

Relationship of Science Teachers' Performance and their Attitude towards Science with Academic Achievement of their Students

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KEY WORDS

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ABSTRACT

The objective of this study was to uncover the relationship of the performance and attitude of science educators with their students' academic achievements. For this purpose, a survey type questionnaire was set to find data regarding science educators' academic/ professional qualifications and experience. To find the attitude of science educators towards science, a 50 items' attitude scale containing five components was formulated and adapted from TOSRA. This questionnaire was completed by 80 secondary grade science educators located in 40 institutions with due consideration being paid to gender, urban/rural representation and inclusion of both private/public secondary institutions. Quantitative analysis of data specified an inverse correlation of educators' academic as well as professional qualifications/teaching experience with their students' academic performance. Most of the educators displayed an extremely positive attitude towards their respective subject. Also, a positive relationship was found between science educators' attitude towards science and academic achievements of their pupils. More studies are required to ascertain the reasons for the negative correlation of educators' academic/professional qualification/ experience with their students' achievements and also to explore the variables that influence the attitude of educators towards science.

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Introduction

Science education consistently plays a crucial function in the life of human beings. The foundation of our modern society is directly dependent

on the development of science. This magnificent, diverse knowledge we describe as 'science', has achieved enormous benefits for human beings. As Aggarawal (2010) articulates, achieving science knowledge is a constant and endless process, i.e. a lifelong practice and advancement. It includes the whole gamut of phenomena that influence persons' characters. Singh (2016) specified that science edification involves limitless improvement in receiving most modern knowledge and insights from the latest sources. It is understandable that the whole development of an appreciation of the interrelationships inherent in science is linked to communicating science systems didactically as well as teaching students the learning process implicated in science learning. Ejiogu (2015) has proposed that for improving science knowledge, it is vital to make apparent for science educators' an educational plan that will prepare science educators to undertake the leadership responsibilities they need for the pedagogical process.

Science educators must be willing to build a supportive environment for science seeking as well as learning (Reddy, 2012). In the same way, Singh and Yadved (2010) articulate that appropriate guidance of science educators provides development in science learning which reinforces that science educators are unable to play their roles if they are not competently skilled. Gupta (2013) suggested that the function of a science educator is linked with science edification; consequently, the science educator needs to pass on to youngsters the information, methods, humanizing of public, customs and feelings as well as learning science knowledge.

Owing to rapidly changing circumstances, it is mandatory for science educators to obtain a higher level of specialization since the significance of science educators' skilled development is now deeply expanded. Consequently, Hayon (2015) considers that science instructors who attain interpersonal and specialized capabilities are more able to competently adapt their science instruction according to their students' feelings, abilities and educational attainments. Moreover, according to Bajah (2014) the achievement of a comprehensive, responsive science plan mostly depends on science educators because they are entrusted to convert various perspectives into proceedings. An exceptional science instructor needs to be dedicated to his/her own occupation and should have the talent as well as knowledge to proceed with confidence (Sparks, 2010).

Science education and the skills of the science educator play an imperative role in teaching; however professional edification and high quality teaching are more crucial because a trained science educator is superior in teaching performance as compared to an untrained science instructor. Harris and Sass (2007) specify the effect of the reliability of outcomes in relation to the influence of science instructors' period of experience; if the highly experienced and less efficient science instructors

are mostly leaving their teaching positions, this causes the lack of effectiveness of highly skilled science staff. A general supposition concerning the relationship between science educators experience and their pupils educational attainments is that learners educated by more skilled science educators attain higher levels because their science educators have expertise in the content and teaching competencies as well as having developed the administrative practices to deal with various class room difficulties (Gibbons, 2011; Slavin 2013).

Moreover, highly skilled science instructors are likely to concentrate on the most specific subject matter pertinent to the learners that enables the students to modify their prior information, and the surroundings (Raudenbush & Williams 2002; Stringfield & Teddie 2012). Similarly, the administrative abilities are also essential for better classroom control and organization. These represent part of the science educators' capabilities, creativity, proficiency to select, practice through experience and intelligence in ascertaining fresh ideas to astutely use the proper method, language and accessible coaching equipment to foster the finest responses from learners' thus promoting high quality educational achievements (Eso, 2003).

An additional key factor that may contribute to the educational achievements of the science learners is the attitude of the science educators towards their subject. Zimbardo (2008) describes attitude as a positive or negative estimation of community, matter, event, dealings and opinion or just about something in your environment. Findings of numerous studies have established the assumption that science educators' attitudes towards science and towards science instruction have an effect on their learners' educational success (Chidolue, 2012). Equally, Okpala (2006) confirmed the effect of 'the attitude of science educators' towards the evaluating their learners' educational success and their tendency for respective subject was constructive. Good attitudes of science educators created a kind and sympathetic classroom atmosphere; enhanced experiences to sustain science learners' on task behaviours allowing efficient use of time for lessons, promoted positive behaviors, promoted a collaborative environment, with science learners being presented an encouraging message (Eggen & Kauchak, 2009).

Brunning (2007) explained further the crucial nature of science educators' positive attitude: Science educators' trait, such as an individual's science training skills, the formation of the individual teacher and the enthusiasm demonstrated reap good results in supporting learners' self-concepts; such traits are also linked with the enhancement of learners' educational achievements. Eggen and Kauchak (2009) affirmed that for successful science instruction to occur, constructive attitudes exhibited by science educators are fundamental. The science educator should suggest to the students that careful attention be paid to recognize the latest changes to their learning in follow-up or reinforcement lessons. Likewise, science

educators' attitude towards their subject is vital for the expansion of their own professionalism as well as for the educational success of their pupils. The academic achievement of the science learners' is a separate natural talent linked with intelligence and other civic dynamics (Onocha, 2000). For science coaching to be more consequential and motivating; there needs to be shared input from both the science instructors and the science learners to create a positive approach for advanced learning success. Consequently, the attitude of science educators should be focused on their pupils' academic achievements. Once science learners displayed a positive attitude, the results clearly reflected the affective contribution to success (Igwe, 2007).

Science educators' attitudes and their students' educational achievements may be examined by the gender variable. Explaining the disposition of attitude, Dodeen (2003) described attitude of science educators towards their subject can be contrasted by gender; as further stated, it seems that female educators exhibit a more positive approach to their subject as compared to male educators. Studies on the differentiation of attitudes towards science based on gender have reaped significant results; for example, a number of researchers have declared that male science educators have more varied attitudes towards their subject in comparison to female science educators, and also male are more probable to carry on learning science (Weinburgh, 2000). Women science educators have a tendency to demonstrate a divided attention between the functioning of their institutions as well as on learning. In contrast, men tend to be more subject focused subject allowing them to be to be successful in science (Oliver & Simpson, 2009).

In concluding the above discussion, it is suggested that the function of science educators is to facilitate educational success in general as well as contributing to learners' educational achievements. Our nation's fortune is based on the strength of its educational provisions in classrooms where in addition, science teachers act as organizers and administrators of the school. Mainly responsible for the new generation of our nation and also he is a real founder of coming generation's engineers, scientists as well as good citizen. Richardson (2013) observed that the instruction in science is like a nation building job and the quality of science teaching depends upon the competence as well as the efficacy of science instructors; this suggests that if science instructors are occupationally expert, educated, motivated and devoted to their field then science teaching will be of a high quality.. Since science educators' attitude towards their respective subject equates to their manners, approach, commitment and dedication to their field, so exhibiting such dedication and also a constructive approach for science reflects that science instructor's presentation will be superior and their striving for success will be realized. Consequently, it is vital to determine the relationship of science educators' performances and attitudes with their students' educational success for the purpose as the basis for further

exploration as well as policy formulation to promote outstanding science education.

Objectives

The current research was to find out the relationship of science teachers' performance and their attitude towards science with the academic achievement of their students. The research objectives were to:

1. Determine the attitude of science educators towards their subject
2. Compare gender-wise the attitude of gender of science educators towards science
3. Find the relationship between science educators' qualifications and students' academic achievement
4. Find the relationship between the attitude of science educators towards science and students' academic achievement.

Delimitation

Due to time constraints, the study was framed to investigate the first question: To find the attitude of science educators towards their subject. As such, only five items in the Test of Related Attitudes (TOSRA) were selected.

Significance of the Study

This research was imperative for numerous reasons as it had the potential to ascertain how knowledge of the association of qualifications paired with attitudes of science educators affected the educational attainments of their pupils. This study anticipated that it would give a clear understanding of the connection between compulsory science educators' qualifications and their potential to impact upon a substantial increase in academic achievements of the learners. Present research differentiates the performance of experienced and highly qualified educators that is helpful for administration to select the best qualified team for teaching science learners with different levels of achievement. This study is helpful for the public, the administration, the nation, the curriculum planners and the scholars to consider and appoint suitable science educators in the future.

Methodology

This research was descriptive and its main purpose was to determine the relationship of the performance of science educators' and their attitude towards science with students' academic achievements. For finding this relationship, subsequent measures were taken.

Population

The population of this research was comprised of 197 male and 135 female secondary level science educators and 5026 male and 1775 female (10th grade) science students located in district Abbottabad in 2016. “

Sample

An appropriate sample of respondents was drawn from the total population. 40 secondary institutions (20 each public/private sector) comprised of an equal number of gender / rural and urban (each sector 10 institutions) were enlisted by through stratified random sampling. In using the random sampling technique, two science educators and 20 science students were drawn from each sampled institute. By this method 80 science educators (40 from each gender private and public sector /urban as well as rural) and 800 students (each gender / private and public sector / urban and rural consist of 400 each) were the participants for the research.

Data Collection

Three tools were developed for collecting data: (i) for collecting the results of 10th grade students in their science subjects a questionnaire was constructed; (ii) for science teachers' qualification and experience another a survey questionnaire was formulated; and (iii) for determining the attitudes of educators towards science, an attitude scale i.e., 5 point Likert type scale was formulated and adapted from TOSRA (Test of Science Related Attitude) consisting of 50 items although only 5 items were delivered to the respondents.

The reliability of Test (Attitude Scale) Cronbach Alpha was found as 0.886 and tools were passed through an adjudication process; the research tools were improved through pilot testing. The academic scores of 800 students' yearly exam results in 2016 were taken from B.I.S.E Abbottabad Pakistan. The enthusiastic attitude and collaboration of the respondents made it feasible for the researcher to have a return rate of 100 %.

Data Analysis

For the process of analyzing the collected information of data, the SPSS were applied i.e. percentage, frequency, arithmetic mean, correlation, independent samples t-test, standard deviations and regressions. These were applied as numerical instruments. The t-test was applied for finding the significant difference in mean scores by gender. Histograms were used to show the value of educators' attitudes for their respective subjects. In the same way, the association of attitude of educators for science with 'students academic achievements' was found by applying respective correlations. The same correlation was also used for the relationships between the qualifications of science educators and students' academic achievements. The differentiation, as well as the comparison of the attitudes of the gender was established. Findings and conclusions were drawn and some suggestions were also made in the end.

Results

The results of the study were tabulated and the variables i.e. academic as well as professional qualifications and 'educators teaching experience' have been assigned proper scores. Analyzed data is given in the subsequent tables.

Table 1

Demographic Data of the Respondents

Characteristics	Male	Female	Total	Percentage
Academic qualifications				
B.A/B.Sc	20	21	41	51.2 %
M.A/M.Sc	19	20	39	48.8 %
Professional qualifications				
Untrained	12	10	22	27.5 %
B.Ed	25	28	53	66.2 %
M.Ed	02	03	05	6.2 %
Experience (years)				
01--05	28	24	52	65 %
06--10	10	14	24	30 %
11--15	01	01	02	2.5 %
16--20	01	01	02	2.5 %

Table 1 gives percentage/frequency of qualifications and teaching experience of gender of science educators of the chosen institutions. It was found that 51.2 % of science educators had B.A/B.Sc qualifications whilst 48.8 % science educators were M.A/M.Sc. Also, 66.2 % of the science educators held a B.Ed professional qualification whereas 6.2 % of science educators had achieved a M.Ed. On the other hand, 27.5 % of the science educators had not acquired any professional qualification. Also, the majority of science educators (65%) had the lowest teaching experience, that is, between 01--05 years with 30 % of the science educators had between 06--10 years' experience whereas only 2.5 % educators had teaching experience of 11-15 years or 16--20 years.

Table 2
Difference between Variables' Mean Scores of Male and Female Science Educators

Variable	Comparison group		Mean score	S.D	t	P
		N				
Academic qualifications	Male	40	1.90	1.008	0.664	0.508
	Female	40	2.05	1.011		
Professional qualifications	Male	40	0.725	0.506	1.028	0.307
	Female	40	0.850	0.580		
Experience	Male	40	1.425	0.636	0.000	1.000
	Female	40	1.425	0.712		
Social implication of science	Male	40	41.80	3.553	0.910	0.366
	Female	40	41.025	4.048		
Attitude towards scientific inquiry	Male	40	42.050	3.312	1.293	0.200
	Female	40	40.975	4.086		
Adoption of scientific attitude	Male	40	41.825	3.558	0.983	0.329
	Female	40	42.675	4.153		
Enjoyment in science learning	Male	40	41.750	4.727	1.957	0.055
	Female	40	43.475	2.952		
Career interest in science	Male	40	42.950	3.485	1.696	0.094
	Female	40	41.325	4.958		
Students' academic achievement	Male	40	50.268	6.638	0.126	0.900
	Female	40	50.486	8.671		

Table 2 indicates significance level (0.05) $p > 0.05$ that means not significant difference was found between academic qualification mean values of male (1.90) as well as female (2.05) educators, mean values for professional qualification of male (0.725) and female (0.850) educators, mean values of educators' experience of male (1.425) and female (1.425), mean values regarding 'social implication of science' of male (41.80) and female (41.025) educators, mean values regarding 'attitude towards scientific inquiry' of male (42.050) and female (40.975) educators, adoption

of scientific attitude mean scores of male (41.825) and female (42.675) teachers, enjoyment in science learning mean scores of male (41.750) and female (43.475) teachers, career interest in science mean scores of male (42.950) and female (41.325) teachers and students’ academic achievement, mean scores of male (50.268) and female (50.486) teachers of the required field respectively.

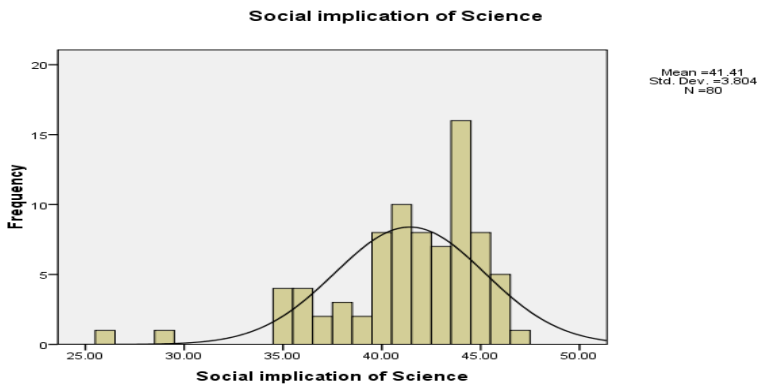
Table 3

Social Implication of Science

Range	Frequency	Percentage
26—40	25	31.2 %
41	10	12.5 %
42—47	45	56.2 %

Mean = 41.41 Median = 42
 Mode = 44

Table 3 with histogram shows the attitude factor as “social implication of science” of the educators with numerical values (mean = 41.41, median = 42, mode = 44, std.dev = 3.804 and N = 80 respectively).

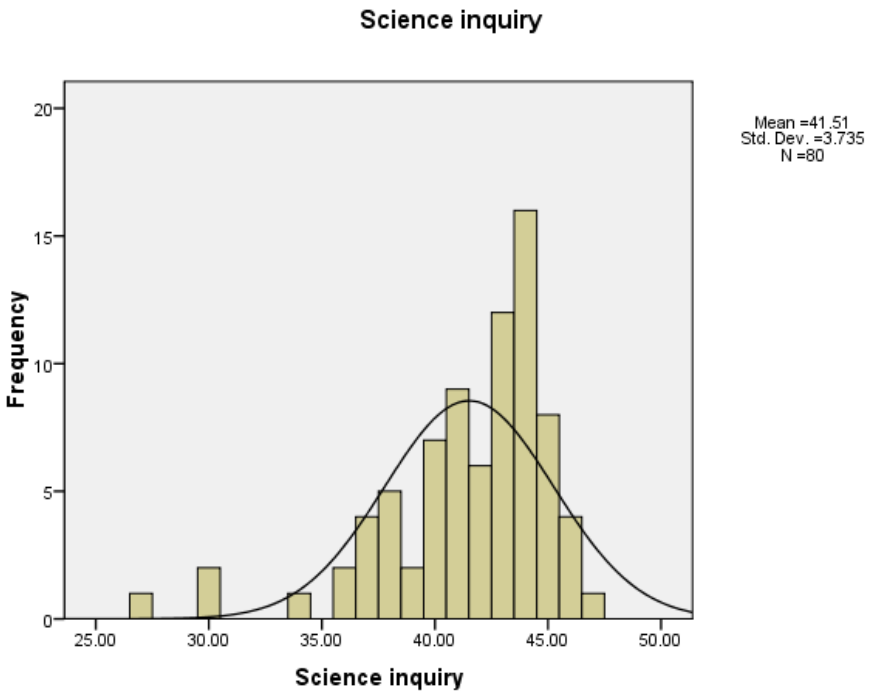


The histogram and values of mean, frequency as well as percentage reflects that higher numbers of educators have score above the mean score. Consequently most of science educators have positive attitude concerning social implication of science.

Table 4
Attitude towards Scientific Inquiry

Range	Frequency	Percentage
27—40	24	30 %
41	09	11.2 %
42—47	47	58.8 %
Mean = 41.51		Median = 43
Mode = 44		

Table 4 and histogram shows the attitude towards scientific inquiry of the science educators. The numerical values (mean = 41.51, median = 43, mode = 44, std.dev”

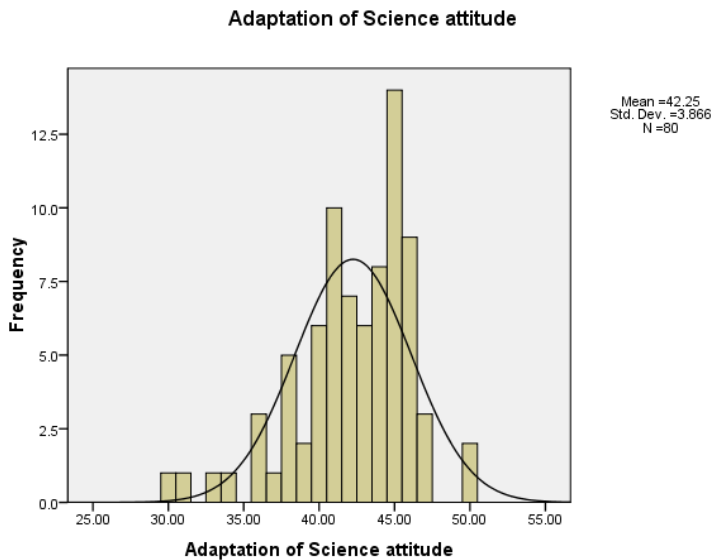


“= 3.735 and N = 80 indicates as larger number of educators have higher scores in comparison to mean score which reflects that most of educators have positive attitude towards science concerning attitude towards scientific inquiry.”

Table 5
Adoption of Scientific Attitude

Range	Frequency	Percentage
30—41	31	38.8 %
42	07	8.8 %
43—50	42	52.5 %
Mean = 42.25 = 45	Median = 43	Mode

Both table 5 as well as histogram shows “adoption of scientific attitude” of educators and values of attitude score with percentage/ frequency. Most of science educators have high scores in comparison to mean = 42.25, that indicates the greater number of educators have positive



adoption of scientific attitude.

Table 6
Enjoyment in Science Learning

Range	Frequency	Percentage
27—41	20	25 %
42	15	18.8 %
43—50	45	56.2 %
Mean = 42.61		Median = 43
Mode = 42		

Table 6 with arithmetic values as mean (42.61), median (43) and mode (42) indicate that the educators' attitude factor as the enjoyment in science learning. Mean values, percentage and frequency show that higher number of educators had scores more than mean score; thus the most of the educators had enjoyment in science learning.

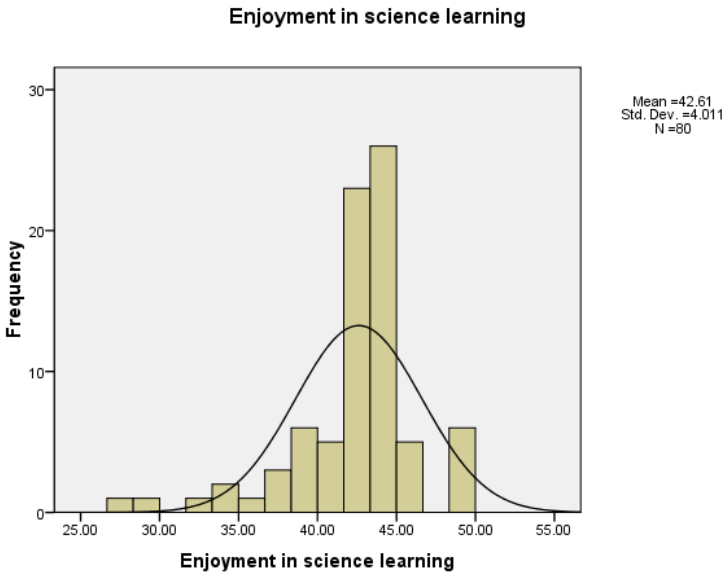


Table 7
Career Interest in Science

Range	Frequency	Percentage
29--41	28	35 %
42	04	5 %
43—50	48	60 %

Mean = 42.13 Median = 43
Mode = 44

Table 7 as well as the histogram indicates the educators’ attitude regarding ‘career interest in science’. Statistical scores reflects (mean = 42.14, median = 43, mode =44, std.dev = 4.336 and N = 80) that most of educators have higher scores as compared to mean values which reflects the positive attitude of educators towards science career.

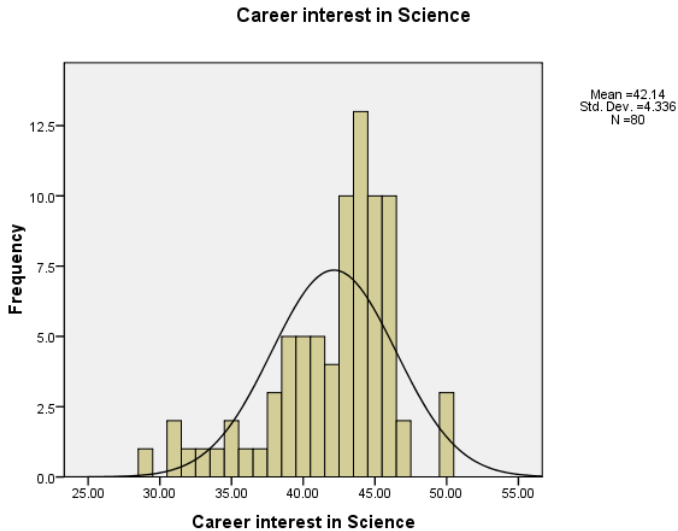


Table 8
ANOVA Showing Significance of Correlation of Various Factors with Students' Academic Achievement Scores

Model	Sum of squares	df	Mean square	F	P
Regression	1111.175	5	222.235	4.644	0.001
Residual	3541.300	74	47.855		
Total	4652.475	79			
Predictors (Constant)	Total Attitude Score, Gender, Professional Qualification, Experience, Academic Qualification				
Dependent Variable	Students Academic Scores				

Table 8 shows that “p = 0.001 and F value = 4.644. Consequently, it is clear that there is a significant relationship of constant variables (predictors) with dependent variable (academic scores of students). More details of the said relationship are given in below table.”

Table 9
Regression Analysis Showing Relationship of Independent Variables with Dependent Variable

Model	Un-standardized Coefficients		Standardized Coefficients Beta	t	p
	B	Std. Error			
Constant	2.636	15.457		0.171	0.865
Gender	0.879	1.560	0.058	0.563	0.575
Academic Qualification	-0.972	0.833	0.127	-1.167	0.247
Professional Qualification	-2.392	1.539	-0.170	-1.555	0.124
Experience	-0.164	1.223	-0.014	-0.134	0.894
Total Attitude Score	0.240	0.069	0.369	3.486	0.001
Dependent Variable	Students Academic Achievements				

Table 9 reflects that gender's of educators has no significant (b= 0.879, p = 0.575 > 0.05) correlation with the “independent variable” i.e. very low positive correlation indicates that gender is not a significant contributor to academic achievements. Similarly, “variable academic qualification’ of science educators is not significantly (b = -0.972, p > 0.05) correlated with students’ academic

achievements". On the other hand, negative scores indicate that educators' higher academic qualification reflects lower achievements of their pupils. The aspect as 'professional qualification' is not a significant ($b = -2.392$, $p = 0.124 > 0.05$) contributor for academic achievements of students. Yet the value of "b" indicates its negative correlation with academic scores of students. Educators' teaching experience ($b = 0.164$, $p = 0.894 > 0.05$) has no significant relation with academic scores of their students. The aspect as "educators' total attitude" towards their respective subject is a significant ($b = 0.240$, $p = 0.001 < 0.05$) contributor in favor of achievements of students. The positive value of coefficient "b" indicates that healthy, positive attitudes of educators towards science reflect good academic results of students.

Discussion

The data regarding the attitude of science educators towards their respective subject was reflected by tables 3, 4, 5, 6 and 7 as well as with relevant histograms i.e. attitude factors as 'social implication of science' (mean = 41.41, median = 42, mode = 44, std.dev = 3.804), 'attitude towards scientific inquiry' (mean = 41.51, median = 43, mode = 44, std.dev = 3.735), 'adoption of scientific attitude' (mean = 42.25, median = 43, mode = 45, std.dev = 3.866), 'enjoyment in science learning' (mean = 42.61, median = 43, mode = 42, std.dev = 4.011) and 'career interest in science' (mean = 42.14, median = 43, mode = 44, std.dev = 4.336) which shows that higher number of science teachers had positive attitude towards their respective subject i.e. science." Consequently, these results as well as findings were in line with the results and findings of the studies conducted by Demir, Pekel and Yildiz (2006), and Josephw, Majanga, Nasongo and Vundi (2009).

The statistical dimensions (table 2) showed the outcomes for the significance of difference between the attitudes of 'genders' of teachers. Social implication of science' mean score of male (41.80) and female (41.025) teachers with $p > 0.05$ indicated that difference between 'social implication of science' mean score of gender of teachers was not significant. The difference in 'attitude to scientific inquiry' mean scores of male (42.050) and female (40.975) teachers with $p = 0.200 > 0.05$ was not significant. As well the 'adoption of scientific attitude' means scores of male (41.825) and female (42.675) educators with $p = 0.329 > 0.05$ showed no significant difference for the teachers of specific grade. In the same way no significant difference ($p > 0.05$) was found between 'enjoyment in science learning' mean scores of male (41.750) and female (43.475) educators. Results (table 2) reflected 'career interest in science' mean scores of 'gender' of educators with $p > 0.05$, which indicated that the difference between 'career interest in science' mean scores of male (42.950) and female (41.325) teachers was not significant. As a result these outcomes as well as findings were in line with results and findings of studies carried out by Bahar, Cavas, Pinar and Tarik (2009), and Emine selcen (2011).

The numerical information reflected that no significant association was found between educators' qualifications and achievements of their pupils. Results (table 9) reflected that the variable academic qualification of educators was not significantly correlated ($b = -0.972$, $p = 0.247$ i.e. $p > 0.05$) with their 'students' academic achievements. Equally the statistical results in favor of "professional qualification" of the educators ($b = -2.392$, $p = 0.124 > 0.05$) revealed there was no significant relationship between the 'professional qualification' of teachers and 'academic achievements' of their students". Moreover, the mathematical value ($b = -0.164$, $p = 0.894 > 0.05$) in favor of "teaching experience" of educators indicated no significant relationship between educators' "teaching experience" and academic achievements of their students. In these results there is a negative correlation between dependent variable and independent variable but the correlation is not significant.

Conversely, coefficient 'b' has a negative value which reflects that a high academic qualification of science educators reaps low students' academic achievement. So, these outcomes as well as findings were similar to the results and findings of studies undertaken by Abell, Chual, Musikul, Pareja and Ritzka (2008), and Callahan, Mackin and Wenning (2009).

Further results (table 9) indicated "the variable 'attitude' of educators towards their respective subject; which was significantly correlated ($b = 0.240$, $p = 0.001 < 0.05$) with their 'students' scores. It showed a significant relationship between educators' attitudes and students' achievements. As 'attitude' of the science educators is positively correlated with students' achievements this suggests that better academic results depend on the positive attitude of the educators for their respective subjects. Therefore, these findings were also in line with the results as well as findings of a study conducted by Josephw, Majanga, Nasongo and Vundi (2009).

Conclusion and Recommendations

Study outcomes indicated that the majority of science educators of preferred group have their academic/professional qualifications as B.Sc/B.Ed respectively which means a large number of science educators were well qualified. The bulk of the science educators was able but with the least experience of their profession. Further, it was concluded that the gender of science teachers have equivalent qualifications. Science educators have positive attitudes towards their respective subjects; it is also concluded that the educational achievements of the students are improved by raising the attitude of science educators towards their respective subjects. A negative correlation was found between science teachers' academic as well as professional qualifications, respective experience and academic achievements of their students."

It is suggested that further research might be carried out to investigate the causes of a negative correlation between science teachers' education/qualification, teaching experience and academic achievements of their pupils. Students' performance may be improved by putting into practice innovative

science lessons and guidance supported by the positive attitude of science teachers for their subjects. Because the educational accomplishment of science students signifies a nation's success in area of science, it is recommended that a thorough qualitative study be undertaken to expose definite variables diminishing the positive attitudes of science teachers towards science. It is suggested in conclusion that equal gender opportunities for science teachers to learn and improve their science comprehensions and knowledge be afforded.

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