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A Comparative Study of Teaching Proficiency among Science Teachers with B.S.Ed. and B.Sc. B.Ed. Degrees

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ABSTRACT

Aim of the Study: The teaching proficiency of educators is a critical factor in enhancing the effectiveness and quality of learning within educational institutions. This study aims to compare the teaching proficiency of science teachers holding B.S.Ed. degrees and those with B.Sc. B.Ed. degrees.

Methodology: Employing a descriptive research design, the study utilized a survey method facilitated through a structured questionnaire. The target population comprised head teachers, science teachers, and students at the secondary school level in Islamabad Model Schools. A multi-stage random sampling technique was adopted to select the sample for the study. Data were analyzed using basic statistical techniques, including percentages, means, standard deviations, t-tests, and chi-square tests.

Findings: The results indicated that science teachers with B.Sc. B.Ed. degrees exhibited significantly higher teaching proficiency compared to their counterparts with B.S.Ed. degrees.

Conclusion: These findings suggest a need for a revision of the B.S.Ed. curriculum to enhance subject mastery and pedagogical knowledge. A revised curriculum should incorporate content that strengthens teachers' understanding of their subject matter, thereby improving the overall quality of science education.

Keywords: Teaching, Proficiency, Science, Teacher, B.Sc. B.Ed., B.S.Ed.

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Introduction

Education serves as a transformative agent, providing individuals with mental, physical, ideological, and moral training that enables them to discover their purpose and achieve holistic development, including spiritual growth and the fulfillment of materialistic needs (Leverage Edu, 2021). Teachers play a pivotal role in this process, acting as facilitators, counselors, and philosophers who shape the social acceptability and nurture the full potential of their students (Mishra, 2005). The quality of an educational system is directly proportional to the competency of its teachers, as they are irreplaceable and essential for the success of the entire school system (Din, 2008, p. 24). Their responsibilities extend beyond mere

instruction to include guiding students through the learning process, offering emotional support, engaging them in critical thinking, and serving as role models (Darling-Hammond, 2017; Goreswar College, 2022; Jaypee Digital, 2018). Ultimately, the success of an educational system largely depends on the quality and dedication of its teachers, who are responsible for nurturing students' intellectual, emotional, and social development, fostering a love for learning, and preparing them for future challenges (Leverage Edu, 2021).

Literature Review

A. Teacher

A teacher is defined as an individual who facilitates learning for both children and adults. The responsibilities of a teacher are multidimensional, formal, and ongoing, varying significantly across different cultural contexts (Khan, 2018). In scenarios characterized by high illiteracy rates, the primary role of a teacher may extend beyond education to include professional training and the facilitation of life skills and experiences (Suleman, 2000). Essentially, a teacher acts as a tutor and facilitator, guiding individuals in their pursuit of education (Khan, 2018).

B. Teaching

Teaching, when viewed narrowly, refers specifically to the act of imparting instructions within a classroom setting. However, from a broader perspective, it encompasses a wide range of activities, including communication between teachers and students, lesson planning, preparation and collection of instructional materials, and the selection of assessment tools (Goreswar College, 2022). Anees (2001) notes that the definition of teaching is often confused, as it consists of various acts performed by different teachers in diverse situations. Teaching is fundamentally an art that involves facilitating learning through interactions designed to bring about desired changes in students' behavior.

C. Teaching Proficiency

Research provides multiple definitions of a proficient teacher. According to Clark (1993), an effective teacher is one who enhances student knowledge, but this definition only scratches the surface of their multifaceted role. Vogt (1984) describes an efficient teacher as someone who successfully teaches students of varying abilities and addresses their individual needs. Collins (1990), as reported by Clark (1993), identified five criteria for effective teaching: mastery of subject matter, responsibility for managing students, commitment to learning and students, systematic thinking about practice, and active participation in a learning community. Sheekly and Keeten (1999) further assert that a proficient teacher skillfully applies knowledge within a specific domain. The Interstate New Teacher Assessment and Support Consortium (INTASC) has established ten standards applicable across disciplines and grade levels, which include knowledge of content, understanding the relationship between development and learning, selecting appropriate teaching methods, and effective instructional planning (Campbell, 2001). Proficient teachers are attuned to the unique backgrounds of their students, fostering a productive, safe, and positive learning environment. Their teaching programs align with assessment, reporting, and curriculum implementation requirements, and they engage in reflective practices to enhance their professional development (Teacher Educator, New South Wales Validation Survey, 2010).

Effective teachers adapt their roles to various situations, whether capturing students' interest, motivating them, or acting as guides or counselors. Numerous factors influence the quality of education, with teacher competency being paramount. Research consistently indicates a positive correlation between teacher competency and student achievement. Darling and Hammond (2000) emphasize that teachers who are well-prepared in content comprehension, activity design, evaluation methods, and responsiveness to student perspectives are more successful, leading to better student outcomes. Arshad and Akram (2013) found that trained teachers significantly outperform their untrained counterparts in presentation skills. Sadruddin (2013) highlighted a curriculum gap in Pakistan's one-year Bachelor of Education program compared to other countries. Ali and Parveen (2013) noted that professionally trained teachers enhance

student learning activities. Both developed and developing countries recognize the importance of teaching practice, necessitating effective policies and their implementation to improve teacher education quality. As the foundation of the education system, competent teachers are essential for its success. Sapieha (2007) argues that teachers are crucial for personality development, making their training, competency, and commitment vital for student well-being.

D. Pre-Service Training and Teaching Proficiency

Sapieha (2007) asserts that various factors directly influence a teacher's effectiveness, including personal qualifications, professional training, teaching skills, personal interest in teaching, classroom atmosphere, and attitudes toward students. Borman and Kimball (2005) and Ball (1990) emphasize the importance of pedagogy in the teaching and learning process. Ballou and Podgursky (2000) further elaborate on the significant impact of pedagogical aspects on student achievement. Gitomer and Latham (1999) demonstrate a positive relationship between teacher preparation and classroom performance. Conversely, Gyton and Farokhi (1987) argue that the methods of teacher preparation are of greater importance. Wenglinsky (2000) and Clotfelter, Ladd, and Vigdor (2006) note that prospective teachers enter training programs with varying prior learning experiences, qualifications, and beliefs about teaching and learning, which subsequently influence their classroom practices. Shami (2005) found a strong correlation between teachers' subject knowledge and student achievement, indicating that better-qualified teachers lead to improved student performance. He further elaborates that formal education and subject mastery exert a more significant impact on student outcomes than pre-service training alone.

This literature review underscores the critical role of teachers in the educational landscape, highlighting the necessity for effective training and ongoing professional development to enhance teaching proficiency and ultimately improve student outcome,

Statement of the Problem

The quality of science education is a crucial factor in shaping the future of a nation, as it lays the foundation for scientific advancement and technological innovation. At the heart of this endeavor lies the role of science teachers, whose teaching proficiency directly impacts student learning outcomes. In Pakistan, two primary teacher education programs produce science teachers: the Bachelor of Science in Education (B.S.Ed.) and the Bachelor of Science with Bachelor of Education (B.Sc. B.Ed.). However, the relative effectiveness of these programs in developing teaching proficiency remains a subject of inquiry.

This study aims to address this gap by conducting a comparative analysis of the teaching proficiency of science teachers holding B.S.Ed. and B.Sc. B.Ed. degrees. By assessing the strengths and weaknesses of each program, this research seeks to provide insights that can inform policy decisions and curriculum reforms to enhance the quality of science teacher education in Pakistan. The findings of this study will contribute to the ongoing discourse on effective teacher preparation and its impact on student learning, ultimately benefiting the education system as a whole.

Objectives of the Study

The specific objectives of this research are as follows:

1. To examine the teaching proficiency of Bachelor of Science in Education (B.S.Ed.) science teachers.
2. To assess the teaching proficiency of Bachelor of Science with Bachelor of Education (B.Sc. B.Ed.) science teachers.
3. To compare B.S.Ed. and B.Sc. B.Ed. science teachers regarding teaching proficiency.

Hypothesis H0

There is no significant difference in the teaching proficiency between secondary school teachers holding a Bachelor of Science in Education (B.S.Ed.) degree and those holding a Bachelor of Science with Bachelor of Education (B.Sc. B.Ed.) degree.

Delimitations of the Study

This study is delimited by the following parameters due to constraints related to time and resources:

- The research focuses exclusively on public sector educational institutions located in Islamabad.
- A questionnaire was utilized as the primary tool for data collection.
- Data were collected solely from head teachers, science teachers, and students at the secondary school level.

These delimitations are intended to provide a clear scope for the study and to ensure that the findings are relevant to the specified context.

Significance of the Study

This study holds significant implications for various stakeholders involved in the improvement of teacher education in Pakistan. Numerous donor agencies actively support initiatives aimed at enhancing the quality of teacher education through grants and funding. The findings of this research will provide these agencies with critical insights into the current state of teacher proficiency, enabling them to formulate effective strategies and allocate resources more efficiently for future educational programs in Pakistan. Additionally, the results will be valuable for both central and provincial governments, offering guidance for informed decision-making regarding teacher education policies. Policymakers and educational planners can utilize the findings to develop targeted plans and initiatives that address identified gaps in teacher training and proficiency. Furthermore, this research will pave the way for future inquiries by opening new avenues for exploration in the field of teacher education, contributing to the ongoing discourse on educational reform in Pakistan.

Research Methodology

The population of the study comprised public sector secondary schools in Islamabad, Pakistan, including heads of these schools, B.Sc. B.Ed. and B.S.Ed. science teachers, and students enrolled at the secondary level. Multigrade sampling was used, with 101 Islamabad Model Secondary Schools, 101 heads, 351 B.S.Ed. science teachers, 351 B.Sc. B.Ed. science teachers (for equal representation), and 606 students selected through convenient and random sampling techniques. Self-developed structured questionnaires on a five-point Likert scale were used as research instruments for data collection, with separate questionnaires for head teachers, science teachers, and students. The validity of the questionnaires was ensured by expert review, while reliability was calculated using Cronbach's alpha. Pilot testing was conducted in 10% of the population to eliminate weaknesses, misconceptions, and ambiguities, and the questionnaires were revised accordingly. The researcher personally visited the sample schools to administer and collect the questionnaires, achieving a 99% response rate during the visits and 1% by mail, with strict confidentiality maintained throughout the process.

Data Analysis and Interpretation

The teaching proficiency of B.S.Ed. and B.Sc. B.Ed. science teachers was assessed using a series of twelve tables. The data collected through the questionnaires designed for head teachers and science teachers were systematically tabulated, analyzed, and interpreted in accordance with the study's objectives. The questionnaires utilized a five-point rating scale (Always, Frequently, Occasionally, Seldom, and Never) to gauge responses. For the scoring process, the responses were assigned values of 5, 4, 3, 2, and 1, respectively, for the closed-ended statements. To determine the significance of the

differences between the mean scores of students' responses regarding B.S.Ed. and B.Sc. B.Ed. science teachers, a t-test was conducted, with a p-value set at 0.05 for significance. This analytical approach enabled a comprehensive evaluation of the teaching proficiency of the two groups of science teachers, providing insights into their effectiveness in the classroom.

Table 1: *Frequencies and percentage of student participants along with demographics*.

Demographics	***f***	**%**
Students of the Teacher		
B.S.Ed.	303	50
B.Sc. B.Ed.	303	50

Table 1 represents the distribution of the sample students of secondary school teachers. Table indicates that 50% respondents were students of B.S.Ed. teachers and 50% respondents were students of B.Sc. B.Ed. teachers.

Descriptive, alpha-coefficient and ranges for students' instrument (questionnaire) regarding Teaching Proficiency in order to present the study results in summarized from means and standard deviations were computed for each variable of the study.

Table 2: *Psychometrics Properties of students' instrument (questionnaire) regarding teaching proficiency (N = 606).*

Scales	**No of items**	**α**	***M(SD)***	**Ranges**	
				Potential	**Actual**
Teaching Proficiency	15	.85	60.05(10.48)	15-75	27-75

Table 2 shows the psychometric properties of students' instrument (questionnaire) used in the study. Teaching Proficiency has acceptable Cronbach Alpha reliability and descriptive statistics.

Table 3: *Means, Standard Deviations and t-values on teaching proficiency between students of B.S.Ed. and B.Sc. B.Ed. Teachers (N=606).*

Variable	**B.S.Ed. (*n* = 100)**		**B.Sc. B.Ed. (*n* = 100)**				**95 %CI**		**Cohen's D**
	M	***SD***	***M***	***SD***	***t(604)***	***p***	**LL**	**UL**	
Teaching Proficiency	54.72	10.04	65.38	7.88	-14.54	.000	-12.10	-9.22	-1.18

Table 3 shows the results of t-test for comparing students of B.S.Ed. and B.Sc. B.Ed. teachers on teaching proficiency scale. The table shows that students were of the view that B.Sc. B.Ed. teachers have higher teaching proficiency as compared to B.S.Ed. teachers. The mean difference 10.66 is highly statistically significant between students of B.S.Ed. and B.Sc. B.Ed. teachers on the score of teaching proficiency as $p < .05$.

Table 4: *Frequencies and percentage of teacher participants along with demographics*.

Demographics	***f***	**%**
Teachers		
B.S.Ed.	351	50
B.Sc. B.Ed.	351	50

Table 4 represents the distribution of the students of secondary school teachers. Table indicates that 50% respondents were B.S.Ed. teachers and 50% respondents were B.Sc. B.Ed. teachers.

Descriptive, alpha-coefficient and ranges for teachers' instrument (questionnaire) regarding Teaching Proficiency in order to present the study results in summarized from means and standard deviations were computed for each variable of the study.

Table 5: *Psychometrics Properties of teachers' instrument (questionnaire) regarding teaching proficiency (N = 702).*

Scales	**No of items**	**α**	***M(SD)***	**Ranges**	
				Potential	**Actual**
Teaching Proficiency	15	.81	58.90 (8.80)	15-75	27-75

Table 5 shows the psychometric properties of teachers' instrument (questionnaire) used in the study. Teaching Proficiency has acceptable Cronbach Alpha reliability and descriptive statistics.

Table 6: *Means, Standard Deviations and t-values on teaching proficiency between B.S.Ed. and B.Sc. B. Ed. Teachers (N=702).*

Variable	**B.S.Ed. (*n* = 25)**		**B.Sc. B.Ed. (*n* = 25)**				**95 %CI**		**Cohen's D**
	M	***SD***	***M***	***SD***	***t(700)***	***p***	**LL**	**UL**	
Teaching Proficiency	58.41	9.61	59.39	7.89	-1.47	.142	-2.28	0.33	-0.11

Table 6 shows the results of t-test for comparing B.S.Ed. and B.Sc. B.Ed. teachers of secondary schools on teaching proficiency scale. The table shows that there is no significant difference between B.S.Ed. and B.Sc. B.Ed. teachers regarding teaching proficiency. The mean difference 0.98 is statistically non significant between B.S.Ed. and B.Sc. B.Ed. teachers on the score of teaching proficiency as $p > .05$.

Table 7: *Frequencies and percentage of Head Teacher participants along with demographics.*

Demographics	***f***	**%**
Head Teachers of Teachers		
B.S.Ed.	50	49.5
B.Sc. B.Ed.	51	50.5

Table 7 represents the distribution of the head teachers of secondary schools. Table indicates that 49.5% were head teachers of B.S.Ed. teachers and 50.5% were head teachers of B.Sc. B.Ed. teachers.

Descriptive, alpha-coefficient and ranges for head teachers' instrument (questionnaire) regarding Teaching Proficiency in order to present the study results in summarized from means and standard deviations were computed for each variable of the study.

Table 8: *Psychometrics Properties of head teachers' instrument (questionnaire) regarding teaching proficiency (N = 101).*

Scales	**No of items**	**α**	***M(SD)***	**Ranges**	
				Potential	**Actual**
Teaching Proficiency	15	.87	56.58(9.58)	15-75	34-75

Table 8 shows the psychometric properties of head teachers' instrument (questionnaire) used in the study. Teaching Proficiency has acceptable Cronbach Alpha reliability and descriptive statistics.

Table 9: *Means, Standard Deviations and t-values on teaching proficiency between head teachers of B.S.Ed. and B.Sc. B.Ed. teachers (N=101).*

Variable	B.S.Ed. (*n* = 25)		B.Sc. B.Ed. (*n* = 25)				95 %CI		Cohen's
	M	*SD*	*M*	*SD*	*t(99)*	*p*	LL	UL	D
Teaching Proficiency	51.70	8.14	61.37	8.45	-5.86	.000	-12.95	-6.39	-1.17

Table 9 shows the results of t-test for comparing head teachers of B.S.Ed. and B.Sc. B.Ed. teachers of secondary schools on teaching proficiency scale. The table shows that the head teachers were of the view that B.Sc. B.Ed. teachers have higher teaching proficiency as compared to B.S.Ed. teachers. The mean difference 9.67 is highly statistically significant between head teachers of B.S.Ed. and B.Sc. B.Ed. teachers score on teaching proficiency as $p<.05$.

Findings and Results

B.Sc. B.Ed. teachers have better teaching proficiency when compared with B.S.Ed. teachers, they better express subject mastery; they teach class with better preparation; they check their students' homework properly and regularly; they better assess their students' academic achievements by arranging weekly/monthly test; they frequently use laboratory apparatus and equipments to clear students' concepts; they allow students to ask relevant question during the lecture; they better participate in new roles other than teaching (e.g., organization, management, monitoring); they always avail the opportunities of in service training related to the subject; they complete assigned tasks on time.

Discussion

H0: There is no significance difference in teaching proficiency of B.S.Ed. secondary school teachers and B.Sc. B.Ed. secondary school teachers.

Answer of this null hypothesis is found with the help of three tables.

The results of t-test for comparing students of B.S.Ed. and B.Sc. B.Ed. teachers on teaching proficiency scale. The table 3 shows that students were of the view that B.Sc. B.Ed. teachers have higher teaching proficiency as compared to B.S.Ed. teachers. The mean difference 10.66 is highly statistically significant between students of B.S.Ed. and B.Sc. B.Ed. teachers on the score of teaching proficiency as $p <.05$.

The results of t-test for comparing B.S.Ed. and B.Sc. B.Ed. teachers of secondary schools on teaching proficiency scale. The table 6 shows that teachers were of the view that there is no significant difference between B.S.Ed. and B.Sc. B.Ed. teachers regarding teaching proficiency. The mean difference 0.98 is statistically non-significant between B.S.Ed. and B.Sc. B.Ed. teachers on the score of teaching proficiency as $p >.05$.

The results of t-test for comparing head teachers of B.S.Ed. and B.Sc. B.Ed. teachers of secondary schools on teaching proficiency scale. The table 9 shows that the head teachers were of the view that B.Sc. B.Ed. teachers have higher teaching proficiency as compared to B.S.Ed. teachers. The mean difference 9.67 is highly statistically significant between head teachers of B.S.Ed. and B.Sc. B.Ed. teachers score on teaching proficiency as $p<.05$.

It is clear from the above results that there is a significance difference in teaching proficiency of B.S.Ed. secondary school teachers and B.Sc. B.Ed. secondary school teachers. B.Sc. B.Ed. teachers have higher teaching proficiency as compared to B.S.Ed. teachers, so H01 is rejected.

Conclusion

Study concluded that B.Sc. B.Ed. teachers have better teaching proficiency when compared with B.S.Ed. teachers. Furthermore, B.Sc. B.Ed. teachers better express subject mastery and B.Sc. B.Ed. teachers teach

class with better preparation. Furthermore, study concluded that B.Sc. B.Ed. teachers always avail the opportunities of in service training related to the subject.

Recommendations

i. B.S.Ed. teachers are found less proficient therefore their teaching program need improvement. It is recommended that the curriculum of their teaching program need revision. Revised curriculum may include content to improve the subject mastery and knowledge of the subject. Higher Education Commission must take initiative in this regard.

ii. It is recommended that in-service training should be arranged for the existing B.S.Ed. teachers in order to equip them with techniques of classroom management and the latest teaching methodologies so that the existing gap may be filled. Training wing of Federal Directorate of Education may work under the guidance of ministry of Capital Administration Development Division to develop and practice such in-service training programs. Short term workshops can be very fruitful.

iii. Lack of incentives for teachers has created a professional inertia among them. To improve the teaching proficiency of teachers, it is recommended that performance based rewards in the forms of trophies, certificates, shields, cash prizes and promotion must be introduced. Federal Directorate of Education may formulate some criteria for such incentives. Different programs may be arranged for such ceremonies. Non-Government organizations may be encouraged to work in collaboration with Federal Directorate of Education to bear expenses of such programs.

iv. A transparent and fair policy for teacher recruitment is the need of time. Government should ensure that merit is observed for recruitment of teachers to improve the quality of teacher.

v. Content and methodology both must be focused during teacher training programs to improve the quality of teachers.

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Conflict of Interest

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