



Changing Structure of Examination System for Preparing Students for 21st Century

Shahinshah Babar Khan¹, Muhammad Arif², Muhammad Azhar³

¹ Deputy District Education Officer, Education Department, Tehsil Choa Saidan Shah, District Chakwal, Pakistan.
Email: personalbabar@gmail.com

² Deputy District Education Officer, Education Department, Tehsil & District Chakwal, Pakistan.
Email: dr.marif68@gmail.com

³ Deputy District Education Officer, Education Department, Tehsil Jand, District Attock, Pakistan.
Email: muhammadazhar.te@gmail.com

ARTICLE INFO

Article History:

Received: September 20, 2022

Revised: December 24, 2022

Accepted: December 27, 2022

Available Online: December 31, 2022

Keywords:

Teaching Methods of Mathematics

Assessment of Mathematics

Changing Pattern of Papers

Funding:

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

ABSTRACT

The objective of this study was to investigate the contribution of teaching methods of mathematics and assessment of mathematics on the achievements of the students in mathematics in view of changing patterns of papers. A total of 41 mathematics teachers (male and female) who were teaching mathematics to secondary classes were selected from secondary and higher secondary schools (male and female) in the city area of district Rawalpindi. A questionnaire was developed to gauge the teachers' perception towards the addition of concept-based questions and the contribution of teaching methods and assessment of mathematics on the achievements in mathematics at the secondary school level. Teaching methods and assessment of mathematics were the independent variables while achievements in mathematics were the dependent variable. Multiple regressions were used and it is found that both teaching methods of mathematics and assessment of mathematics contribute towards achievements of mathematics at the secondary school level.

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Corresponding Author's Email:

1. Introduction

The overall educational system of Pakistan is criticized with the belief that it is only producing such students who have degrees without knowledge. Higher Education institutions blame schools and colleges for producing poor students. Even within schools, teachers of elementary and secondary sections think that they could not prepare students as they come these sections with zero level concepts. The story is not ended at this point, the teachers of primary blame parents for this as they think that students of primary level have no sense of importance of education and they do not pay proper attention towards their study, it is the duty of the parents to care their children. In real situation, it is a fact that majority of the parents are illiterate or even if they are literate, they have no time to teach their children. It is another reality that the parents are not able to teach their children the existing syllabus as it is too hard and difficult to teach. The net result of all this situation is the poor performance of the students in the examinations.

It is a common perception of the teachers that students are not taught well at primary and elementary level. Also, students are not gauged at some difficult level. They are prepared only to pass the papers with minimum percentage and with very low level of understanding, the students join secondary level. External exams are considered some fair process to assess the students. Boards of Intermediate and Secondary Education (BISEs) are created to assess the performance of the students. For the last two decades, it is seen that students are getting 100 percent marks in almost all subjects. The educational experts are explaining this phenomenon with the view that it is happening because of poor paper settings, it is not due to

the actual performance of the students. This view is strengthening with the results of MDCAT and other results of exams taken by some other agency. Many students who come to these exams with very high score from BISE could not get enough marks to justify their previous performance shown in the BISE exams. On the other side, it is need of the time to produce such students who should work globally. Emerging technologies also shrink the world and increases the challenges for the educational systems of the world.

To cope this situation and to improve the overall examination system, BISEs decided that from 2022 onward, 30 % concept based questions will be added in the question papers. For the first time, in 2022, this changed form of question papers was administered and the results showed that majority of the students could not get through the examination. On one side, these results forced teachers to think about teaching patterns in the classrooms and on the other side put a question mark on the performance of the teachers. In Pakistan, the current assessment system of educational boards was only checking memory level and on the bases of good memory, certificates were awarded. All these situations were clear to educational boards and they were facing a lot of criticism about their assessment system from society and higher educational institutions as well. To improve the system, discussions were there by the managing authorities of educational boards. It was decided by the educational boards that assessment mechanism should be revised in the light of the ongoing changes around the world and such practices may be introduced that have shown good results around the world. For this, it was decided that paper pattern may be changed and some portion may be added to check the concepts and skills of the students they have learnt in the class.

In 2022, for the first time, it was decided that 30% portions of the paper will be based on the lower order thinking of Bloom's Taxonomy to measure the students' understanding of the learning content and it use in some new situations. Gradually, percentage of concept based questions will be increased in future. The results of Secondary School Certificate (SSC) were low as compare to the previous results. The majority of the students remain failed to perform well as the concept bases questions were formed.

Mathematics is the subject that may help students to get 100 % marks and ultimately increases the overall percentage. At the same time, mathematics is considered the main subject where understanding of basic concepts is necessary to earn good marks. Teaching mathematics needs some way others as compare to teaching of general subjects. Assessment of mathematics also needs to develop rubrics and solved papers must be assessed according to the rubrics. For the current research, the problem to be investigated the contribution of teaching methods of mathematics and assessment of mathematics on the achievements of the students. The objective of the study was to investigate the contribution of teaching methods and assessment on the achievements of the students due to changing pattern of papers.

2. Literature Review

For survival in the 21st century, it is necessary that one must be decorated with the knowledge and skills that are workable in the market. Classrooms are the places that are assumed to equip the students for the markets of 21st century. The students can only be prepared for 21st century if their teaching and assessment are designed while keeping in view the requirements of 21st century. For the last many decades, Pakistan's educational system remained under criticism even at national level. It is a common observation; it Pakistan's educational system is producing such students who have degrees with poor knowledge. Majority of the students leave schools after completing matriculation because of different reasons. Among these reasons, poverty is one of the main reasons. These children enter into the market to support their families and it is assumed that with the learning they have had in the classrooms will perform well and will be able to earn some money for their families. The main functions of secondary and higher secondary school system to prepare students for market and for higher education but the system remains failed to equip them for market and higher education (National Education Policy, 2009). Furthermore, National Education Policy (2009) states that the Quality of education in Pakistan is weak.

On the other hand, the demands of 21st century are entirely different as compare to the past. For survival in the 21st century, degrees only provide standing space in the queue and then knowledge, skills, out of box thinking, critical thinking and many other requirements appear. Zhao (2009) is of opine that the 20th century skills are not workable in 21st century.

Skill is some ability to use for some situation to handle the situation. On the basis of this general meaning, one can say that these are the abilities that decorate some individual to manage the situation effectively. Currently, around the world, the term 21st century skills is used in the educational context that is comprises of skills that are necessary for working in the existing world (Khan, Jumani, & Gul, 2019; Teo, 2019) describes these skills as the competencies that must be teach to students to become global citizens. These skills facilitate students to deal with real world problems (Kivunja, 2014). Trilling (2010) is of the opinion that for 21st century skills, students must learn the skills that are necessary for success in school family and work. (Wagner, 2010) enlists the following seven skills that are necessary for 21st century:

- Critical thinking and problem solving
- Collaboration and leadership
- Agility and adaptability
- Initiative and entrepreneurialism
- Effective oral and written communication
- Accessing and analyzing information
- Curiosity and imagination

Ghamrawi, Ghamrawi, and Shal (2017) conducted a study to know the existing teaching learning process in the Lebanese public schools and concluded that these schools are working in the framework of 20th century and are far away from the skills that are needed for 21st century. Khan et al. (2019) conducted a research about the existing universities programs and their relation with 21st century skills in Higher Education of Pakistan. They concluded that critical thinking and problem solving skills were developed among students. Around the world, assessment system is designed to measure the learning level of the students. For raising educational standards, understanding of assessment is necessary (Weeden, Winter, & Broadfoot, 2002). Pakistan's assessment system based on written examination only that is based on memorization. Khattak (2012) is of the view that students do not sit in the class to get something new rather they sit there to be in higher standard next year.

In Pakistan, For the last many decades, examination system for Secondary School Certificate (SSC) is facing criticism. It is a common view that SSC examination only measure memorization. It is also said that the students reproduce the same as they have learnt from the books and got high scores. Boards of Intermediate and Secondary Education (BsISE) were created to assess the students. These educational boards work as external examination agencies. Many question mark are there on the working of these educational boards. There is need of overhauling of entire examination system in the current scenario (Ahmad, Rauf, Rashid, ur Rehman, & Salam, 2013). From the first annual examination 2022, Boards of Intermediate and Secondary Education (BISE) introduced 30 % weightage consisting statements that were based on the lower thinking level and it is decided that gradually statements built on higher order thinking will be added in the papers for upcoming years. The main idea behind this change is to prepare students who have abilities to work in the markets of 21st century that are facing huge changes in almost all fields of work.

3. Methodology

3.1 Delimitation of the Study

It is a perception that in urban area schools, subject teachers are available to teach in secondary schools. The study was delimited to the teachers of Mathematics (science group) teaching in secondary schools (male and female) for the last five years in urban area of city Rawalpindi.

3.2 Variables of the Study

Teaching methods and assessment of mathematics were the independent variables while achievements in mathematics was dependent variable

3.3 Sample of the Study

As the study was delimited to the urban area of city Rawalpindi so for the present study, only those schools were selected that were lying in the urban area. There were 12 girls secondary and higher secondary schools and 8 boys secondary and higher secondary schools

and in these selected schools 41 teachers were teaching mathematics to secondary and higher secondary schools (male and female) classes.

3.4 Instruments Used for the Study

A custom made questionnaire was used to collect the data from the teachers about the teaching methods of mathematics and assessment of mathematics and their contributions on the achievements of the students. The questionnaire was developed on five points Likert scale. For each statement, five options were given to choose ranged from strongly agree to strongly disagree.

4. Data Analysis

Multiple regressions were used to regress the contribution of independent variables towards dependent variable. Multiple regressions provide the relationship of independent variable and dependent variables. In other words, it highlights the variation in independent variable as changes are made in dependent variables. The results are described as under:

Table 1: Variance Explained by Teaching Methods and Assessment in Mathematics

| Model | R | R Square | Adjusted R Square | Std. Error of Estimate |
|-------|------|----------|-------------------|------------------------|
| 1 | 0.49 | 0.341 | 0.080 | 1.012 |

From table 1, R offers the correlation between the observed values of dependent variable and predicted values of the dependent variable. R Square (Coefficient of determination) value provides the amount of proportion of variance in the dependent variable (achievements in Mathematics) that can be explained by the independent variables (teaching methods and assessment in mathematics). It means independent variables (teaching methods and assessment in mathematics) explain 34.1 % of variance in achievements in mathematics. This is the overall association between independent and dependent variables. It does not tell the contribution of each independent variables towards dependent variable.

Table 2: Analysis of Variance

| Model | | Sum of Squares | df | Mean Square | F | Significance |
|-------|------------|----------------|----|-------------|---------|--------------|
| 1 | Regression | 2014.23 | 1 | 2864.2 | 2367.10 | 0.00 |
| | Residual | 2534.31 | 40 | 1.21 | | |
| | Total | 4548.54 | 41 | | | |

From Table 2, the F value is the ratio of the mean square for regression to the mean square for the residual) and the p value associated with F is .00 that is very small. These values answer the questions related to variability in dependent variable due to independent variables. By comparing the p value with alpha level that is .05, it is found that here p value (.00) is lesser than alpha level (.05) means independent variables predict the dependent variable.

Table 3: Coefficients of Independent Variables in the Model

| | Standardized | Sig | Correlations | | | Collinearity | VIF |
|------------------|--------------|------|--------------|---------|-----------|--------------|-------|
| | Coefficients | | Zero-Order | Partial | Part | Statistics | |
| | Beta | | | | Tolerance | | |
| Constant | | 0.01 | | | | | |
| Teaching Methods | 0.48 | 0.00 | 0.90 | 0.41 | 0.11 | 0.12 | 24.31 |
| Assessment | 0.54 | 0.00 | 0.92 | 0.67 | 0.08 | 0.14 | 49.49 |

Table 3 showing tolerance that is an indicator explaining the specific amount of variability in some independent variable that is not explained by the other independent variable in the model. As tolerance values for both the independent variables is greater than .10, it means that there is strong relationship between the independent variables and hence multi Collinearity exists between the independent variables. Beta value tells the contribution of each independent variable in predicting dependent variable. The bigger beta value is .54 for assessment, it means, assessment is contributing more in explaining the dependent variable that is achievements in mathematics while the variance due to the other independent variable is controlled for. Similarly, beta value for teaching methods is .48, it means teaching methods is the second contributing variable in the model. As the significant values for both the

independent variables are 0.00, it means both the independent variables are contributing in predicting the dependent variable.

5. Conclusion

However, mathematics is considered hard subject but these are students who are prepared to solve the questions not only given in the books but also to apply this learning in the daily life as well. The study found that both teaching methods for mathematics and assessment of mathematics contribute towards achievements of the students. These two factors explain 34.1 % of variance in achievements in mathematics. When separate effect was calculated, it is found that assessment of mathematics contributes more (.54) as compare to teaching methods of mathematics (.48).

At secondary level, mathematics is considered a hard subject and at the same time, it is a general opinion that its applications make the life easy. The achievements in mathematics depend on the teaching ways and assessment of mathematics. The study confirmed that both teaching methods and assessment contribute towards achievements. For this study, the overall contribution of these elements was 34.1 %. The separate contribution of each independent variable was also calculated and it is found the teaching methods contribute .48 and assessment contribute .54. It is concluded that as these two independent variables play their role in the achievements so improving teaching methods and assessment means improving achievements in the mathematics.

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Appendix

Questionnaire for the Teachers

The objective of the questionnaire is to collect data regarding Teaching of Mathematics, Assessment of Mathematics and Achievements in Mathematics at secondary level. You are assured that your given information will be used for only a conference paper only. For each statement, five options are given to select ranged for strongly agree to strongly disagree. You are requested to read the statements carefully and select one of the option. Your given input will be valuable for understanding the mathematics classroom situations.

SA= Strongly Agree A= Agree UNC=Uncertain DA= Disagree , SDA= Strongly Disagree

Appendix A

| Sr. # | Statement | SA | A | UNC | DA | SDA |
|------------------------------------|---|----|---|-----|----|-----|
| Teaching Methods | | | | | | |
| 1 | Students remain unable to understand the basics of mathematics taught at primary and elementary level so remain unable to apply the learning in some new ways | | | | | |
| 2 | Students are trained to solve the given expressions and sentences in the book only so remain unable to solve questions with changed statements. | | | | | |
| 3 | In the classrooms, weak connection between questions and their use in daily life is established, so they remain unable to generate connections | | | | | |
| 4 | Even in the class, it is poured in mind that mathematics is too difficult so they enter in exam with negative mind. | | | | | |
| 5 | Teaching will be updated accordingly for the upcoming examinations. | | | | | |
| Assessment in Mathematics | | | | | | |
| 6 | Students are only assessed from the given questions in the exercises. | | | | | |
| 7 | Theory behind the basic concepts of mathematics missed while assessing students. | | | | | |
| 8 | Questions are excluded from assessment and are communicated to the students. | | | | | |
| 9 | Rubrics are not prepared for checking steps of solved questions. | | | | | |
| 10 | Feedback on assessment is not maintained. | | | | | |
| Achievements in Mathematics | | | | | | |
| 11 | Concept based questions confused the students. | | | | | |
| 12 | Mixing of statements from different concepts put burden on the students, | | | | | |
| 13 | Understanding of lengthy statements in the form of words was a serious problem for the students | | | | | |
| 14 | Non-availability of related sample papers was a cause of low achievements | | | | | |
| 15 | Attempting statements in the objective type paper within short time was a problem for the students. | | | | | |