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A Study on School Performance in Terms of Some Teacher Characteristics

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ABSTRACT

One of the important factors that affect student achievement is teacher characteristics. Therefore, there exists much research that investigates the relationship between student achievement and teacher characteristics in the literature. However, none of the research examines all characteristics of a qualified teacher together. The relevant literature generally focuses on the characteristics that are easy to measure. The purpose of this study is to investigate the relationship between some teacher characteristics and student achievement based on the TIMSS 2011 data set on Turkey.

In this study, the data set on Turkey is analyzed by dividing the schools into three groups as low-, middle- and high-performing schools according to the mean science achievement of students instead of utilizing the TIMSS benchmarks. So that, it is investigated whether teacher characteristics vary by school level. This study utilizes the International Database (IDB) analyzer which is a plug-in for the SPSS, and developed by the IEA Data Processing and Research Centre.

As a result of the analysis, it is seen that students whose teachers have an experience of at least 10 years have higher mean achievement in science, and that students at high-performing schools have teachers with an experience of at least 10 years across Turkey. The rate of students whose teachers feel satisfied with their profession is higher in Turkey than the TIMSS average. Moreover, it is revealed that the mean achievement of students whose teachers feel satisfied with their profession is higher than the others at middle- and high-performing schools. The rate of students whose teachers have participated in professional development activities in various topics is significantly higher at high-performing schools. However, this rate is remarkably below the TIMSS average. At the fourth-grade level, teachers feel confident about "applying various problem solving strategies" and "providing challenging tasks for capable students". At the eighth-grade level, on the other hand, they feel less confident about "providing challenging tasks for capable students".

Keywords: Science achievement, Teacher self-confidence, teacher experience, teacher career satisfaction, teacher professional development.

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Bazı Öğretmen Özellikleri Açısından Okulların Fen Performanslarının İncelenmesi

ÖZ

Öğrenci başarısını etkileyen önemli faktörlerden biri öğretmenin niteliğidir. Bu nedenle literatürde öğrenci başarısı ile öğretmen niteliği arasındaki ilişkileri inceleyen pek çok çalışmaya rastlamak mümkündür. Bununla birlikte nitelikli öğretmen özelliklerinin tümünü birden ele alan bir çalışmaya da rastlanmamaktadır. İlgili literatür genellikle daha kolay ölçülebilen öğretmen niteliklerine odaklanmaktadır. Bu çalışmada da TIMSS 2011 datasından elde edilen Türkiye data setini kullanarak, öğretmen niteliğine ilişkin bazı özellikler ile öğrenci başarısı arasındaki ilişkinin incelenmesi amaçlanmıştır.

Türkiye datası TIMSS tarafından kullanılan ölçütler yerine, okullar öğrencilerin fen başarı puan ortalamaları bakımından alt, orta ve üst düzey okullar olmak üzere üçe ayrılarak incelenmiştir. Böylece farklı başarı düzeyinde yer alan okullarda görev yapan öğretmenlerin özelliklerinin farklılaşıp farklılaşmadığı incelenmiştir. Analiz sürecinde SPSS tabanlı çalışan ve IAE (The International Association for the Evaluation of Educational Achievement) tarafından geliştirilmiş olan IDB Analyzer adlı bir program kullanılmıştır.

Yapılan analizler sonucunda, Türkiye genelinde öğretmenleri en az 10 yıllık deneyime sahip olan öğrencilerin ortalama fen başarısının daha yüksek olduğu ve üst düzey okullardaki öğrencilerin büyük çoğunluğunun en az 10 yıllık deneyime sahip öğretmenler tarafından okutulmakta olduğu ortaya çıkmıştır. Türkiye'de öğretmenleri mesleğinden çok memnun olan öğrencilerin oranı TIMSS ortalamasının üstündedir. Bununla birlikte öğretmenleri mesleklerinden çok memnun olan orta ve üst düzey okul öğrencilerinin başarı ortalamalarının da diğerlerinden daha yüksek olduğu ortaya çıkmıştır. Türkiye genelinde son iki yılda öğretmenleri çeşitli konularda mesleki eğitimlere katılan öğrenci oranının, üst düzey okullarda diğerlerine göre net bir şekilde daha yüksektir. Ancak bu oran TIMSS ortalamalarından oldukça daha azdır. 4. sınıf seviyesinde öğretmenler kendilerini "farklı problem çözme stratejileri gösterme" ve "iyi öğrencilere ilginç ve zor sorular sorabilme" alanlarında, 8. sınıflarda ise "iyi öğrencilere ilginç ve zor sorular sorabilme" alanında diğer alanlara kıyasla daha az yeterli bulmaktadırlar.

Anahtar Sözcükler: Fen başarısı, mesleki deneyim, mesleki memnuniyet, mesleki gelişim.

INTRODUCTION

The teaching process has a very important place in education and the main goal of this process is to ensure that learners gain knowledge and develop the desired skills and attitudes. Undoubtedly, teachers are one of the key factors in the teaching process. The relations between good teachers and higher student performance were reported in much research (Clotfelter, et al. 2007; Goe 2008; Guarino et. al., 2006; Harris and Sass 2007 and 2011). However, the specific teacher characteristics related to higher student performance are not very clear. There are also some studies which demonstrate that the relationship between teacher characteristics and teaching effectiveness is not clear (Boyd et al. 2006; Buddin and Zamarro 2009; Hanushek, 2011).

There is no research that examines the characteristics of a qualified teacher in a comprehensive manner, or investigates all factors related to the characteristics of a successful teacher. Studies on teacher characteristics and their effects on student achievement focus on the characteristics that are measured more easily. This study is carried out based on the variables of teacher confidence, teacher career satisfaction, teacher experience and teacher professional development that are included in the TIMSS 2011 teacher questionnaire.

The recent studies on the relationship between teacher experience and student achievement, which is a characteristic easy to measure, enable us to better understand this relationship (e.g., Boyd et al. 2009; Hanushek et al., 2004; Ingersoll & Smith, 2004; Loeb et al., 2005; Podgursky et al., 2004). Most of these studies claim that students whose teachers are experienced are more successful than students whose teachers are less experienced. However, it should be kept in mind that there may be other factors affecting the relationship between teacher experience and student achievement. For example, it is likely that experienced teachers have more say than less experienced ones at schools, and thus they are assigned to more successful classes. Nevertheless, the studies in which some variables are controlled reveal that teacher experience has a positive effect on student achievement especially during the first years of school (Croninger et al., 2007; Clotfelter et al., 2006; Hanushek, et al., 2005).

Confidence in teaching is another characteristic of a qualified teacher that can affect student achievement. Teacher confidence is generally considered within the context of self-efficacy. Teacher confidence can depend on many factors. These may include professional behaviours of teachers, student performance, and motivation (Martin et al., 2012; Bandura, 1997; Henson, 2002). In addition, there is a significant and important relationship between teacher confidence and subject matter knowledge (Appleton & Kindt, 1999).

Teacher career satisfaction was considered in TIMSS as an important factor which may have a positive effect on student performance. Teacher career satisfaction related to good working conditions at schools and related to the profession has a positive effect on the instruction process (Martin et al., 2012). Teacher career satisfaction was considered by means of teacher attrition. When the literature on teacher attrition is examined, it is seen that teacher attrition results from two main factors. The first factor focuses on the individual teacher while the second one focuses on working conditions (Schaefer, 2013). The efforts to increase teacher

career satisfaction or to reduce teacher attrition may affect student performance positively (Boyd et al., 2009).

Professional development through seminars, workshops, conferences, and professional journals can help teachers increase their effectiveness and broaden their knowledge (Yoon et al., 2007). In Turkey, Ministry of National Education provides opportunities for teachers to participate in such activities. Furthermore, teachers are informed by various means during both pre-service education and professional life that teaching is a profession that requires lifelong learning, and that successful teachers continue to gain new knowledge and skills during their professional lives.

The data obtained from TIMSS 2011 is of great importance for evaluating the consequences of the large-scale curriculum reforms that were put into implementation in 2005 in Turkey. TIMSS provides a rich data series related to teachers, students, parents and schools. This study examines the differences among mean student achievement at various school levels in terms of teacher characteristics and some of the abovementioned variables by use of the TIMSS data. The study is intended especially to compare the characteristics of teachers working at low- and high-performing schools.

RESEARCH METHOD

Sample

This study utilizes the TIMSS 2011 data. TIMSS mainly assesses trends in science and mathematics achievement of fourth- and eighth-grade students within the context of mathematics and science. Because this research is concerned with Turkish fourth and eighth graders, the data related to eighth graders including science teachers' responses and student achievement scores is used in this study. The responses of 6928 eighth graders and 239 teachers at same level, and 7479 fourth graders and 257 teachers at the same level are analyzed. The data is collected by the TIMSS 2011 teacher questionnaire, and the student achievement test in science. The questionnaires and tests were developed and validated by TIMMS 2011 (Martin & Mullis; 2012).

Measures

The data is collected though the TIMSS 2011 teacher questionnaire and the student achievement test in science. The questionnaires and tests were developed and validated by TIMMS 2011 (Full Report).

To examine teacher confidence in teaching science for the fourth and eighth grades, teachers are asked to denote how confident they feel about doing each of the followings: (1) Answer students' questions about science; (2) Explain science principles or concepts by doing science experiments; (3) Provide challenging tasks for capable students; (4) Adapt their teaching to engage students' interest; and (5) Help students appreciate the value of learning science. Teacher responses were indicated as: (1) not confident; (2) somewhat confident; and (3) very confident.

With respect to teacher career satisfaction, teacher responses to several items are included in these analyses: (1) I am content with my profession as a teacher; (2) I am satisfied with being a teacher at this school; (3) I had more enthusiasm when I began teaching than I have now (reverse coded); (4) I do important work as a teacher; (5) I plan to continue as a teacher for as long as I can; and (6) I am frustrated as a teacher (reverse coded). Teacher agreement was indicated as: (1) disagree a lot, (2) disagree a little, (3) agree a little, or (4) agree a lot.

Teacher experience and their professional development areas are also included in this study. Teachers, through the teacher questionnaire, reported the areas of professional development in science in which they had participated in the past two years, and their experience in terms of year.

Procedure

The sample design preferred in the TIMSS studies is generally referred to as a two-stage stratified cluster sampling design. Because the TIMSS studies apply a two-stage stratified cluster sample design, jack-knife variance estimation procedures using replicate weights were used to compute appropriate standard errors for each variable included in this study.

The International Database (IDB) analyzer is used to analyze data in this study. All statistical procedures applied to analyses of teacher and student variables by the IDB Analyzer apply the jack-knife algorithm described above. IDB analyzer is a plug-in for the SPSS developed by the IEA Data Processing and Research Centre that can be used to combine files, and analyze data from large-scale assessments such as TIMSS, PISA and PIRLS. It generates code and syntax for SPSS. Hence, it can be able to handle the use of multiple plausible values and calculate the variance of estimates due to imputation.

The science achievement results of TIMSS 2011 are reported as average scores and ranges between 0 and 1000 for both the fourth and eighth grade TIMSS scales. However, student performance typically has a range of 300-700. At each grade level, the mean of the overall achievement distribution was 500, and the standard deviation was 100 points. Student performance is reported at four benchmarks: Advanced International Benchmark (625), High International Benchmark (550), Intermediate International Benchmark (475), and Low International Benchmark (400) (Martin et al., 2012).

In this study, the schools are divided into three groups according to the new benchmark set which are assigned to handle more useful information for TIMSS 2011 Turkey data. This new categorization is made at the school level (by taking into account the standard error). So the new school groups and benchmarks are as follows: low-performing schools (below 400); middle-performing schools (400 – 550 range); and high-performing schools (over 550). Table 1 presents school distribution and percentages of fourth and eighth graders at these schools in Turkey. As shown in Table 1, a large proportion of schools are located at the middle level.

Table 1. Student and school distribution

	Fourth Grade				Eighth Grade			
School Level	Percentage of School	SE	Percentage of Student	SE	Percentage of School	SE	Percentage of Student	SE
Low	22	(5,4)	15	(2,4)	8	(2,6)	6	(1,5)
Middle	71	(5,3)	75	(2,8)	84	(3,1)	81	(2,7)
High	7	(1,9)	9	(1,9)	8	(1,9)	13	(2,2)

RESULTS

Table 2 presents teacher experience by year for the teachers that participated in the TIMSS fourth and eighth grade assessment. In addition, students are scored according to teacher experience at each school level.

Table 2. Teacher experience by year

	20 years or more				**At least 10 but less than 20 years**				**At least 5 but less than 10 years**				**Less than 10 years**			
School Level	%	SE	Average Achiev.	SE	%	S.E.	Average Achiev.	SE	%	SE	Average Achiev.	SE	%	SE	Average Achiev.	SE
4th Grade																
Low	3	(3,4)	345	(10,4)	20	(7,2)	381	(19,5)	17	(8,3)	325	(33,2)	59	(10,1)	350	(15,4)
Middle	22	(3,2)	484	(4,8)	41	(3,2)	474	(4,0)	21	(2,9)	464	(5,6)	16	(2,8)	460	(7,1)
High	47	(11,0)	575	(8,2)	41	(10,7)	560	(5,0)	10	(6,9)	558	(27,0)	3	(0,6)	559	(9,9)
Turkey Av.	21	(2,7)	498	(7,3)	38	(3,0)	475	(5,2)	20	(2,5)	450	(11,8)	21	(2,8)	415	(11,7)
TIMSS Av.	40	(0,5)	494	(1,1)	30	(0,5)	485	(1,1)	16	(0,4)	483	(1,6)	14	(0,4)	482	(1,8)
8th Grade																
Low	8	(7,0)	360	(8,1)	15	(8,3)	374	(10,2)	18	(10,1)	357	(15,4)	58	(12,1)	377	(8,0)
Middle	11	(2,4)	483	(7,2)	32	(3,2)	483	(5,0)	22	(3,3)	475	(6,1)	35	(3,8)	468	(5,1)
High	23	(8,9)	569	(12,0)	43	(10,2)	595	(21,0)	14	(7,0)	576	(8,5)	19	(7,2)	602	(16,0)
Turkey Av.	13	(2,2)	497	(11,0)	32	(3,0)	498	(7,8)	21	(2,9)	476	(6,5)	35	(3,4)	467	(5,8)
TIMSS Av.	33	(0,4)	480	(1,3)	29	(0,5)	480	(1,2)	19	(0,4)	475	(1,3)	20	(0,4)	471	(1,3)

%: Percent of students; SE: Standard error

According to Table 2, most of the students at high-performing schools have teachers with an experience of at least ten years, and few of them have teachers with an experience of less than five years. This is obvious especially for the fourth grades at high-performing schools (88%). However, most of the fourth and eighth graders at low-performing schools (nearly 76%) have teachers with an experience of less than ten years. It can be said that the mean science achievement at the fourth-grade level at low-performing schools does not vary by teacher experience, but it increases in parallel with teacher experience at middle- and high-performing schools. It is interesting that the mean science achievement of the eighth graders whose teachers have an experience of less than five years is relatively high at high-performing schools.

Fourth and eighth-grade students are scored according to their teachers' degree of agreement with the six statements on the *Teacher Career Satisfaction* scale for each school level. The results are shown in Table 3.

Table 3. Teacher career satisfaction

	Satisfied				**Somewhat Satisfied**				**Less Than Satisfied**			
School Level	%	SE	Average Achiev.	SE	%	SE	Average Achiev.	SE	%	SE	Average Achiev.	SE
4th Grade												
Low	43	(8,1)	356	(17,2)	49	(8,9)	347	(18,4)	7	(4,3)	372	(24,2)
Middle	64	(3,6)	477	(3,6)	32	(3,6)	465	(3,4)	4	(1,5)	449	(10,7)
High	77	(8,5)	567	(5,6)	23	(8,5)	564	(7,6)				
Turkey Av.	62	(3,4)	475	(5,1)	34	(3,4)	445	(8,3)	4	(1,5)	429	(11,3)
TIMSS Av.	54	(0,5)	490	(0,7)	41	(0,5)	483	(0,9)	5	(0,2)	483	(2,1)
8th Grade												
Low	36	(11,1)	375	(5,9)	54	(13,4)	372	(10,8)	11	(7,6)	361	(10,2)
Middle	57	(3,8)	478	(3,7)	36	(3,5)	476	(4,3)	8	(2,1)	458	(7,6)
High	76	(8,4)	595	(12,2)	20	(8,0)	558	(5,0)	4	(3,8)	556	(2,3)
Turkey Av.	58	(3,3)	493	(5,5)	35	(3,1)	472	(5,6)	7	(1,9)	456	(11,6)
TIMSS Av.	47	(0,5)	481	(0,8)	45	(0,5)	474	(0,8)	8	(0,3)	473	(2,3)

%: Percent of students; SE: Standard error

Table 3 demonstrates that most of the teachers are satisfied with their profession. All of the teachers at the fourth-grade level at high-performing schools are satisfied with their profession. The achievement rate of the students whose teachers are satisfied with their profession at middle- and high-performing schools is higher than those of the students whose teachers are satisfied with their profession at low-performing schools. It is seen at all school levels that the mean achievement is generally higher for the students whose teachers are satisfied with their profession.

Students are scored according to their teachers' responses to how confident they felt in using the five instructional strategies on the *Confidence in Teaching Science* scale for each school level. The results are shown in Table 4.

Tablo 4. Confidence in teaching science

	Very Confident				Somewhat Confident			
School Level	%	SE	Average Achiev.	SE	%	SE	Average Achiev.	SE
4th Grade								
Low	57	(9,7)	347	(14,9)	43	(9,7)	360	(17,9)
Middle	64	(3,7)	470	(3,1)	36	(3,7)	476	(4,5)
High	94	(4,4)	567	(4,8)	6	(4,4)	553	(44,4)
Turkey Av.	66	(3,1)	466	(5,6)	34	(3,1)	455	(8,4)
TIMSS Av.	59	(0,5)	487	(0,7)	41	(0,5)	485	(1,0)
8th Grade								
Low	62	(12,9)	383	(6,7)	38	(12,9)	354	(8,3)
Middle	67	(3,9)	476	(2,9)	33	(3,9)	474	(5,4)
High	66	(9,0)	585	(14,5)	34	(9,0)	587	(9,0)
Turkey Av.	66	(3,5)	484	(4,6)	34	(3,5)	480	(6,7)
TIMSS Av.	73	(0,4)	479	(0,7)	27	(0,4)	467	(1,5)

%: Percent of students; SE: Standard error

Table 4 shows that most of the students in Turkey have science teachers with high self-confidence. This percentage is higher than the TIMSS average at the fourth-grade level while it is lower than the TIMSS average at the eighth-grade level. It can be said that the mean achievement of students does not vary significantly by teacher confidence at the fourth-grade level at low-, middle- and high-performing schools.

Table 5 presents more information about the components of the Confidence in Teaching Science scale for the fourth and eighth-grade assessment. Table 4 includes the percentage of students whose teachers reported feeling "very confident" in using each of the five instructional strategies.

Table 5. Percentage of students whose teachers feel very confident

	Answer Student Questions About Science		Explain Science Concepts or Principles by Doing Science Experiments		Provide Challenging Tasks for Capable Students		Adapt Teaching to Engage Student Interests		Help Students Appreciate the Value of Learning Science	
School Level	%	SE	%	SE	%	SE	%	SE	%	SE
4th Grade										
Low	62	(9,3)	37	(9,3)	46	(10,2)	69	(8,4)	65	(8,8)
Middle	66	(3,8)	43	(3,7)	45	(3,3)	73	(3,2)	67	(3,8)
High	97	(2,7)	64	(9,9)	54	(12,0)	95	(3,4)	80	(8,5)
Turkey Av.	69	(3,2)	44	(3,2)	46	(3,2)	75	(2,7)	68	(3,1)
TIMSS Av.	62	(0,5)	51	(0,5)	43	(0,5)	63	(0,5)	63	(0,5)
8th Grade										
Low	64	(10,0)	54	(13,5)	27	(12,5)	44	(13,3)	88	(7,6)
Middle	72	(3,8)	60	(4,0)	49	(3,8)	64	(3,6)	60	(4,2)
High	66	(9,7)	67	(9,6)	61	(9,0)	70	(9,0)	66	(9,1)
Turkey Av.	70	(3,5)	61	(3,6)	49	(3,4)	63	(3,1)	63	(3,7)
TIMSS Av.	81	(0,4)	72	(0,5)	57	(0,5)	65	(0,5)	70	(0,5)

%: Percent of students; SE: Standard error

At the fourth-grade level at high-performing schools, teachers mostly feel confident in terms of "answering student questions about science", "adapting teaching to engage student interests" and "helping students appreciate the value of learning science". At the fourth-grade level at low- and middle-performing schools, on the other hand, the percentage of students whose teachers feel confident in terms of "explaining science concepts or principles by doing science experiments" and "providing challenging tasks for capable students" is higher than the percentage of students whose teachers feel confident in the other areas.

It is remarkable that the percentage of students whose teachers feel confident in terms of "helping students appreciate the value of learning science" is quite high (88%) for the eighth-grade level at high-performing schools. At the eighth-grade level at low- and middle-performing schools, the percentage of students whose teachers feel confident in terms of "providing challenging tasks for capable students" and "adapting teaching to engage student interests" is lower than the percentage of students whose teachers feel confident in the other areas.

Table 6 presents teachers' reports for both the fourth and eighth-grade TIMSS assessment about areas of professional development in science in which they had participated in the past two years. Students are grouped based on their teachers' responses. Only eight-grade teachers are asked whether they had participated in professional development courses related to improving critical thinking or inquiry skills of students.

Table 6. Percentage of Students by Teacher's Area of Professional Development

	Science Content		**Science Pedagogy / Instruction**		**Science Curriculum**		**Integrating Information Technology into Science**		**Improving Students' Critical Thinking or Inquiry Skills**		**Science Assessment**	
School Level	%	SE	%	SE	%	SE	%	SE	%	SE	%	SE
4th Grade												
Low	8	(4,7)	8	(4,7)	5	(5,6)	5	(4,1)			3	(3,2)
Middle	8	(2,1)	8	(2,3)	8	(2,2)	9	(2,1)			7	(2,0)
High	17	(6,2)	17	(6,2)	19	(7,4)	21	(7,6)			20	(6,9)
Turkey Av.	9	(1,7)	9	(1,9)	8	(2,0)	9	(1,9)			8	(1,8)
TIMSS Av.	35	(0,5)	34	(0,5)	34	(0,5)	28	(0,5)			27	(0,4)
8th Grade												
Low	26	(12,1)	36	(12,7)	25	(11,4)	22	(10,0)	39	(12,7)	18	(10,0)
Middle	33	(3,7)	36	(4,1)	33	(3,2)	33	(3,7)	37	(3,7)	25	(3,3)
High	61	(10,4)	64	(10,4)	70	(9,5)	58	(10,4)	42	(10,7)	35	(9,1)
Turkey Av.	36	(3,4)	40	(3,6)	37	(3,1)	35	(3,5)	38	(3,3)	26	(3,0)
TIMSS Av.	55	(0,5)	58	(0,5)	53	(0,5)	49	(0,5)	43	(0,5)	48	(0,5)

%: Percent of students; SE: Standard error

When Table 6 is examined, it is seen that the percentage of students whose teachers had participated in professional training programmes in the abovementioned areas is quite below the TIMSS average. These percentages are lower at low-performing schools. However, the percentages are relatively high at the eighth-grade level compared to the fourth-grade level.

CONCLUSIONS AND SOME RECOMMENDATIONS

It is revealed in various studies, including those mentioned in the introduction part of this study, that teachers should be competent at their profession for an effective teaching process. In this context, TIMSS collects data related to teacher experience, teacher career satisfaction, teacher professional development and teacher confidence. The results of this study, which utilizes the TIMSS 2011 data, can be summarized as follows.

When the schools are divided into three groups according to the benchmarks determined within the scope of this study, it is seen that most of the schools are middle-performing at both the fourth-grade and the eighth-grade level.

It is observed that teacher experience which can be related to student achievement has generally a positive effect on student achievement. For example, most of the fourth graders (88%) have teachers with an experience of at least 10 years while most of the teachers (76%) working at low-performing schools have an experience of less than 10 years.

Another finding which is in line with the literature is related to teacher career satisfaction. The mean achievement of students increases in parallel with the career satisfaction of their teachers. Generally a positive relationship is observed between teacher career satisfaction and student achievement at schools even at the same level.

Another result of the study is that the mean student achievement varies by teacher confidence at the fourth- and eighth-grade levels. At the fourth-grade level, it is difficult to say that there is a relationship between teacher confidence and student achievement at various achievement levels. At the eighth-grade level, on the other hand, it can be said that there is a positive relationship, even if it not very significant, between teacher confidence and student achievement. Most of the teachers feel confident about teaching strategies that include basic cognitive and affective activities, but their confidence decreases remarkably in terms of teaching strategies that include meta-cognitive processes. This is a finding that should be worked on more specifically. Furthermore, most of the teachers feel confident about answering student questions about science at the fourth-grade level while they feel less confident about the same strategy at the eighth-grade level. This can be resulted from the fact that both the content is more complex and the process requires more complex skills at the eighth grade. Another striking finding which should be discussed is related to the teachers working at low-performing schools at the eighth-grade level. These teachers feel highly confident about “helping students appreciate the value of learning science”. More specific research should be conducted to reveal the reasons behind this finding which is based on the reports of the teachers, and which is difficult to explain.

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