

**ATTITUDE OF PROSPECTIVE TEACHERS TOWARDS SCIENCE-  
EXPLORING TEACHERS PREPAREDNESS IN THE SUBJECT AREA  
OF SCIENCE EDUCATION AT TEACHER EDUCATION LEVEL IN  
SINDH, PAKISTAN**

*Dr. Munir Moosa Sadruddin*

*Dr. Mumtaz Khawaja*

*Samina Zafar*

**ABSTRACT**

*Positive attitude towards science is recognized as significant for teachers to inculcate optimum level of interest among students towards scientific endeavors. This exploratory field seeks quality teachers, who possess global knowledge as well as positive approach towards science. The present study reflects the attitude of prospective teachers towards science and teaching of science in Sindh. Quantitative research methodology is used. Within this domain, case survey method is adopted. Population includes all the prospective teachers of Sindh. Through criterion sampling, University of Sindh Jamshoro is chosen as case. Sample size n=100 prospective teachers is drawn from the Department of Education through convenient sampling. Data is collected using two Attitude Scales, i.e., Attitude towards Science (ATS) and Attitude towards Teaching of Science (ATTS). These scales were adapted and piloted in the local context. Findings are analyzed using tables and basic statistics. Findings revealed that overall, respondents have positive attitude towards science and teaching of science. Although their attitude is optimistic, yet they highlighted the existing gaps in the policy and curricula, which fail to prepare them towards global teaching methodologies and strategies. In addition, prospective teachers are keen to teach science with positivity, but lack of availability of resources hamper their preparedness towards bringing innovation into their teaching. There are few clashes of ideas among them towards science and teaching of science, which echo the need to strengthen their knowledge and skills. The researchers suggest integration of global knowledge with practical components in the science curricula of teacher education. Theoretical and outdated components should be replaced with current knowledge and skills. In this regard, HEC must loop in all the expert science teachers for their valuable feedbacks. More research studies such as content analysis of science courses should be conducted to identify gaps in science education. Scholarships and research opportunities should also be extended for science educators.*

**Keywords:** Attitude, Prospective Teachers, Science, Teacher Preparedness, Global Mindedness.

## INTRODUCTION

Science and technology are central to the national development of every country. It is also the part of sustainable developmental policies, which has scope to counteract global challenges effectively (Krohn, Layton & Weingart, 2012; National Academies Press, 2002). In this domain, science education plays important role in preparing future leaders towards pursuing career in the fields of science.

The critical discourse and competency of global citizens is determined through their active engagement in the developmental fields (Rao, 2010; Ungar, 2010). Generally, students show inclination towards those subject areas, which enhance their skills, develop curiosity, and are creatively driven; however, during the last few decades, in both developing and developed countries, it has been observed that despite of vitality of science, the affective engagement of students and their interest (by age ladder) to pursue career in science and technology is declining due to various factors (Papadouris *et.al.*, 2015; Potvin & Hasni, 2014; Xie & Achen, 2009; Saracho & Spodek, 2008; Watt, 2005; Osborne, Simon & Collins, 2003; Jones, Howe, & Rua, 2000), which include but not limited to lack of knowledge about career options in science, loss of interest towards science during schooling, outdated teaching methodologies, and lack of integration of global dimension in science education curricula (Christidou, 2011; Sgard, n.d.).

Few of the local and global research studies highlighted the attitude of students towards science education (Hasni & Potvin, 2015; Loukomies *et.al.*, 2013; Anwer, Iqbal & Harrison, 2012; Tytler & Osborne, 2011; Adesoji, 2008; Sjoberg & Schreiner, 2005; Haste, 2004; Osborne, Simon & Collins, 2003; Francis & Greer, 1999). Results revealed that activities, class environment, self-motivation, problem solving instructions, integrated curricula, experiences and aspirations stimulated students towards science education. In addition, gender and grade level (sustenance of interest) motivate students to embark upon the fields of science.

A detail study was undertaken by Anwar & Bhutta (2014) to find the attitude of lower secondary students towards science across Pakistan. Findings revealed positive outlook of students towards science; however, the study also pointed out that as the ladder of grade increase, curiosity among students towards science education decline in Pakistan. With regard to gender, female students are more

inclined towards science education (Iqbal & Harrison, 2012; Abbas *et.al.*, 2011); however future occupation has no significant effect on student's interest (Shah, Mahmood & Harrison, 2013).

Teachers play crucial role in developing interest of students towards science (Bulunuz & Jarrett, 2008), which is based on their preparedness and perceptions towards science education.

Preparing teachers for science education require meaningful curricula, innovative teaching practices and methodologies rather theory alone. Adapting global trends in science education help shaping positive attitude of teachers towards science; however, with regard to Pakistan, the curricula of science education at teacher education level are outdated. In the research project titled 'towards understanding the state of science in Pakistan', researchers pointed out inconsistency in science policy, and lack of supportive attitude of public policy makers towards science education (Inayatullah, 2003).

In the local and global contexts, limited research studies explored the attitude of teachers towards science (Denessen *et.al.*, 2015; Aalderen-Smeets & Molen, 2015; Metin, Acisli & Kolomuc, 2012; Asma, Walma., & Aalderen-Smeets, 2011; Haase, 2009; Jones & Levin, 1994). Although findings of most of these studies disclosed that teachers have optimistic attitude towards science with greater influence of their background, interest, experience, etc. however results cannot be generalized. Attitude formation and practical implementation of science education (observation, sustenance) require triangulation on a larger scale or in a case context, which has not yet been undertaken by any research study in Pakistan.

In the local context, researchers did not find any study, which identify the factors influencing the attitude of prospective teachers towards science and teaching of science in Pakistan. It certainly brought their attention towards (initially) exploring the attitude of prospective teachers towards both of these areas.

This research study will provide baseline for exploring further researches into this area. Findings of the research will also help suggesting policy makers as well as teacher education institutions to revisit the curricula of science education. It will also expand the scope of research by finding the attitude of institutions and policy makers towards science education in the future.

**RESEARCH DESIGN**

Quantitative research methodology is used. Within this domain, the researchers have undertaken case survey method. The population consists of all the prospective teachers of Sindh. Through criterion sampling, Sindh University Jamshoro is chosen as case. Sample size, i.e., 100 prospective teachers is drawn through convenient sampling from the Department of Education (doing either B.Ed, M.Ed, M.Phil /MS). Two Attitude Scales, i.e. Attitude towards Science (ATS) and Attitude towards Teaching of Science (ATTS) were drafted, validated and made reliable for consistency. For ethical consideration, each respondent signed consent letter before participating in survey. Data is analyzed using tables and basic statistics.

**ANALYSIS**

**TABLE-1**  
**SHOWING THE NUMBER OF RESPONDENTS ON THE BASIS OF GENDER**

<b>Gender</b>	<b>No. of Respondents</b>	<b>Percentage</b>
Male	35	35
Female	65	65
<b>Total</b>	<b>100</b>	<b>100</b>

Majority of the participants for this study are female

**TABLE-2**  
**SHOWING NUMBER OF RESPONDENTS ON THE BASIS OF AGE**

<b>Age</b>	<b>No. of Respondents</b>	<b>Percentage</b>
20-25 yrs	68	68
26- 30 yrs	22	22
31-35 yrs	10	10
36 -above	-	-
<b>Total</b>	<b>100</b>	<b>100</b>

Majority of the respondents belong to the age group of 20-25 yrs

**TABLE-3**  
**SHOWING THE NUMBER OF RESPONDENTS ON THE BASIS OF CURRENT EDUCATION STATUS**

<b>Degree</b>	<b>No. of Respondents</b>	<b>Percentage</b>
B.Ed	74	74
M.Ed	25	25
M.Phil/MS	01	01
<b>Total</b>	<b>100</b>	<b>100</b>

**TABLE-4**  
**SHOWING THE NUMBER OF RESPONDENTS ON THE BASIS OF**  
**PAST TEACHING EXPERIENCE**

<b>Experience</b>	<b>No. of Respondents</b>	<b>Percentage</b>
Below 5 years	84	84
6- 10 years	15	15
11- 15 years	01	01
16 years and above	00	--
<b>Total</b>	<b>100</b>	<b>100</b>

Most of the respondents are enrolled in Bachelors of Education.

Most of the respondents have less than five years of past teaching experience

#### **SECTION A: ATTITUDE TOWARDS SCIENCE**

**TABLE-1A**  
**SHOWING THE NUMBER OF RESPONDENTS ON THE BASIS OF**  
**ITEM NO.1A**

<b>Responses</b>	<b>No. of Respondents</b>	<b>Mean SD</b>
Strongly Agree	35	<b>20 17.5</b>
Agree	42	
Neutral	13	
Disagree	08	
Strongly Disagree	02	
<b>Total</b>	<b>100</b>	

**TABLE-2A**  
**SHOWING THE NUMBER OF RESPONDENTS ON THE BASIS OF**  
**ITEM NO.2A**

<b>Responses</b>	<b>No. of Respondents</b>	<b>Mean SD</b>
Strongly Agree	52	<b>20 25.31</b>
Agree	43	
Neutral	03	
Disagree	01	
Strongly Disagree	01	
<b>Total</b>	<b>100</b>	

**TABLE-3A**  
**SHOWING THE NUMBER OF RESPONDENTS ON THE BASIS OF**  
**ITEM NO.3A**

<b>Responses</b>	<b>No. of Respondents</b>	<b>Mean SD</b>
Strongly Agree	61	<b>20 26.27</b>
Agree	32	
Neutral	03	
Disagree	02	
Strongly Disagree	02	
<b>Total</b>	<b>100</b>	

**TABLE-4A**  
**SHOWING THE NUMBER OF RESPONDENTS ON THE BASIS OF**  
**ITEM NO.4A**

<b>Responses</b>	<b>No. of Respondents</b>	<b>Mean SD</b>
Strongly Agree	16	<b>20 7.90</b>
Agree	19	
Neutral	12	
Disagree	33	
Strongly Disagree	20	
<b>Total</b>	<b>100</b>	

**TABLE-5A**  
**SHOWING THE NUMBER OF RESPONDENTS ON THE BASIS OF**  
**ITEM NO.5A**

<b>Responses</b>	<b>No. of Respondents</b>	<b>Mean SD</b>
Strongly Agree	09	<b>20 9.59</b>
Agree	29	
Neutral	14	
Disagree	31	
Strongly Disagree	17	
<b>Total</b>	<b>100</b>	

**TABLE-6A**  
**SHOWING THE NUMBER OF RESPONDENTS ON THE BASIS OF**  
**ITEM NO.6A**

<b>Responses</b>	<b>No. of Respondents</b>	<b>Mean SD</b>
Strongly Agree	20	<b>20 12.82</b>
Agree	42	
Neutral	15	
Disagree	10	
Strongly Disagree	13	
<b>Total</b>	<b>100</b>	

**TABLE-7A**  
**SHOWING THE NUMBER OF RESPONDENTS ON THE BASIS OF**  
**ITEM NO.7A**

<b>Responses</b>	<b>No. of Respondents</b>	<b>Mean SD</b>
Strongly Agree	27	<b>20 12.82</b>
Agree	37	
Neutral	20	
Disagree	12	
Strongly Disagree	04	
<b>Total</b>	<b>100</b>	

**TABLE-8A**  
**SHOWING THE NUMBER OF RESPONDENTS ON THE BASIS OF**  
**ITEM NO.8A**

<b>Responses</b>	<b>No. of Respondents</b>	<b>Mean SD</b>
Strongly Agree	58	<b>20 24.96</b>
Agree	33	
Neutral	06	
Disagree	02	
Strongly Disagree	01	
<b>Total</b>	<b>100</b>	

**TABLE-9A**  
**SHOWING THE NUMBER OF RESPONDENTS ON THE BASIS OF**  
**ITEM NO.9A**

<b>Responses</b>	<b>No. of Respondents</b>	<b>Mean SD</b>
Strongly Agree	35	<b>20 18.26</b>
Agree	44	
Neutral	10	
Disagree	08	
Strongly Disagree	03	
<b>Total</b>	<b>100</b>	

**TABLE-10A**  
**SHOWING THE NUMBER OF RESPONDENTS ON THE BASIS OF**  
**ITEM NO.10A**

<b>Responses</b>	<b>No. of Respondents</b>	<b>Mean SD</b>
Strongly Agree	15	<b>20 8.45</b>
Agree	35	
Neutral	16	
Disagree	16	
Strongly Disagree	18	
<b>Total</b>	<b>100</b>	

**TABLE-11A**  
**SHOWING THE NUMBER OF RESPONDENTS ON THE BASIS OF**  
**ITEM NO.11A**

<b>Responses</b>	<b>No. of Respondents</b>	<b>Mean SD</b>
Strongly Agree	06	<b>20 11.93</b>
Agree	17	
Neutral	15	
Disagree	38	
Strongly Disagree	24	
<b>Total</b>	<b>100</b>	



**TABLE-12A**  
**SHOWING THE NUMBER OF RESPONDENTS ON THE BASIS OF**  
**ITEM NO.12A**

<b>Responses</b>	<b>No. of Respondents</b>	<b>Mean SD</b>
Strongly Agree	14	<b>20 9.97</b>
Agree	32	
Neutral	27	
Disagree	20	
Strongly Disagree	07	
<b>Total</b>	<b>100</b>	

**TABLE-13A**  
**SHOWING THE NUMBER OF RESPONDENTS ON THE BASIS OF**  
**ITEM NO.13A**

<b>Responses</b>	<b>No. of Respondents</b>	<b>Mean SD</b>
Strongly Agree	21	<b>20 18.17</b>
Agree	51	
Neutral	10	
Disagree	12	
Strongly Disagree	06	
<b>Total</b>	<b>100</b>	

**TABLE-14A**  
**SHOWING THE NUMBER OF RESPONDENTS ON THE BASIS OF**  
**ITEM NO.14A**

<b>Responses</b>	<b>No. of Respondents</b>	<b>Mean SD</b>
Strongly Agree	21	<b>20 7.77</b>
Agree	22	
Neutral	16	
Disagree	31	
Strongly Disagree	10	
<b>Total</b>	<b>100</b>	

**TABLE-15A**  
**SHOWING THE NUMBER OF RESPONDENTS ON THE BASIS OF**  
**ITEM NO.15A**

<b>Responses</b>	<b>No. of Respondents</b>	<b>Mean SD</b>
Strongly Agree	16	<b>20 16.55</b>
Agree	46	
Neutral	24	
Disagree	12	
Strongly Disagree	02	
<b>Total</b>	<b>100</b>	

**TABLE-16A**  
**SHOWING THE NUMBER OF RESPONDENTS ON THE BASIS OF**  
**ITEM NO.16A**

<b>Responses</b>	<b>No. of Respondents</b>	<b>Mean SD</b>
Strongly Agree	21	<b>20 8.09</b>
Agree	32	
Neutral	21	
Disagree	10	
Strongly Disagree	16	
<b>Total</b>	<b>100</b>	

**SECTION-B: ATTITUDE TOWARDS SCIENCE TEACHING**

**TABLE-1B**  
**SHOWING THE NUMBER OF RESPONDENTS ON THE BASIS OF**  
**ITEM NO.1B**

<b>Responses</b>	<b>No. of Respondents</b>	<b>Mean SD</b>
Strongly Agree	39	<b>20 22.06</b>
Agree	48	
Neutral	11	
Disagree	01	
Strongly Disagree	01	
<b>Total</b>	<b>100</b>	

**TABLE-2B**  
**SHOWING THE NUMBER OF RESPONDENTS ON THE BASIS OF**  
**ITEM NO.2B**

<b>Responses</b>	<b>No. of Respondents</b>	<b>Mean SD</b>
Strongly Agree	35	<b>20</b> <b>20.97</b>
Agree	49	
Neutral	11	
Disagree	03	
Strongly Disagree	02	
<b>Total</b>	<b>100</b>	

**TABLE-3B**  
**SHOWING THE NUMBER OF RESPONDENTS ON THE BASIS OF**  
**ITEM NO.3B**

<b>Responses</b>	<b>No. of Respondents</b>	<b>Mean SD</b>
Strongly Agree	28	<b>20</b> <b>16.95</b>
Agree	45	
Neutral	17	
Disagree	06	
Strongly Disagree	04	
<b>Total</b>	<b>100</b>	

**TABLE-4B**  
**SHOWING THE NUMBER OF RESPONDENTS ON THE BASIS OF**  
**ITEM NO.4B**

<b>Responses</b>	<b>No. of Respondents</b>	<b>Mean SD</b>
Strongly Agree	27	<b>20</b> <b>18.26</b>
Agree	48	
Neutral	16	
Disagree	06	
<b>Strongly Disagree</b>	<b>03</b>	
<b>Total</b>	<b>100</b>	

**TABLE-5B**  
**SHOWING THE NUMBER OF RESPONDENTS ON THE BASIS OF**  
**ITEM NO.5B**

<b>Responses</b>	<b>No. of Respondents</b>	<b>Mean SD</b>
Strongly Agree	33	<b>20 15.66</b>
Agree	40	
Neutral	14	
Disagree	09	
Strongly Disagree	04	
<b>Total</b>	<b>100</b>	

**TABLE-6B**  
**SHOWING THE NUMBER OF RESPONDENTS ON THE BASIS OF**  
**ITEM NO.6B**

<b>Responses</b>	<b>No. of Respondents</b>	<b>Mean SD</b>
Strongly Agree	35	<b>20 17.80</b>
Agree	43	
Neutral	11	
Disagree	08	
Strongly Disagree	03	
<b>Total</b>	<b>100</b>	

**TABLE-7B**  
**SHOWING THE NUMBER OF RESPONDENTS ON THE BASIS OF**  
**ITEM NO.7B**

<b>Responses</b>	<b>No. of Respondents</b>	<b>Mean</b>	<b>SD</b>
Strongly Agree	52	<b>20</b>	<b>23.40</b>
Agree	38		
Neutral	06		
Disagree	02		
Strongly Disagree	02		
<b>Total</b>	<b>100</b>		

**TABLE-8B**  
**SHOWING THE NUMBER OF RESPONDENTS ON THE BASIS OF**  
**ITEM NO.8B**

<b>Responses</b>	<b>No. of Respondents</b>	<b>Mean SD</b>
Strongly Agree	12	<b>20 9.30</b>
Agree	17	
Neutral	16	
Disagree	36	
Strongly Disagree	19	

**TABLE-9B**  
**SHOWING THE NUMBER OF RESPONDENTS ON BASIS OF ITEM**  
**NO.9B**

<b>Responses</b>	<b>No. of Respondents</b>	<b>Mean SD</b>
Strongly Agree	35	<b>20 20.35</b>
Agree	48	
Neutral	08	
Disagree	08	
Strongly Disagree	01	

**TABLE-10B**  
**SHOWING THE NUMBER OF RESPONDENTS ON THE BASIS OF**  
**ITEM NO.10B**

<b>Responses</b>	<b>No. of Respondents</b>	<b>Mean SD</b>
Strongly Agree	28	<b>20 19.48</b>
Agree	50	
Neutral	13	
Disagree	08	
Strongly Disagree	01	

**TABLE-11B**  
**SHOWING THE NUMBER OF RESPONDENTS ON THE BASIS OF**  
**ITEM NO.11B**

<b>Responses</b>	<b>No. of Respondents</b>	<b>Mean SD</b>
Strongly Agree	36	<b>20 22.70</b>
Agree	52	
Neutral	07	
Disagree	03	
Strongly Disagree	02	

**TABLE-12B**  
**SHOWING THE NUMBER OF RESPONDENTS ON THE BASIS OF**  
**ITEM NO.12B**

<b>Responses</b>	<b>No. of Respondents</b>	<b>Mean SD</b>
Strongly Agree	38	<b>20</b> <b>22.46</b>
Agree	50	
Neutral	07	
Disagree	05	
Strongly Disagree	00	

**TABLE-13B**  
**SHOWING THE NUMBER OF RESPONDENTS ON THE BASIS OF**  
**ITEM NO.13B**

<b>Responses</b>	<b>No. of Respondents</b>	<b>Mean SD</b>
Strongly Agree	27	<b>20</b> <b>18.78</b>
Agree	48	
Neutral	19	
Disagree	03	
Strongly Disagree	03	

**TABLE-14B**  
**SHOWING THE NUMBER OF RESPONDENTS ON THE BASIS OF**  
**ITEM NO.14B**

<b>Responses</b>	<b>No. of Respondents</b>	<b>Mean SD</b>
Strongly Agree	30	<b>20</b> <b>19.89</b>
Agree	50	
Neutral	12	
Disagree	06	
Strongly Disagree	02	

**TABLE-15B**  
**SHOWING THE NUMBER OF RESPONDENTS ON THE BASIS OF**  
**ITEM NO.15B**

<b>Responses</b>	<b>No. of Respondents</b>	<b>Mean SD</b>
Strongly Agree	23	<b>20</b> <b>19.19</b>
Agree	52	
Neutral	12	
Disagree	09	
Strongly Disagree	04	

**FINDINGS**

Overall, prospective teachers have positive attitude towards science and teaching of science.

**For Scale 1:** Majority of the respondents agreed that science is taught in an interesting way in teacher education. They also considered science as relevant to everyday life, as well as agreed that it is important for the brighter future of Pakistan. It is quite interesting to note that most of the prospective teachers disagreed that this subject is difficult to learn and teach, but a good number of respondents showed agreeableness towards its difficult nature. Similarly, most of the respondents disagreed that there is no inclusion of global concept in science education at teacher education level, but a good proportion of respondents highlighted lack of inclusion of global content. Majority of the respondents are keen to learn about scientific explanations. Most of the respondents are looking forward to teach science lessons in school. It reflects their positive motivation towards science. Majority of the respondents showed interest in science; however few respondents did not show any curiosity towards science. Most of the respondents agreed that science and technology are the root cause of global issues. We can verify this attitude through item number 10, where question of similar nature was asked, and alike responses were gathered. Preponderance of the respondents agreed that they would like to study science thoroughly to improve existing knowledge. This can be correlated to item number 7, where they highlighted the need to strengthen their scientific knowledge.

**For Scale 2:** Majority of the respondents agreed that they have knowledge to teach science to the students. Most of them agreed that there is a shortage of science teaching resources in Pakistan. In addition, lack of preparedness towards modern teaching methodologies fails to equip them with global teaching skills. Majority of the respondents highlighted the importance of using modeling, simulation and experiments in science education, but did not use these due to the latter issue. Most of the respondents believed that learning formulae and procedures is the key to success in science education; however in the view of researchers, this notion reflects proclivity of prospective teachers towards rote-learning. Contrary to that is another item, where respondents underlined the importance of using science in the real-world setting, which is linked to clarifying concepts rather rote-learning. Majority of the respondents supported

reflective practices and critical thinking skills. Most of them agreed that it is important to equip children with scientific facts. They also agreed that it is crucial to guide students while conducting experiments.

## DISCUSSION

In today's context, the role of science education is to create scientifically literate population, who can confront global issues through pertinent decision making and critical reasoning skills. Exploring science helps gaining deeper understanding towards innovations, as well as facilitates finding alternative solutions to challenges. A research study shared that the field of science has potential to empower communities in Pakistan (Zahur, Barton & Upadhyay, 2002); however, due to lack of use of scientific approach, much advance development has not been witnessed in Pakistan.

With on-going global transformations, science has opened up more career paths (environmental scientist, synthetic biologist, etc.) for the students. But the question tickles, are students willing to pursue career in science? What attitude they carry towards science education?

In Pakistan, environmental education, and many other emerging sub-fields are often excluded from the domain of science education at school, college and university level, which could be one of the contributing factors for trivial interest of youth towards scientific careers. Also, awareness towards the future prospect of scientific fields is sparse.

It is often perceived that the constructive attitude of students towards science is framed by their personal curiosity; however, science teachers play equal role in motivating, inspiring, guiding and developing positive attitude of students towards science education (Stratton *et.al.*, 2015). If the aptitude and attitude of teachers towards science is acceptable, it is likely that student's beliefs and interest may further accelerate (Zint, 2002).

Teachers' beliefs, attitude and awareness impact teaching and learning process (Evan, 2014). Thus, it is important for teachers to deliver best, and build stronger ties with the students and colleagues to justify this profession. With regard to science educators, the role of teacher is central to create interest of students towards science by using global teaching methodologies and innovative strategies to



make science teaching appealing. Further, teachers have potential to empower students to play their active role in social change (Roth & Barton, 2004). Thus, science educators are the agent of change and novelty.

As a science teacher, it is also important to support and expand the intellectual capacities of students, make students effective problem solver, promote scientific inquiry, stay up-to-date about science pedagogy, become reflective practitioners, and bring innovation in teaching (NSTA, 2006). Osborne *et.al.*, (2003) shared that positive attitude of students towards science is co-related to the positive attitude of teachers towards the same. It gives an idea, how essential the role of science teacher is, to build up positive interest of students towards science education.

Teacher education plays significant role (Craven & Penick, 2001) in deepening knowledge and promoting competent skills among teachers towards science (Rhoton, 2010). Innovative teaching methods, dynamic knowledge, creative ideas, reflective practices, action research, integration of technology, and modeling and simulation are significant elements of global science education at teacher education level.

Globally, several reformations have taken place in the standards, curricula and instructional techniques of science education (Cheng & Winnie, 2011; Abell, 2006). In the book, *Crossing Boundaries in Science Teacher Education*, various scholars have shared successful cases of innovations in science education curricula, and discussed integration of global teaching methodologies to inculcate positive interest towards teaching of science (Hansen, Graber & Lang, 2012).

Teacher education programs in Pakistan are not equipping teachers with global knowledge and competent skills in science education (Halai, 2008). In this regard, policies are aloof to bring sustainable reformations. As a result, majority of the teachers prefer using outdated teaching methods and activities in science class. Findings of one of the studies revealed that most of the science teachers apply traditional teaching methods due to lack of preparedness towards global competent skills (Iqbal, Azam, & Rana, 2009). Iqbal & Mahmood (2000) further highlighted lack of quality of course content in teacher education in Pakistan.

Findings of the present research study endorsed most of the former and latter discussed challenges. Although prospective teachers have encouraging attitude towards science education and its teaching, but there is a gap between attitude and realities. Majority of the respondents are desirous to learn about scientific explanations. This notion clarifies that although global content, in most of their views, are included in science education, yet, their preparedness towards scientific knowledge needs further acceleration. They are also keen to adapt global methodologies, but science education failed to equip them with global teaching skills. This could be due to lack of attentiveness of policy makers towards science education, and the existence of outdated curricula. In this regard, role of teacher educator is central. Looking at the education policies, researchers found that although science and technology has received policy attention, yet its practical implementation is missing. It certainly brings challenging task for teachers to teach students with innovation, in the absence of modern scientific teaching resources as well as teaching skills. Most of the respondents showed interest in science; however twenty three respondents did not show any curiosity towards science. It shows that a good number of prospective teachers are learning science without taking keen interest in the subject matter. We can relate this attitude to their future role in preparing students towards the same. It somehow gives an idea that their lack of interest and unconstructive attitude might impact students' curiosity towards science. There are few clashes of ideas among prospective teachers towards science and teaching of science, which echo the need to strengthen knowledge and skills of prospective teachers towards teaching of science.

#### **CONCLUSION**

In addition to a positive attitude of prospective teachers towards science, teaching of science with innovation requires global knowledge, set of modern teaching skills, and availability of resources. In this regard, curricula of science education must be integrated with 21<sup>st</sup> century skills.

#### **RECOMMENDATION**

Science education curricula at teacher education level should be revised. It should be integrated with global knowledge, methodologies and teaching strategies. Further shortage of science teaching resources

should be addressed. Misconceptions among prospective teachers over few of the elements of science and its teaching should be clarified. To match the performance and competency, global standards should be aligned with local policies. Further, attributes such as open-mindedness should be instilled among science teachers (Marlow, 2002). To develop interest of prospective teachers towards science, HEC should provide scholarships and research opportunities to science educators.

## REFERENCES

- Aalderen-Smeets, S., & Molen, J. (2015), Improving Primary Teachers' Attitudes Toward Science by Attitude-Focused Professional Development. *Journal of Research in Science Teaching*.
- Abbas, R.Z., Ashraf, M., Ahmad, Z., & Ahmad, M. (2011), Measuring the Attitude Towards Science in Pakistan a Study of Secondary School Students. *Interdisciplinary Journal of Contemporary Research in Business*, 2(10).
- Abell, S.K. (2006), Science Teacher Education: An International Perspective. *Springer Science & Business*.
- Adesoji, F.A. (2008), Managing Students' Attitude Towards Science Through Problem-Solving Instructional Strategy. *Anthropologist*, 10(1):21-24.
- Anwar, N.P., & Bhutta, S. M. (2014), Students' Attitude Towards Science in Lower Secondary Classes: Comparison Across Regions. *Journal of Educational Research*, 17(1):77-90.
- Anwer, M., Iqbal, H.M., & Harrison, C. (2012), Students' Attitude Towards Science: A Case of Pakistan. *Pakistan Journal of Social and Clinical Psychology*, 10(1):3-9.
- Asma, L.J.F., Walma, J.H., & Aalderen-Smeets, S.I. (2011), Primary Teachers' Attitudes Towards Science: Results of a Focus Group Study. In M.J. de Vries, H. van Keulen, S. Peters, & J.H. Walma van der Molen (Eds.). *Professional Development for Primary Teachers in Science. The Dutch VTB-Pro Project in an International Perspective* (pp.89-105). Rotterdam: Sense.
- Bulunuz, M., & Jarrett, O. S. (2008), Development of Positive Interest and Attitudes Toward Science and Interest in Teaching Elementary Science: Influence of Inquiry Methods Course Experiences. Paper presented at the Teacher Education Policy in Europe (TEPE), University of Ljubljana, Slovenia.

- Cheng, M., & Winnie, W.M. (2011), Science Education in International Contexts. Springer Science & Business.
- Christidou, V. (2011), Interest, Attitudes and Images Related to Science: Combining Students' Voices with the Voice of School Science, Teachers, and Popular Science. *International Journal of Environmental and Science Education*, 6(2):141-159.
- Craven, J. A., & Penick, J. E. (2001), Preparing New Teachers to Teach Science: The Role of the Science Teacher Educator Electronic. *Journal of Science Education*, 6 (1):1-14.
- Denessen, E., Vos, N., Hasselman, F., & Louws, M. (2015), The Relationship Between Primary School Teacher and Student Attitudes Towards Science and Technology. *Education Research International*, doi:<http://dx.doi.org/10.1155/2015/534690>
- Evan (2014), The Role of Science Teachers' Beliefs in International Classrooms. Sense Publishers.
- Francis, L.J., & Greer, J.E. (1999), Measuring Attitude Towards Science Among Secondary School Students: The Affective Domain. *Research in Science & Technological Education*, 17(2).
- Haase, R. (2009), Elementary Teachers Attitudes Towards Science and the Teaching of Science and Technology. University of Windsor.
- Halai, N. (2008). Curriculum Reform in Science Education in Pakistan. Science Education in Context: An International Examination of the Influence of Context on Science Curricula Development and Implementation, 115-129.
- Hansen, K.H., Graber, W., & Lang, M. (2012), Crossing Boundaries in Science Teacher Education. Waxmann Verlag.
- Hasni, A., & Potvin, P. (2015), Student's Interest in Science and Technology and its Relationships with Teaching Methods, Family Context and Self-Efficacy. *International Journal of Environmental and Science Education*, 10(3):337-366.
- Haste, H. (2004), Science in My Future: A Study of the Values and Beliefs in Relation to Science and Technology Amongst 11-21 year olds. Nestlé Social Research Programme.
- Inayatullah. (2003), Towards Understanding the State of Science in Pakistan. Islamabad: Council of Social Sciences Pakistan.
- Iqbal, H.F., Azam, S., & Rana, R.A. (2009), Secondary School Science Teachers' Views About the 'Nature of Science'. *Bulletin of Education and Research*, 31(2):29-44.

- Cheng, M., & Winnie, W.M. (2011), Science Education in International Contexts. Springer Science & Business.
- Christidou, V. (2011), Interest, Attitudes and Images Related to Science: Combining Students' Voices with the Voice of School Science, Teachers, and Popular Science. *International Journal of Environmental and Science Education*, 6(2):141-159.
- Craven, J. A., & Penick, J. E. (2001), Preparing New Teachers to Teach Science: The Role of the Science Teacher Educator Electronic. *Journal of Science Education*, 6 (1):1-14.
- Denessen, E., Vos, N., Hasselman, F., & Louws, M. (2015), The Relationship Between Primary School Teacher and Student Attitudes Towards Science and Technology. *Education Research International*, doi:<http://dx.doi.org/10.1155/2015/534690>
- Evan (2014), The Role of Science Teachers' Beliefs in International Classrooms. Sense Publishers.
- Francis, L.J., & Greer, J.E. (1999), Measuring Attitude Towards Science Among Secondary School Students: The Affective Domain. *Research in Science & Technological Education*, 17(2).
- Haase, R. (2009), Elementary Teachers Attitudes Towards Science and the Teaching of Science and Technology. University of Windsor.
- Halai, N. (2008). Curriculum Reform in Science Education in Pakistan. Science Education in Context: An International Examination of the Influence of Context on Science Curricula Development and Implementation, 115-129.
- Hansen, K.H., Graber, W., & Lang, M. (2012), Crossing Boundaries in Science Teacher Education. Waxmann Verlag.
- Hasni, A., & Potvin, P. (2015), Student's Interest in Science and Technology and its Relationships with Teaching Methods, Family Context and Self-Efficacy. *International Journal of Environmental and Science Education*, 10(3):337-366.
- Haste, H. (2004), Science in My Future: A Study of the Values and Beliefs in Relation to Science and Technology Amongst 11-21 year olds. Nestlé Social Research Programme.
- Inayatullah. (2003), Towards Understanding the State of Science in Pakistan. Islamabad: Council of Social Sciences Pakistan.
- Iqbal, H.F., Azam, S., & Rana, R.A. (2009), Secondary School Science Teachers' Views About the 'Nature of Science'. *Bulletin of Education and Research*, 31(2):29-44.

- Iqbal, H.M., & Mahmood, N. (2000), Science Teacher Education in Pakistan. In S.K. Abell (Ed.), *Science Teacher Education: An International Perspective* (pp.75-92). Boston: Kluwer.
- Iqbal, M.A., & Harrison, C. (2012), Students' Attitude towards Science: A Case of Pakistan. *Pakistan Journal of Social and Clinical Psychology*, 10(1):3-9.
- Jones, C., & Levin, J. (1994), Primary/Elementary Teachers' Attitudes Toward Science in Four Areas Related to Gender Differences in Students' Science Performance. *Journal of Elementary Science Education*, 6(1):46-66.
- Jones, M. G., Howe, A., & Rua, M. J. (2000), Gender Differences in Students' Experiences, Interests, and Attitudes toward Science and Scientists. *Science Education*, (84):180-192.
- Krohn, W., Layton, E.T., & Weingart, P. (2012), The Dynamics of Science and Technology: Social Values, Technical Norms and Scientific Criteria in the Development of Knowledge. *Springer Science & Business Media*.
- Loukomies, A., Pnevmatikos, D., Lavonen, J., Spyrtou, A., Byman, R., Kariotoglou, P., & Juuti, K. (2013), Promoting Students' Interest and Motivation Towards Science Learning: the Role of Personal Needs and Motivation Orientations. *Research in Science Education*, 43(6):2517-2539.
- Marlow, E. (2002). Assessing Teacher Attitudes in Teaching Science. *Journal of Instructional Psychology*, 29(1):25-28.
- Metin, M., Acisli, S., & Kolomuc, A. (2012), Attitude of Elementary Prospective Teachers Towards Science Teaching. *Procedia - Social and Behavioral Sciences*, (46):2004-2008.
- National Academies Press. (2002), Making the Nation Safer: The Role of Science and Technology in Countering Terrorism. National Academies Press.
- NSTA. (2006), NSTA Position Statement: Professional Development in Science Education. National Science Teachers Association.
- Osborne, J., Simon, S., & Collins, S. (2003), Attitudes Toward Science: A Review of the Literature and its Implications. *International Journal of Science Education*, 25(9):1049-1079.
- Papadouris, N., Hadjigeorgiou, A., & Constantinou, C.P. (2015), Insights from Research in Science Teaching and Learning: Selected Papers from the ESERA 2013 Conference. Springer.
- Potvin, P., & Hasni, A. (2014), Analysis of the Decline in Interest Towards School Science and Technology from Grades 5 Through 11. *Journal of Science Education and Technology*, 23(6):784-802.

- Rao, D.B. (2010), Scientific Attitude, Scientific Aptitude and Achievement. Discovery Publishing House.
- Rhoton, J. (2010), Science Education Leadership: Best Practices for the New Century. NSTA Press.
- Roth, W., & Barton, A.C. (2004), Rethinking Scientific Literacy. Psychology Press.
- Saracho, O.N., & Spodek, B. (2008), Contemporary Perspectives on Science and Technology in Early Childhood Education. IAP.
- Sgard, F. (n.d.), Global Science Forum Activity on Declining Interest in Science Studies among Young People. OCDE- Global Science Forum.
- Shah, Z.A., Mahmood, N., & Harrison, C. (2013), Attitude Towards Science Learning: An Exploration of Pakistani Students. *Journal of Turkish Science Education*, 10(2):35-47.
- Sjoberg, S., & Schreiner, C. (2005), How Do Learners in Different Cultures Relate to Science and Technology? Results and Perspectives from the project ROSE. *Asia Pacific Forum on Science Learning and Teaching*, 6(2):1-16.
- Stratton, S., Hagevik, R., Feldman, A., & Bloom, M. (2015), Educating Science Teachers for Sustainability. Springer.
- Tytler, R., & Osborne, J. (2011), Student Attitudes and Aspirations Towards Science. *Second International Handbook of Science Education*. Springer.
- Ungar, S.J. (2010), Seven Major Misperceptions About the Liberal Arts. *The Chronicle of Higher Education*.
- Watt, H. M. G. (2005). Explaining Gendered Math Enrolments for NSW Australian Secondary School Students. In J. E. Jacobs & S. D. Simpkins (eds.), *Leaks in the Pipeline to Math, Science, and Technology Careers*. (pp.15-29). San Francisco: Jossey-Bass.
- Xie, Y., & Achen, A. (2009), Science on the Decline? Educational Outcomes of Three Cohorts of Young Americans. Population Studies Center, University of Michigan.
- Zahur, R., Barton, A.C. & Upadhyay, B. R. (2002), Science Education for Empowerment and Social Change: A Case Study of a Teacher Educator in Urban Pakistani School. *International Journal of Science Education, U.K.*, 24(9):899-91.
- Zint, M. (2002), Comparing Three Attitude-Behavior Theories for Predicting Science Teachers' Intentions. *Journal of Research in Science Teaching*, 39(9):819-844.