief. Data for this study was collected from 230 secondary science teachers employed within various school zones in UAE. The participants' responses on both dimensions of the in-service STEBI-A scale were used to collect data. Using a series of Kruskal-Wallis one way ANOVA and Mann-Whitney statistics revealed no significant differences in PSTE scores on levels of subject matter taught, years of teaching experiences and gender. However, the findings revealed only significant differences in STOE scores between the three levels of years of experiences.

Keywords: *teachers' self- efficacy beliefs, subject matter taught, years of experience, gender*

Introduction

In United Arab Emirates (UAE) and many other countries worldwide, ongoing curriculum reforms aim to revise the traditional approach of science learning as a mastery of factual knowledge and procedures to an inquiry approach of learning where students are expected to be engaged in methodological learning by discovering scientific concepts and developing the processes of problem solving. In order to bring about such important reform in science education requires that teachers possess certain beliefs about themselves, science learning, and science teaching that depart significantly from the realities of current school science practices. One possible reason that makes some teachers are not able to change their traditional models while others accept reform practice and change the environment of their science classroom is that these teachers have different beliefs about teaching and learning. That is, they have different teaching efficacy beliefs which can be considered an integral and essential aspect of the teaching process. As Czerniak and Lump (1996) noted, science teachers

of high self-efficacy belief adopt more student- center strategies than teachers of low self- efficacy who adopt teacher- centered strategies.

The construct of teachers' self- efficacy belief has gained the attention of many educators in the last three decades (Chan, 2008; Tschannen-Moran & Woolfolk Hoy, 2007; Yeo, Ang, Chong, Huna, & Quek, 2008). Science educators, as well, have begun to recognize the importance of examining science teachers' self-efficacy beliefs. Various studies have examined prospective and practice science teachers' self- efficacy beliefs about student learning, classroom instruction, and teacher education preparation programs (Baldwin, Ebert-Mary, & Burns, 1999; Britner & Pajares, 2006; Luft, Roehrige, & Patterson, 2003; Ritchie & Rigauc, 2002; Settlage, Southerland, & Ceglies, 2009). Generally, teachers' self-efficacy refers to "the effort teachers invest in teaching, the goal they set, their persistence when things do not go smoothly, and their resilience on the face of setbacks" (Tschannen – Moran, & Woolfolk Hoy, 2007, p.944). In science education perspective, however, science teaching efficacy is defined as a "teacher's belief that he or she has the ability to teach science effectively and to affect student achievement" (Riggs, 1988 as cited in Ramey-Gassert, Shroyer & Staver ,1996, p 284).

As Bandura (1977) proposed, self-efficacy belief is an assessment of one's ability to attain a desired performance in a given situation or context; Thus, "some situations require greater skills and more arduous performance, or carry greater risk of negative consequences than others" (Bandura, 1986, p.411). That is, a teacher may feel very competent in teaching a certain subject and feel less competent in teaching another subject (Tschannen – Moran, Woolfolk Hoy, & Hoy, 1998).This idea has important implication for research in secondary school science teachers' self- efficacy. Secondary school science teachers work with different classes that vary in size, students ability levels, subject matter to be taught and many other factors. Therefore, it is expected that these factors may affect their self-efficacy beliefs. With respect to subject matter to be taught, for example, teaching physics is different from teaching biology or chemistry. This is simply because each subject has its own epistemological bases that require different teaching strategies methods and skills (Lawson, 1994). Thus, it could be difficult to teach Physics than to teach Biology or Chemistry to secondary school students. In such a situation, it may be that physics teachers' self- efficacy is different from biology or chemistry teachers' self- efficacy and this what the current study aims to find out.

Understanding how teacher efficacy can develop and evolve overtime is important to teacher educators as they seek to prepare and support teachers in ways that help them stay in the profession.

Woolfolk- Hoy and Spero (2005) observed that the first year of teaching is an important context for the development of teacher efficacy. Although much has been reported on self- efficacy and teaching, little attention has been given to the relationship between years of teaching experience and teaching efficacy beliefs (Tschannen-Moran et al., 1998). Studies in this area are inconsistent. While one study found that expert teachers (i.e., those who are at later stages in their career) had a lower self-efficacy compared to novice teachers (Brown & Gibson, 1982), another found no difference across career stages among outstanding teachers (Pigge & Marso, 1993). A third study, however, found that teachers with more teaching experience and higher levels of education had higher levels of both personal and general teaching efficacy (Hoy & Woolfolk, 1993). Further investigation of the progress of efficacy beliefs throughout the span of teachers' career would be useful.

In other parts of the world, few research studies compared the efficacy beliefs of novice versus experienced teachers. Campbell (1996) compared the teacher efficacy beliefs of pre-service and in-service teachers in Scotland and USA and found that the in-service teachers obtained significantly higher scores on teacher efficacy than their pre-service counterparts in both countries. In particular, experienced teachers (more than 10 years' experience outperformed novice teachers (zero to three years' experience), and so did older teachers (over age forty) when compared to the younger teachers (below age twenty-five).

In a study conducted in Singapore, Wilson and Tan (2004) examined the efficacy beliefs of elementary school teachers, and they found that teachers with more than twenty years' teaching experience had a great sense of efficacy than those with less than twenty years of teaching experience. In a recent study in Spain, de la Torre Cruz and Arias (2007) compared self- efficacy beliefs of pre-service and in-service teachers who have on average fifteen years' experience. The finding revealed that experienced teachers had a higher teacher efficacy than prospective teachers. Although the above studies were conducted in different parts of the world, to date, no study investigated the relationship between teachers' experience and their self- efficacy beliefs in UAE context.

Similarly, a number of research studies have devoted to the relationship between teacher gender and their efficacy. A major goal of such research is to understand how teachers' self- efficacy beliefs are related to gender. Bandura (1986) argued that self-efficacy is related to gender role- playing because it is a key motivational factor that underpinned gender behavior. In the field of mathematics and science, research has shown that males and females have different experiences and differences in their self-efficacy throughout their education

(Simpkins, Davis-Keen, & Eccles, 2006; Wright & Holttum, 2010). According to Pajares (2005) there appears to be a developmental trend in which females' confidence in their math and science ability becomes significantly lower than males' confidence in their math and science ability as they get older. Additionally, there is a difference between males and females' view regarding their future performance in mathematics and science related careers. Findings suggest that females' perceive their success in mathematics and science courses to be lower than males, and consequently, fewer women choose to major in fields related to mathematics and science once they reach college or even after graduation from college (Betz & Hackett, 1997; Britner & Pajares, 2001; Britner & Pajares, 2006; Pajares, 1997, Kupermintz, 2002; Lau & Roeser, 2002; Rayburn, 2009; Zeldin, Britner, & Pajares, 2008).). Thus, teachers' efficacy beliefs are important component for understanding gender differences in experiences related mathematics and science education.

Much of the research about gender differences in science education has addressed the differences between males and females on issues, such as teachers' leadership positions, classroom behavior, teaching expectations and practices, students participation and achievement gabs (Baker, 2002; Brickhouse, Lowery, & Schultz, 2000; Brotman & Moore, 2008; Kahle, 2004; Scantebury, & Bakerf, 2007). Little work has specifically considered gender differences in science teachers' self-efficacy, as viewed from secondary school science teachers themselves, especially in UAE. The present study tried to attend to gaps that have been untouched by the above reviewed research studies by exploring teachers' self efficacy as it relates to the subject matter they teach, their teaching experience, and their gender.

Theoretical Frame work

The present study draws upon Bandura's construct of self-efficacy belief which is defined as "judgments of how one can execute courses of actions required to deal with prospective situations (Bandura, 1982, p. 122). According to Bandura (1977, 1997), studies of teachers' efficacy beliefs have been based on two separate dimensions: the first is personal efficacy, and the second is outcome expectancy. Bandura (2006) made it clear that self-efficacy beliefs differ from outcome expectancy beliefs. Self- efficacy belief is a "judgment of capability to execute given type of performance; outcomes expectancies are judgment about outcomes that are likely to follow from such performance" (p. 309). In this research study, we think it is beneficial to keep this distinction between the two dimensions. In this study self-efficacy is viewed as the person's belief about his/her ability to perform certain behavior, while outcome expectancy belief is viewed as the

belief that the behavior may result in certain positive outcomes (Dellinger, Bobbett, Olivier, & Ellett, 2008;Tosun, 2010). However, the two dimensions are not related (Bandura, 2006).

The present study argues that in the field of education, teaching efficacy belief is what teachers think about their ability to teach (personal teaching efficacy), and to have students learn (teaching outcome expectancy) (Ramey-Gassert, Shroyer, & Staver,1996). Thus, teaching self- efficacy beliefs involve both outcome expectations for students and belief in personal teaching abilities. These two dimensions of teaching efficacy affect and are affected by many teacher characteristics and behavior such as years of experience, gender, and academic subject matter taught to students.

Riggs and Enochs (1990) showed that teachers with higher sense of personal science teaching efficacy are more likely to exert great effort to achieve their teaching objectives, will persist longer in the face of obstacles when compared to those who have lower sense of personal science teaching efficacy. In contrast, science teaching outcome expectancy describes the science teachers' perceptions that certain action will produce particular outcomes (Bandura, 1997). Those who have higher levels of science teaching outcome expectancy would indicate the confidence that effective teaching could overcome factors that might compromise student learning compared to those who have low science teaching outcomes expectancy (Settlage, et al, 2009).

As Bandura argued, individuals' efficacy beliefs are subject specific, therefore the present study focuses on science teaching efficacy beliefs of secondary school teachers. Secondary school science teachers' teaching efficacy beliefs can be defined as a combination of their confidence in their ability to teach science using effective methods of teaching, personal science teaching efficacy [PSTE] belief and the belief that student learning of science can be influenced when these effective teaching methods are employed, science teaching outcome expectancy [STOE] beliefs (Bayraktar, 2011).

Purpose

The purpose of this study was to determine the effect of three levels of subject matter taught, three levels of years of experience, and two levels of gender on two levels of self-efficacy beliefs, namely, personal science teaching efficacy belief, and science teaching outcome expectancy belief. Specifically, we attempted to answer the following three questions: (1) Do subject matter taught significantly impact secondary school science teachers' performance on the Personal Science Teaching efficacy Belief Subscale (PSTE) and the Science Teaching Outcome Expectancy Subscale (STOE)?, (2) Do years of teaching experience significantly impact secondary school science

teachers' performance on the Personal Science Teaching efficacy Belief Subscale (PSTE) and the Science Teaching Outcome Expectancy Subscale (STOE)?, and (3) Do gender significantly impact secondary school science teachers' performance on the Personal Science Teaching efficacy Belief Subscale (PSTE) and the Science Teaching Outcome Expectancy Subscale (STOE)?

Method

Context of the study

This study is based on UAE context with diverse teacher population of different preparation and experience background. UAE as a country can be regarded as an affluent society with high level of living standards. Education generally receives a generous annual budgetary consideration to cater for resources and teaching and learning operations. UAE policy makers have recognized the need for high quality education in order to maintain the country's progress. In recent years a number of initiatives have been introduced not only to develop modern and student centered curricular but also teacher training programs to guarantee the supply of quality teachers to teach these curricular. The teaching as a profession attracts highly qualified expatriate teachers in addition to those locally trained. Because of the attractive employment conditions, most teachers are highly qualified and motivated to work and help students learn. Considering these contextual circumstances, it is important to explore the influence of teachers' self efficacy on their practice.

Participants

The participants of this study consisted of a convenient sample of secondary (Years10-12) school science teachers employed within various school zones of Abu Dhabi Education Council (ADEC) in UAE. ADEC is the largest educational council in UAE tasked with providing quality education to students within the Emirate of Abu Dhabi. The sample consisted of 230 science teachers selected as a result of their agreement to participate in the study. Table 1 shows the characteristics of the sample for the variables studied. The first set of variables described the teachers' area of specialization (i.e., Physics, Biology, and Chemistry), the second set of variables described the teachers' years of experience (i.e., 1-5 years, 6-10 years, and more than 10 years), and the final set of variables described the teachers' gender.

Table1
Sample Characteristics and Descriptive Statistics of the Teachers Variables

Variable	N	%
Area of Specialization		
Biology	77	33.5
Physics	77	33.5
Chemistry	76	33
Years of Experience		
1- 5 Years	65	28.3
6- 10 Years	65	28.3
More than 10 Years	100	43.5
Gender		
Males	99	43
Females	131	57

Instrument and Procedures

The study employed a modified version of a commonly known instrument, Science Teaching Efficacy Belief Form A (STEBI- A) developed by Riggs & Enochs, (1990). The instrument used in this study consists of two parts. The first part includes questions regarding science teachers' demographic variables (gender, subject matter taught, and years of teaching experience). The second part is a scale that measures Science Teaching Efficacy Belief (Riggs & Enochs, 1990).The researchers used STEBI-Form A to measure self- efficacy and outcome expectancy because all participants were practicing science teachers. STEBI-A consists of 25- item, 5 point Likert type format ranging from strongly agree to strongly disagree. 13 items were stated positively and 12 items were worded negatively. STEBI-A includes two subscales. The first subscale asks teachers to respond to items regarding their beliefs about their own ability to teach science, i.e. their Personal Science Teaching Efficacy Belief (PSTE). The second subscale asks teachers to respond to items concerning their anticipation of the results of teaching science, i.e., their Science Teaching Outcome Expectancy (STOE). STEBI-A is a commonly used measure of science teachers' efficacy beliefs (Desouza, Boon, &Yilmaz, 2004; Palmer, 2006; Riggs & Enochs, 1990; Rubeck & Enochs, 1991). Riggs & Enochs (1990) conducted a reliability analysis and produced an alpha coefficients of 0.92, and 0.77 for its subscales PSTE and STOE (pp.630-631). A factor analysis that conducted by both researchers showed that in both scales all the 25 items loaded highly within their own scale. For the present study, all the items of the STEBI-A were reviewed for clarity and suitability for the United Arab Emirates context. As such some of the items were reworded without changing the original intended meanings. The final version of the instrument with

its two subscales generated scores that had alpha reliability coefficient of 0.82 for PSTE subscale and 0.78 STOE subscale.

The researchers sent the survey to the participants in a paper format. All data collected from the survey was kept in complete confidence and all responses were completely anonymous. The participants answered the demographic questions first. These questions provided the independent variable data while the responses to the twenty five items provided the dependent variable data for the causal comparative research design.

Design

To answer the research questions of this study, a causal comparative research design was used (Gay, Mills, & Airasian, 2009, p. 218). This design is used to examine the effect of the independent variables (i.e. Subject matter taught, years of teaching experience, and gender) on the PSTE, and STOE scores. The causal comparative research design is appropriate in this case because the independent variables of interest cannot be manipulated experimentally with the participants of the study.

Data Analysis

The statistical analyses for the data obtained from the STEBI-A two subscales in the study included the Mann-Whitney *U* test and the Kruskal-Wallis One Way Analysis of Variance. These two tests are appropriate data analysis procedure when the assumptions of the parametric statistics were violated or the data are ordinal in nature as is the case in the current study (Field, 2009). If the results of the Kruskal-Wallis One Way Analysis of Variance are significant, a Mann-Whitney *U* follow-up analysis is used. The .05 level was used for all statistical tests.

Results

Results of the study were presented in ways to respond to the research questions as follows:

1**:** Do subject matter taught significantly impact secondary school science teachers' performance on the Personal Science Teaching efficacy Belief Subscale (PSTE) and the Science Teaching Outcome Expectancy Subscale (STOE)?

The first question dealt with evaluating the differences among Biology, Physics, and Chemistry teachers' perceptions of their personal science teaching efficacy, and outcome expectancy beliefs. Regarding personal science teaching efficacy beliefs, the mean rank for Biology teachers, Physics teachers, and Chemistry teachers are respectively 122.93, 101.72, and121.93. The Kruskal-Wallis χ^2 test is not significant beyond the .05 level: χ^2 (2, N = 230) = 4.99, p= .08, and η^2= .02 which

in Cohen's classification, is a small effect (Table 2 and Table 3).That is, the proportion of variability in the ranked dependent variable (Personal Efficacy belief) accounted for by the independent variable (subject matter taught) was .02, indicating a low relationship between the subject matter taught and teachers' perceptions of their personal science teaching efficacy beliefs.

Table 2
Mean Ranks for Teachers' Perceptions of Their Personal and Outcome Expectancy Beliefs by the Subject Matter Taught, Years of Teaching Experience, and Gender

	Personal Efficacy		Outcome Expectancy	
	N	Mean Rank	N	Mean Rank
Subject Matter Taught				
Biology	77	122.93	77	118.46
Physics	77	101.72	77	119.94
Chemistry	77	121.93	77	108.00
Total	230		230	
Years of Experience				
1- 5 Years	65	114.18	65	110.08
6- 10 Years	65	127.47	65	133.99
More than 10 Years	100	108.58	100	107.00
Total	230			230
Gender				
Males	99	109.99	99	114.07
Females	131	119.66	131	116.58
Total	230		230	

Table 3
Kruskal-Wallis Tests for the Three Independent Variables: Subject Matter Taught, Years of Teaching Experience, and Gender

	Subject Matter Taught		Years of Teaching Experience		Gender	
	PE	OE	PE	OE	PE	OE
Total	230	230	230	230	230	230
Test Statistics (χ^2)	4.99	1.47	3.22	7.19*	1.19	0.08
df	2	2	2	2	1	1
Asymp.Sig.	.08	0.48	0.2	.03	0.3	0.8

Note, PE= Personal Science Teaching Efficacy Belief and OE= Outcome Expectancy Belief.
$p \leq .05$

As for science teaching outcome expectancy, the mean rank for Biology teachers, Physics teachers, and Chemistry teachers are respectively 118.46, 119.94, and 108. The Kruskal-Wallis χ^2 test is also not significant beyond the .05 level. χ^2 (2, N = 230) = 1.47, p≥ .05, and η^2= .01which in Cohen's classification, is a small effect. That is, the proportion of variability in the ranked dependent variable (outcome expectancy belief) accounted for by the independent variable (subject matter taught) was .01, indicating a low relationship between the subject matter taught and teachers' perceptions of their science teaching outcome expectancy (Table 2 and Table 3).

2**:** Do years of teaching experience significantly impact secondary school science teachers' performance on the Personal Science Teaching efficacy Belief Subscale (PSTE) and the Science Teaching Outcome Expectancy Subscale (STOE)?

The second question dealt with evaluating the differences among secondary science teachers who have different teaching experiences regarding their perceptions of their personal science teaching efficacy and outcome expectancy beliefs. Regarding personal science teaching efficacy, kruskal-Wallis test was conducted to analyze these teachers' responses. As it is clear from Table 2 the mean rank of teachers who have from 1 to 5 years of teaching experience is 114.18, for those who have from 6 to 10 years of teaching experience is 127.47, and for those who have more than 10 years of teaching experience is 108.58. The Kruskal-Wallis χ^2 test is not significant beyond the .05 level: χ^2 (2, N = 230) = 3.22, p= 0.2 and η^2= .01 (Table 3) which in Cohen's classification is a small effect. That is, the proportion of variability in the ranked dependent variable (Personal Science Teaching Efficacy Belief) accounted for by the independent variable (years of teaching experience) was .01, indicating a low relationship between the years of teaching experience and teachers' perceptions of their personal science teaching efficacy beliefs.

Regarding science teaching outcome expectancy beliefs, the data in Table 2 show that the mean rank of the different levels of teaching experience are respectively 110.08, 133.99, and 107. The Kruskal-Wallis χ^2 test is significant beyond the .05 level. χ^2 (2, N = 230) = 7.11, p= .03, and η^2= .03 (Table 3) which in Cohen's classification, is a small effect. That is, the proportion of variability in the ranked dependent variable (outcome expectancy belief) accounted for by the independent variable (years of teaching experience) was .03, indicating a low relationship between years of teaching experience and teachers' perceptions of their science teaching outcome expectancy beliefs. Follow-up tests using Mann-Whitney statistics were conducted to evaluate pairwise differences among the three groups' perceptions of the teaching science outcome expectancy beliefs (1-5 years, 6-10 years,

and more than 10 years of teaching experience), controlling for Type I error across tests by using the Bonferroni adjustment of the level of significance. The adjusted level of significance is .017. Table 4 shows the mean ranks for teachers' perceptions of their personal and outcome expectancy beliefs by years of teaching experience. As shown in Table 5The results of the follow up tests indicated a significant difference between the 6 to 10 years of teaching experience group and the more than 10 years of teaching experience group (U= 2489, p= 01). However, there is no statistical significance between the 1- to 5 years of teaching experience group and the more than 10 years of teaching experience group (U= 3165, p= .8). In addition, there is no statistical significance between 1- to 5 years of teaching experience group and the 6-to 10 years of teaching experience group (U= 1767, p= .04).

Table 4

Mann-Whitney Mean Ranks for Teachers' Perceptions of Their Personal and Outcome Expectancy Beliefs by Years of Teaching Experience

	Personal Efficacy		Outcome Expectancy	
	N	Mean Rank	N	Mean Rank
Years of Experience				
1- 5 Years	65	61.99	65	58.78
6-10 Years	65	69.01	56	72.22
Years of Experience				
1- 5 Years	65	85.18	65	84.30
More than10 Years	100	81.58	100	82.16
Years of Experience				
6- 10 Years	65	91.46	65	94.78
More than10 Years	100	77.50	100	75.35

Table 5

Man-Whitney Pair-wise Comparisons of the Differences in years of experience

	Years of Experience (1- 5 Years vs. 6- 10 Years)		Years of Experience (1-5 Years vs. More than 10 Years)		Years of Experience (6-10 Years vs. More than 10 Years)	
	PE	OE	PE	OE	PE	OE
Mann- Whitney	1884.5	1676	3108	3165.5	2700	2484.5
Wilcoxon W	4029.5	3821	8158	8215.5	7750	7534.5
Z	-1.06	-2.04	-.48	-.28	-1.84	-2.56
Asymp.Sig.	.29	.04	.64	.78	.06	.01*

Note, PE= Personal Science Teaching Efficacy Belief and OE= Outcome Expectancy Belief.

*p≤ .02

3: Do gender significantly impact secondary school science teachers' performance on the Personal Science Teaching efficacy Belief Subscale (PSTE) and the Science Teaching Outcome Expectancy Subscale (STOE)?

The third question dealt with exploring whether there was a significant difference between male and female teachers' personal science teaching efficacy and science teaching outcome expectancy belief. As for personal science teaching efficacy- beliefs, a Kruskal-Wallis test was conducted. As is clear from Table 2, the mean rank for male teachers is 111.11 and the mean rank of female teachers' is118.82. The Kruskal-Wallis χ^2 test is not significant beyond the .05 level: χ^2 (1, N = 230) = 0.76, p= 0.3, and η^2= .003 which in Cohen's classification, is a very small effect (Table3).That is, the proportion of variability in the ranked dependent variable (Personal Science Teaching Efficacy belief) accounted for by the independent variable (gender) was .003, indicating a low relationship between gender and teachers' perceptions of their personal science teaching efficacy beliefs.

Another Kruskal-Wallis test was conducted to evaluate the difference between male and female teachers' science teaching outcome expectancy beliefs. As shown in Table 2 the mean rank for male teachers is 114.06 and for female teachers is 116. 58. The Kruskal-Wallis χ^2 test is also not significant beyond the .05 level. χ^2 (1, N = 230) = .08, p= 0.8, and η^2= .001which in Cohen's classification, is a very small effect (Table 3). That is, the proportion of variability in the ranked dependent variable (science teaching outcome expectancy belief) accounted for by the independent variable (gender) was .001, indicating a low relationship between gender and teachers' perceptions of their science teaching outcome expectancy beliefs.

Discussion

The present study set out to examine the self- efficacy beliefs of secondary school science teachers along two dimensions: personal science teaching efficacy and science teaching outcome expectancy beliefs in relation to their teaching experiences, subject matter taught, and gender. In answering the first question, "Do subject matter taught significantly impact secondary school science teachers' performance on the Personal Science Teaching efficacy Belief Subscale (PSTE) and the Science Teaching Outcome Expectancy Subscale (STOE)? The results revealed no statistical significant differences between the mean ranks of biology, physics and chemistry teachers on both dimensions. In addition, the low effect size shows weak relationships between the perceptions of the three groups of teachers and the tow dependent variables. These results are in disagreement with the results of other

studies such as, Ross, Cousins, Gadalla, & Hannay, (1999), Rubeck & Enochs (1991), Tschannen-Moran et al. (1998). Ross et al. (1999) found that the subject specialization of teachers accounted for 5% of the variation in self-efficacy beliefs. Although it is considered a small variation, the finding was significant. Rubeck and Enochs (1991) study indicated that science teaching self- efficacy was significantly different from and higher than chemistry teaching self-efficacy. The study of Tschannen-Moran et al. (1998) showed that teachers' efficacy beliefs differ from one area of study to another area. These differences could be due to lack of resources which is not the case in this study. As Bandura (1986) argued, perceived self-efficacy will not be clear if external factors such as lack of resources, supplies, poor facilities, class size are not taken care of. In the present study, all the participants work with Abu Dhabi Educational Council (ADEC) which provides schools with the needed resources to teach subject matter well. ADEC has the same school policy for all schools under its supervision; school has almost the same class sizes, the same facilities and laboratories to teach science. Taking together the similarities in the schools, it may be a reason that enhances the teaching act of our sample with such similar self efficacy levels.

With regard to science teaching outcome expectancy beliefs, despite the insignificant results of the present study, it was found that the mean ranks of biology and physics teachers are higher than the mean rank of chemistry teachers. That is both biology and physics teachers have higher science teaching outcome expectancy beliefs than chemistry teachers. This means that teachers with high outcome expectancy feel more responsible toward their students' learning than those with less outcome expectancy beliefs (Riggs & Enochs ,1990; Tschannen-Moran & Hoy, 2001). As Gibson and Dembo (1984) indicated, teachers who have high outcome expectancy criticize students less than low outcome expectancy teachers, deal with students until they respond correctly before dealing with other students, and communicate high expectations to their students.

The second research question explores the effect of three levels of science teaching experience on both construct: personal science teaching efficacy beliefs and science teaching outcome expectancy beliefs. Regarding the personal science teaching efficacy beliefs the result show that there is no statistical significance differences between the mean ranks of the three levels of teaching experience. The results of the present study are consistent with the findings of Pigge and Marso (1993), Raudenbush, Rowan, and Cheong (1992), and Ross et al. (1999). These researchers found those teachers' background variables such as years of teaching experience and gender did not significantly predict the changes in self- efficacy beliefs. The findings of the present

study also are inconsistent with those of Campbell (1996), Hoy and woolfolk-Hoy (1993), Palmer (2006, 2011), Tschannen-Moran and Woolfolk-Hoy (2007), Wilson and Tan (2004), Woolfolkl- Hoy and Spero (2005), Yeo et al. (2008). These studies indicated that highly experienced teachers had higher self-efficacy beliefs compared to less experienced teachers.

The results of the present study indicate that teaching experience does not have an effect on teachers' perceptions of their personal science reaching efficacy beliefs. One possible reason for these results are that personal science teaching efficacy could be related to several antecedent variables, such as successful pre-service preparation, professional development experience, interest in science and science teaching, family and community support, and effective communication in and out of school (Ramey-Gassert et al., (1996) that cannot be controlled in a survey study like the present study. A second possible reason for the lack of significant differences between the three levels of science teaching experience that years of teaching experience as a demographic variable came as a general question in the survey and not directly connected to the years of teaching specific science subject such as years of teaching biology or chemistry or the number of years of teaching experience in the same school. It might be better to use a more focused subject specific question that might help triggering the appropriate responses from the participants. .

Regarding science teaching outcome expectancy, the findings of this study show that there are statistical significance differences between the mean ranks of the three levels of teaching experience. The follow up statistical analysis revealed that there is a statistical significance difference between the group that has 6-10 year and the group that has more than 10 years of teaching experience. The results for the other two comparisons (1-5 years vs. 6-10 years and 1-5 years vs. more than 10 years) show no statistical significance differences. These findings are partially in agreement with the findings of Coladarci and Breton (1997), Desouza et al. (2004), Lin, Gorrell, and Taylor (2002), Tschannen-Moran and Woolfolk-Hoy, (2007), and Taimalu and Õim (2005). These studies' findings revealed that the extent of years of teaching experiences is negatively related to teaching outcome expectancy beliefs; low experience teachers had the highest outcome expectancy beliefs compared with the highest experience teachers. Based on these findings and the findings of the present study , it could be argued that this inconsistency may be caused by less experienced teachers' enthusiasm and effort to help their students to achieve more, or that less experienced teachers' lack of awareness of the difficulties associated with the teaching subjects such as Biology, Chemistry and Physics. Later on when they gain more experience as a science

teachers, they understand that teaching is not an easy task, and they become aware of the many factors that affect their student achievement (e.g., students' ability, the science curriculum offered in the school, the school facilities and resources).

The third research question explores the gender effect on both personal science teaching efficacy and teaching science expectancy beliefs. The findings indicated no statistical significant differences between males and females mean ranks on both scales. These finding is in disagreement with the finding of Betz and Hackett (1997), Lent, Brown, Gover, and Nijjer (1996), Pintrich and De Groot (1990), Wigfield, Eccles, Maclever, Reuman, and Midgley (1991), and Wright and Holttum (2010). These studies indicated that males had higher science self-efficacy beliefs than females while the present study found no differences among both males and females teachers in their personal science teaching efficacy and science teaching outcome expectancy. Based on the literature of the previous studies, one possible explanation of the high efficacy beliefs of men could be attributed to societal perception rather than a reflection of women's abilities. That is, in an environment where men are shown to be better at science than women, women tend to feel insecure, less able and less confident at science. Thus, they will not get involved in science related career. In fact this is not the case in UAE where female teachers work in female schools (female- dominated academic environment) and male teachers work in male schools (male-dominated academic environment). As Eisenberg, Martin, and Fabes (1996) claimed, there is some evidence in recent years that the gap between males and females success in doing science have dramatically decreased. There is also evidence that the differences between male teachers and female teachers in self- efficacy beliefs can be minimized or eliminated when teachers derive clear performance information about their capabilities or progress in their career (Schunk & Pajares, 2002). It could be that female teachers in our sample understand that academic success is a matter of effort, desire and commitment rather than of gender differences.

Conclusion and Recommendations

The conclusions drawn from the findings of the present study can be summarized as follows: First, The personal science teaching efficacy (PSTE) and the science teaching outcome expectancy (STOE) of secondary science teachers do not differ according to subject matter taught (Biology, Physics and Chemistry). That is, biology, physics, and chemistry teachers have the same feeling of efficacy beliefs regarding teaching subjects' content knowledge and pedagogical content knowledge that promote effective science teaching and learning. However, further research may be conducted to investigate the effect of

the educational background of the present study participants on their PSTE and STOE. Future research studies may focus on answering questions related to teachers' qualifications and how the level of qualifications such as bachelor or master degrees could impact the level of self efficacy beliefs of teachers. A second conclusion that can be drawn is that years of teaching experience had an effect on UAE secondary science teachers' perception of their science teaching outcome expectancy (STOE), but not for personal science teaching efficacy belief (PTOE). These findings emphasize the need to provide continuous support and professional development programs for all teachers regardless of their teaching experiences so that they can maintain and develop a strong sense of efficacy belief as well as teaching strategies and skills. Third, although most of the research in the field of science teaching efficacy belief found differences between males and females, the results of this study found no difference between males and females regarding personal science teaching and science teaching outcome expectancy. It is clear that female teachers were as confident as male teachers when teaching subject content knowledge. This confidence in their subject content knowledge was a strong influence on their perceptions of self-efficacy. Nevertheless, the findings of this study may encourage science educators, educational leaders and researchers to work towards improving science efficacy beliefs among secondary school science teachers, especially female teachers. This can be done by providing female teachers with adequate professional development programs in both science content and pedagogical content knowledge and skills.

However, in interpreting the findings of this study, the following limitations should be considered: First, only secondary school science teachers were included in this study, and as such the findings can only be interpreted in relation to the secondary school context. Personal science teaching efficacy beliefs and outcome expectancy beliefs can be an issue for science teachers in elementary and preparatory schools in UAE when teaching science classes. It should be noted that factors affecting personal science teaching efficacy beliefs and outcome expectancy beliefs for specialist secondary science teachers are not the same as those of elementary and preparatory science teachers. Therefore, further research is needed on the differences between science teachers' beliefs across grade levels. Second, the sample of the present study is not truly representative of the secondary science teacher population at UAE in that more teachers in the high experience group (more than 10 years of experience) and female teachers were involved in the study. Therefore, it will be helpful to examine these PSTE and STOE with much larger and more representative sample. Third, data in the present study were collected

only through a questionnaire, no intervention, or classroom observations were made, but they should be considered in future research for more in depth understanding of how PSTE and STOE may impact teachers' practice. Fourth, the study did not obtain enough demographic information on variables such as teachers' professional qualifications, number and type of science courses taken, amount of time spent on teaching science in secondary school level. Thus, further studies are needed to explore the effect of such variables on PSTE and STOE. Fourth, the present study did not focus on the sources of efficacy beliefs. It seems important that sources that may influence self efficacy beliefs such as vicarious experience, physiological and contextual factors being studied with science teachers in secondary schools at UAE. These sources may affect the teachers' STOE and PSTE beliefs. Finally, as an extension of the present study, it is important to examine how secondary science teachers' PSTE and STOE affect their students' achievement in science. In UAE, further studies are needed to explore the relationship between Teachers' PSTE and STOE efficacy beliefs and behavior as related to student achievement.

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