

Interrogations and Prospective of Science Education at Secondary Level in Punjab, Pakistan

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Abstract

This research was designed to study the interrogation and prospective of science education at secondary level in Punjab, Pakistan. The present study was descriptive in nature and cross-sectional survey was conducted. Study was delimited to Punjab. All the science teachers of public secondary schools were the population. The sample was comprised of 495 secondary science teachers from the public schools of Lahore selected by proportionate sampling technique. The questionnaire was developed, piloted and validated before data collection. Main findings of the study indicated that secondary science teachers have challenges and prospects in science education related to classroom management, internal evaluation system, application of teaching methodologies. It is recommended to train teachers about application of modern teaching methodologies and strategies for motivating students to learn in effective environment and the science might get progress and emphasis on learning that contribute in the prosperity of the country in the field of science.

Key Words: Challenges, Science Education, Classroom Management, Evaluation, Teaching Methodology, Strategies.

Introduction

Modern science has revolutionized this world. It ensures the safety of nation, gave the modern root great quality items, enhanced the watering structure framework and expanded the horticulture yields. Additionally, it discovered cures and treatments for different infections, expanded the future rate, added to the correspondence framework with quick moving cars and air ships, educated the more prominent crowds of individuals with quick method for data analyzing, TOT broadcasting, immersive technology, and cyber security has revolutionize the life of individuals healthier and simple. The improvement and creation of digital DAB radio, smart TV, portable correspondence, 360 degree attractive reverberation photography, drones, AI (Artificial Intelligence), , advancement of semi-directing gadgets, coordinated circuits, 10th generation PCs, hybrid engines, power, space creates, web, e-saving money and so forth have extensive effect on the human life. The scientific knowledge is the knowledge that stipulate people with the theoretical and advanced technical tools and procedures to explain how the world works or going on ([Shukla, 2014](#)).

Science has developing significance in the present today's reality. Now the old meaning of science gradually changed and based on verifiable knowledge and experimentation. Developments in showing

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guides and showing methodologies are acquainted with enhance students' execution. The science students of ninth and tenth grades portrayed that the students cannot feel the relationship between the school life and the experience passes smoothly ordinary life and a large number of students failed in science subjects in the final year (Hussain & Reid, 2006), [Donnelly & Jenkins \(2001\)](#), [Osborne & Collins \(2001\)](#).

The Education Sector Reforms displayed that the organization of Pakistan have proposed diverse parameters for upgrading the way of preparing and improvement in quality of science. The ESR recognized that there are diverse stipulations in the science preparing undertaking. The secondary schools are deficient in science workplaces. The science examination focuses are severely arranged or nonexistent in the discretionary schools. The progressions proposed to the national government to produce three thousand science labs in schools in the midst of the year 2001-2011. Furthermore, the essential lab equipment is given to five thousand secondary schools which are insufficient in science mechanical gathering. Thus, a total of Rs. 3408.875 million was spared in the ESR. The key time of the ESR was named as "Re-trying of Science Education at Secondary Schools Level". In the midst of this stage, 1000 new school lab were to be constructed and furnished with science equipment and consumables. In like manner, around 1250 ebb and flow school exploration focuses were to be given the essential science gear. The regions and associations were to be offered trusts to the same reason. The district would then give the trusts to their different region on need premise (National Education Policy, 2009).

[Gallagher \(2000\)](#) acknowledged that the conceptualization of science education requires consideration of previous science education reforms in a field that many believe has been reformed in somehow or another since its emergence

[Ediger \(1999\)](#) pointed out three destinations in science instruction. The main goal is to identify the intellectual space, which contains the learning of thoughts, ideas and speculations. The second is the use of the science learning for taking care of the understudies issues went against regular life. Last yet not the minimum are the improvements of an inspirational state of mind towards science educational programs and towards the general public ([Wallace & Loudon, 2002](#)), ([Bekalo & Welford, 2000](#)). On the other hand, it is accentuation that the school science is not fit for taking care of the understudies and their regular issues. What's more, science instruction has neglected to create an inspirational demeanour in the understudies towards oneself, towards science educational programs and the general public ([Sharma, 2004](#)), ([Ribas, 2005](#)), ([Sternberg, Grigorenko, & Zhang, 2008](#)).

[Jacques and Poisson \(2001\)](#) while expounding that the extent of science instruction contrasts from nation to nation. The complement moreover keeps moving among the substance of science, indicating methods, exploratory mechanical assemblies and qualities. We are living in a consistent age which obliges the appreciation of science ([Mathews, 2000](#)). It is a socio-social and recorded thing that can serve the whole mankind. Despite the way that, science has brought various ills and difficulties, yet toward the days end ([Rowlands, 2008](#)). [Hazen \(2002\)](#) require test competent persons who can welcome their general surroundings and can settle on taught particular choices (Wolf, 2004), ([Zhang, 2008](#)).

[Bailin, \(2002\)](#) says science training should weight on creating basic intuition in the understudies. This basic speculation might be logical in nature, while utilization of this idea in science training includes concentrating on the assignments, issues and issues in the science educational modules. [Hill and Tanveer \(1990\)](#) presented that a systematic plan for the implementation of national curriculum development effort in science education was brought in Pakistan. Science education was given little attention and was not included in secondary level curricula until after the establishment of Pakistan in 1947 (Hallay, 2008). For Pakistan, the challenges lie in adopting scientific approach in four areas that need to be fully modernized according to the STS approach. These dimensions include: assessment system; science textbooks; training programs for science teachers; available school resources and facilities ([Jessani, 2015](#)).

The secondary level starts from 9th grade and ends at 10th grade. The students after passing middle level exam took admission in 9th class. At this level, the students have a choice to select one line generally

called science and arts group. On the basis of 8th grade numbers the students with the guidance of teachers and assistance of parents decided to go to science line or the arts line. The shining students adopts science group. Science group include many subjects like physics, biology/computer, chemistry and mathematics. During two years period, the students face many challenges and hurdles in science education related activities. These challenges and barriers alter the attitude and behaviour of students.

Since its independence in 1947, Pakistan has achieved a niche in science and innovation. On the other hand, the examination of the current situation with the science education program at the secondary level is of particular importance. The research study will focus on distinctive challenges of teaching science at the secondary level in Pakistan. These risk areas for identifying challenges include goals for science teaching, science course content, presentation systems, assessment, instructors' preparation, and access to types of science equipment in the laboratory. The announcement of the issue under scrutiny is in this manner "Interrogation and Prospective of science education at Public Secondary Schools of Punjab, Pakistan"

Objectives of the Study

The main objectives of this study were to identify challenges faced by teachers in science education at secondary level and, to compare the challenges and prospects faced by teachers in the secondary level.

Research Questions

1. What are the difficulties to secondary school teachers in using modern teaching methods, laboratory equipment's, class room management and evaluation system?
2. What are the training programs fulfill the needs of science teachers?
3. What is the present science curriculum fulfill the needs and comparability to the secondary schools students?
4. What is the difference between the challenges and prospects in science education faced by teachers on the base of gender?

Methods and Procedure of the Study

The research study was descriptive in nature and cross-sectional survey was conducted to collect data. The population contained all the science teachers of secondary level in Lahore. There were total 331 (male 152 and female 179) secondary schools in Lahore. Thus, all the secondary science teachers were the part of population. The sample was chosen by proportionate sampling technique. There were total 152 male and 179 female secondary schools in Lahore. At first stage, thirty percent of male (45) and female (54) secondary schools were chosen by proportionate random sampling technique. At second stage, five secondary science teachers were chosen randomly from each school. Thus, the sample was comprised of 495 secondary science teachers from the public schools of Lahore ([Gay, Mills & Airasian, 2009](#)).

The questionnaire for the teachers was developed on the base of components of education. The component of the educations selected on the base of literature review. Those components were classroom management, teaching methodology, curriculum, evaluation, laboratory facilities and training. These components were used as factor to identify the challenges and prospect of science instructions at secondary level in public schools of Lahore. There were total 34 statements in the questionnaire. Each factor contains statements to collect the responses of teachers on five-point scale.

The questionnaires were piloted on fifty secondary science teachers of public schools in Lahore. Piloted data was used to find out the reliability of the instruments by Cronbach Alpha statistics. The reliability of questionnaire developed for teacher was 0.834 Cronbach Alpha which is assumed as good reliability. Along with questionnaire was validated by 5 experts of the related field.

Presentation and Analysis of Results

To identify the challenges and prospects faced by secondary science teacher of the public schools in Lahore, descriptive statistics (frequencies and percentages) were applied.

Table 1. Interrogation to Secondary Science Teachers in Classroom Management

Statements about classroom management	Frequency (Percentage)				
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
The objectives of teaching of science are known.	279(56.4)	165(33.3)	9(1.8)	12(2.4)	30(6.1)
The objectives of science teaching at secondary level are well defined	239(48.5)	221(44.8)	6(1.2)	6(1.2)	23(4.8)
The objectives of science teaching at secondary level are achievable.	217(44.2)	240(48.4)	15(3.0)	3(0.6)	20(4.2)
You encourage student's classroom participation.	332(67.3)	89(18.2)	9(1.8)	15(3.0)	50(10.3)
There is always discipline in class during lesson.	131(26.6)	314(63.6)	15(3.0)	20(4.2)	15(3.0)
Students take interest in science subject.	18(3.6)	131(26.6)	18(3.6)	281(56.9)	47(9.6)
You use formative assessment.	205(41.8)	265(53.9)	6(1.2)	9(1.8)	10(2.4)
You have control over the class during lesson.	179(36.3)	263(53.3)	6(1.2)	15(3.0)	32(6.6)

N=495

Table 1 shows that most the teachers were strongly agree (56.4%) and agree (33.3%) that they know the objectives of teaching of science. Teachers were strongly agreed (48.5%) and agree (44.8%) that objectives of science teaching at secondary level are well defined. Teachers were strongly agreed (67.3%) and agree (18.2%) that they encourage student's classroom participation. Teachers were strongly agreed (26.6%) and agree (63.6%) that discipline is maintained in class during lesson. Most of the teachers were strongly disagree (9.6%) and disagree (56.9%) that students take interest in science subject. Teachers were strongly agreed (41.8%) and agree (53.9%) that they use formative assessment. Teachers were strongly agree (36.3%) and agree (53.3%) that they have control over the class during lesson.

Table 2. Interrogation to Secondary Science Teachers in Teaching Methodologies

Statements about teaching methodology	Frequency (Percentage)				
	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
Teaching aids are available in schools.	15(3.0)	293(59.0)	41(8.4)	137(27.7)	9(1.8)
You feel comfortable while teaching science subject.	206(41.8)	254(51.5)	9(1.8)	11(2.4)	15(3.0)
You are using visual aids during teaching science.	232(47.2)	239(48.4)		15(3.0)	9(1.8)
Proper updated Av-aids are available in schools.	131(26.6)	310(63.0)	6(1.2)	45(9.1)	3(0.6)
You are competent in teaching science through variety of techniques.	210(42.4)	239(48.4)		23(4.8)	23(4.8)

N=495

Table 2 shows that most the teachers were agree (59.0%) that teaching aids are available in schools. Teachers were strongly agreed (41.8%) and agree (51.5%) that they feel comfortable while teaching science subject. Teachers were strongly agreed (47.2%) and agree (48.4%) that they are using visual aids during teaching science. Teachers were strongly agreed (26.6%) and agree (63.0%) that proper updated Av-aids are available in schools. Teachers were strongly agreed (42.4%) and agree (48.8%) that they are competent in teaching science through variety of techniques.

Table 3. Challenges to Secondary Science Teachers in Curriculum

Statements about curriculum	Frequency (Percentage)				
	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
You are satisfied with existing science curriculum	203(41.2)	270(54.5)		19(4.2)	3(0.6)
Science course content is lengthy (overloaded).	195(39.2)	38(7.8)	9(1.8)	247(50.0)	6(1.2)
Existing science curriculum is updated.	219(44.2)	238(48.0)	15(3.0)	11(2.4)	11(2.4)
Existing science curriculum has some irrelevant material.	78(15.7)	179(36.1)		182(36.7)	56(11.4)
Existing science curriculums meets the objectives of national standards	242(48.8)	203(41.0)	9(1.8)	26(5.4)	15(3.0)

N=495

Table 3 shows that most the teachers were strongly agree (41.2%) and agree (54.5%) that they are satisfied with existing science curriculum. Most of the teachers were disagree (50%) that science course content is lengthy. Teachers were strongly agree (44.2%) and agree (48.4%) that existing science curriculum is updated. Teachers were agree (36.1%) and equally disagree (36.7%) that existing science curriculum has some irrelevant material. Teachers were strongly agree (48.8%) and agree (41.0%) that existing science curriculums meets the objectives of national standards.

Table 4. Challenges to Secondary Science Teachers in Laboratory Facilities

Statements about laboratory facilities	Frequency (Percentage)				
	Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
Adequate science apparatus is available when needed in laboratory	175(33.5)	226(45.8)	11(2.4)	69(14.0)	17(3.6)
Proper demonstration table is available in laboratory	230(46.6)	224(45.4)	9(1.8)	32(6.6)	
Science teachers have proper training about laboratory usage.	200(40.6)	278(56.3)		17(3.6)	
School has appropriate fund for maintenance of laboratory.	185(37.2)	203(41.0)	48(9.6)	50(10.2)	9(1.8)
Science teachers use demonstration methods for better understanding of science	243(49.0)	237(47.8)		9(1.8)	6(1.2)

N=495

Table 4 shows that most the teachers were strongly agree (33.5%) and agree (45.8%) that adequate science apparatus is available when needed in laboratory. Teachers were strongly agreed (46.6%) and agree (45.4%) that proper demonstration table is available in laboratory. Teachers were strongly agreed (40.6%) and agree (56.3%) that science teachers have proper training about laboratory usage. Teachers were strongly agreed (37.2%) and agree (41.0%) that school has appropriate fund for maintenance of laboratory. Teachers were strongly agreed (49.0%) and agree (47.8%) that science teachers use demonstration methods for better understanding of science.

Table 5. Challenges to Secondary Science Teachers in Evaluation System

Statements About Evaluation	Frequency (Percentage)				
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Examination system stress on rote learning.	158(32.0)	229(46.4)	26(5.4)	71(14.5)	6(1.2)
Examination system stress on understanding concepts.	98(19.7)	176(35.5)	6(1.2)	135(27.2)	80(16.3)
You are competent in preparing evaluation test.	242(49.0)	239(48.4)		11(2.4)	3(0.6)
You are competent in monitoring science student's progress regularly.	331(67.2)	149(30.3)		9(1.8)	6(1.2)
You provide feedback to science students after evaluation.	281(56.9)	208(42.4)		3(0.6)	3(0.6)

N=495

Table 5 shows that most the teachers were strongly agree (32.0%) and agree (46.4%) that examination system emphasized on rote learning. Teachers were strongly agreed (19.7%) and agree (35.5%) that examination system emphasized on understanding concepts. Teachers were strongly agree (49.0%) and agree (48.4%) that they are competent in preparing evaluation test. Teachers were strongly agreed (67.2%) and agree (30.3%) that they are competent in monitoring science student's progress regularly. Teachers were strongly agreed (56.9%) and agree (42.4%) that they provide feedback to science students after evaluation.

Table 6. Challenges to Secondary Science Teachers in Training.

Statements About Training	Frequency (Percentage)				
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Department provide adequate training opportunities to science teachers.	203(41.0)	247(50.0)		30(6.0)	11(2.4)
Training programs fulfill the needs of science teachers.	199(40.0)	242(48.8)	6(1.2)	48(9.6)	
Training program improve teaching methodology of teachers.	245(49.4)	235(47.6)	9(1.8)	6(1.2)	
Training programs are designed according to new trends.	232(46.4)	223(44.6)	17(3.6)	22(5.4)	
Training is conducted by professional trainers.	242(48.8)	242(48.8)		15(3.0)	

Training improves the academic performance of students.	254(51.2)	238(48.2)	3(0.6)
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$N=495$

Table 6 shows that most the teachers were strongly agree (41.0%) and agree (50.0%) that department provide adequate training opportunities to science teachers. Teachers were strongly agree (40.0%) and agree (48.8%) that training programs fulfill the needs of science teachers. Teachers were strongly agreed (49.4%) and agree (47.6%) that training program improve teaching methodology of teachers. Most of the teachers were strongly agree (46.4%) and agree (44.6%) that training programs are designed according to new trends. Teachers were strongly agreed (48.8%) and agree (48.8%) that training is conducted by professional trainers. Teachers were strongly agreed (51.2%) and agree (48.2%) that training improve the academic performance of students.

Table 7. Difference between Challenges Faced by Science Male and Female Teachers at Secondary School

	N	Mean	SD	t	Sig
Male	225	1.398	5.677	-0.040	0.968
Female	270	1.398	5.024		0.968

$P^* < 0.05$

Table 7 reveals that there is no significant difference between the challenges and prospects faced by male teachers and female teachers of secondary school. The mean value for both genders is 1.398.

Conclusions

Findings of the study concluded that teachers showed agreement about the challenges and prospects in classroom management. They were agreed they know the objectives of teaching of science, objectives of science teaching at secondary level are well defined, they encourage student's classroom participation, discipline were maintained in class during lesson, they use formative assessment, and they have control over the class during lesson. But on the other hand, most of the teachers revealed disagreement that students take interest in science subject.

In science education programs, teaching strategies affect the learning behavior of the students and their achievement. For science students, teachers use lecture method mostly during lesson, teacher's methods of teaching are very important in classroom, demonstration method is better than lecture method for understanding of science concepts, and science teachers need to be trained. It was concluded that most of the teachers showed agree about the challenges and prospect in teaching methodology. They were agreed that teaching aids were available in schools; they felt comfortable while teaching science subject, they were using visual aids during teaching science, proper updated Av-aids are available in schools, and they were competent in teaching science through variety of techniques. All these point out the need to review that training of the science teachers to made them update with new techniques and strategies.

It was concluded that teacher showed agreement about challenges and prospects in curriculum. Teachers revealed that they were satisfied with existing science curriculum, existing science curriculum is updated, existing science curriculums meets the objectives of national standards. On the other side, teachers are equally agreed and disagreed that existing science curriculum has some irrelevant material and most of the teachers disagreed that science course content is lengthy.

The study concluded that teachers showed agreement about challenges and prospects in facilities of laboratory. Teachers were agreed that adequate science apparatus is available when needed in laboratory, proper demonstration table is available in laboratory, science teachers have proper training about laboratory

usage, school has appropriate fund for maintenance of laboratory, and science teachers use demonstration methods for better understanding of science.

Results revealed that teachers showed their concern about challenges and prospects in evaluation. Teachers were agreed that examination system stress on rote learning, examination system stressed on understanding concepts. They are competent in preparing evaluation test, they are competent in monitoring science student's progress regularly, and they provide feedback to science students after evaluation.

Most the teachers showed agreement about challenges and prospects in training. Teachers were agreed that department provide adequate training opportunities to science teachers, training programs to fulfill the needs of science teachers, training program improves teaching methodology of teachers, training programs are designed according to new trends, training is conducted by professional trainers, and training improves the academic performance of students.

It is concluded that there was no significant difference between the challenges and prospects faced by male and female secondary school teachers in Lahore.

Recommendations

In the light of the conclusions and discussion some recommendations are drawn:

1. Teaching methodologies of teachers are good but they should use more interesting ways.
2. Schools should change the laboratory equipments or may have up to date them with the passage of time according to the requirements of students and new technologies should be introduced to promote science.
3. Teachers should be given the trainings about the usage of laboratory equipments.
4. It is recommended that there is need to revise the curriculum according to the requirements and needs of the students so that they can develop their interest in study.
5. There is dire need that the evaluation system should be revised because students are not satisfied with existing examination system.

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