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Challenges of Business Students to Apply Mathematical Knowledge in Business Discipline: A Case Study

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Abstract: The main objective of the study explores the challenges of business students to apply mathematical knowledge in business discipline.To do this, the author has collected the data from 200 students of BGC Trust University Bangladesh (BGCTUB) by using purposive sampling technique. The data are processed with the help of statistical package of social science (SPSS 23 Version) and the MS excel. Factor analysis (Principal Component Analysis) as well as multiple regression analysis has been done for the study. The factor analysis reduced the 17 challenges into 6.Among the 6 challenges, first one is most important which explains highest variance (25.862%) in the variables and initial Eigen value is 4.40.It covers most challenges (10) out of the 17 challenges. And second one is also important which explains 8.43% of the variation in students' challenges for their understanding and initial Eigen value is 1.43. It covers 3 challenges.In the multiple regression analysis, all the factors of challenges are significant statistically and they are positively correlated. Hence, Business Mathematic (BM) instructors are suggested to concentrate all of the challenges especially first and second important factors of challengesto apply mathematical knowledge in business studies.

Keywords: *Business mathematical knowledge, Challenges of Business Students, business studies, BM Instructors.*

Introduction: Mathematics is a technological toolbox that is utilized frequently in business studies as well as all scientific fields in the actual world. In applied disciplines such as business and economics, many students are underprepared and struggling in mathematics [14]. Many mathematicians and economists emphasize how closely related mathematics and business studies (BS) /economics are. It has long been accepted that one of the foundational courses for both business studies and the sciences is mathematics. Mathematics has been a crucial tool in the study of nature since ancient times.

Today, Mathematics is utilized to answer a variety of problems in business and economics, therefore students must have a strong foundation in business studies. Investigating students' transfer of learning is crucial to comprehending how business students apply the knowledge they have acquired in BM courses to their business studies. The ability to adapt what has been taught in one circumstance to another has been described as the transfer of learning, which is the ultimate objective of education. Students were unable to transfer a concept or schema gleaned from one setting to another, as was seen. In this study, the instructors also keep track of what they see while they watch that circumstance while instructing. Some instructors of BM courses assert that their pupils do not have the prerequisite BM knowledge necessary to solve difficulties. The majority of business students struggle in the first BM classes. In this inquiry, I tried to investigate the issue facing the undergrad business students at BGC Trust University in Bangladesh.As a result, the primary goal of this study is to examine how what students learn in BM courses transfers to business studies.

Problem Statements: The business students act as though they had never studied elementary mathematics when speaking to the BM lecturer. As a result, the majority of business students at this university have expressed a desire to avoid or reject taking BM. Even when they dislike the course, they are compelled to take it due to a previous interest or decision. In this instance, the majority of the teachers had noticed students protesting that mathematics was not offered at the preparatory level.In their teaching experience they saw the weakness of BS and they are also afraid of mathematics. So I believed that students have challenges to apply the knowledge they had achieved from BM courses to the introductory of business study, even though they need to use BM knowledge to solve and understand different kinds of problems in business courses, especially in economics and finance.

Objectives of the Study: The main aim of this study is to explore the challenges of BGC Trust University's business students to apply business mathematics knowledge in business studies.The following specific objectives are covered:

i) To analysis the important challenges of students to apply mathematical knowledge inbusiness studies.

ii) To find out the significant challenges of students that help the instructors how to teach BM in business discipline.

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Significance of the Study: The findings of this study were advantageous to both teachers and students. Since the majority of teachers have backgrounds in applied science, understanding the challenges and methods for integrating business mathematics into business studies will be crucial for teaching both mathematics and basic business studies. Additionally, it will provide as a launching pad for young scholars interested in this area of study to conduct additional research.

Literature Review: The use of mathematics to address issues was particularly challenging for many business students [1, 2, 3]. They must yet continue learning mathematics because of its importance to daily life [4,5]. They must be able to solve business challenges since problem-solving is essential for the development of human skills [6]. Mathematics is thought of as the language for problem solving, which is something that students need to perform in order to function in daily life. Knowing mathematics is like having a positive or negative attitude toward arithmetic. Knowledge factors were shown to be useful in predicting grades, and significant discrepancies were found in a number of areas [14]. Many researchers assertthat classroom setting, instructional strategies, students' conceptions of themselves as mathematicians, attitudes toward mathematics, and other variables all have a direct bearing on students' mathematical abilities. In other words, it can enhance the students' learning environment if it is presented properly. Additionally, pupils that benefit more from outstanding education are self-regulatory, have strong mathematical foundations, and feel less dissatisfaction.

There are several factors at play when it comes to why certain pupils struggle with arithmetic. One factor influencing students' mathematical development is their self-concept, and this factor is linked to their eagerness to learn mathematics. How well children learn mathematics is influenced by their social and psychological incentives as well as their intellectual and mathematical motivations. In addition to this, studies of students in elementary schools through high schools found that mathematical proficiency is a crucial component of mathematics education. One's attitude and level of attachment might affect their knowledge of business mathematics. Knowledge is the most important aspect in increasing a student's interest in business mathematics. Given the aforementioned research, it is critical for corporate mathematics instructors to foster a good learning environment in the classroom [7].

Mathematicswas difficult for students because they had problems understanding and remembering ideas, formulas, facts, and processes, claims [2]. Additionally, they had trouble visualizing mathematical problems and concepts [3].Problem-solving errors were caused by inadequate conceptual understanding, irrational thinking, and a lack of strategic knowledge [8]. When they happened, these mistakes gave away problems [9]. In addition, mistake analysis showed that students' lack of arithmetic and process knowledge was due to their weak conceptual comprehension [10]. According to [11], many students found it difficult to interpret the challenges and lacked the information essential to create and use efficient problem-solving strategies.

However, very few studies have concentrated on the difficulties in applying arithmetic to solve mathematical issues. If the necessary arithmetic abilities are recognized, better programs to address the challenges might be devised. Additionally, kids may have trouble learning mathematics if the instructional strategies and learning techniques employed do not fit their intellectual demands. Teachers must understand students' potential, problems, and learning obstacles in order to use an effective teaching strategy and foster meaningful learning among students [7].

Research Design:

Questionnaire Development and Scaling: There have been both closed-ended and open-ended inquiries employed. The closed-ended questions are coded, whereas the open-ended questions are post-coded, to benefit from data processing. This implies that I first gathered data from the respondents, which was then divided into several groups. A five-point Likert scale developed by Likert was used to produce the questionnaire. Levels of satisfaction are represented on the scale by the digits "4" and "5"; the higher the score, the higher the degree of contentment. Similarly, recording '1' and '2' signify dissatisfaction level, the lower the score, and the lower level of dissatisfaction. The remaining "3" denotes variables that are still up for debate.

Population and Sample Size:The survey was conducted at BGC Trust University Bangladesh, where a sample of 200 respondents was chosen from a population of 1532 graduate and undergraduate students in the 2019 academic year[12].The sample was taken by using purposive sampling technique. The respondents were asked to list the aspects they thought about or that had an impact on their decision to attend BGC Trust University Bangladesh.

Table 1: Demographic Characteristics of Sample.

Variables	Category	Frequency	Percentage (%)
Monthly Income Level(BDT) of Guardian	0-15000	42	21
	15001-30000	57	28.5
	30001-45000	54	27
	45001-60000	19	9.5
	60001 and above	28	14
	Total	200	100
Education Board of Students' Academic Qualification	Barisal	10	5
	Chittagong	130	65
	Comilla	17	8.5
	Dhaka	17	8.5
	Jessore	7	3.5
	Rajshahi	9	4.5
	Barisal	10	5
	Total	200	100
Current Education Level	Graduate	38	19
	Undergraduate	162	81
	Total	200	100
Location of Students	Rural Area	102	51
	Urban Area	86	43
	Hill Tracts	12	6
	Total	200	100
Gender of Students	Male	131	65.5
	Female	69	34.5
	Total	200	100

Source: Questionnaire Survey, 2019

I used primary data from 200 students of BGC Trust University Bangladesh in my study. In order to determine their socioeconomic situation, I questioned them about their HSC education board, the income of their guardians, the location of their SSC School, current education level and their gender.According to the information provided above Table 01, Bangladesh has nine educational boards: Barisal, Chittagong, Comilla, Dhaka, Dinajpur, Jessore, Rajshahi, Sylhet, and Madrasha. A maximum of 130 (65%) students from the Chittagong board of education successfully completed their HSC. 57 (28.5%) out of the 200 guardians have monthly incomes ranging from BDT 15001 to BDT 30,000 which is maximum in the study and they influenced. The majority of the students in my study are from rural area is 81%, undergraduateis 51% and male is 65.5%.

Data Processing and Analyzing Technique:IBM SPSS 23.0 and Microsoft Excel 2010 were used to handle and analyze the data. The socioeconomic status of students enrolled at private universities was determined using Microsoft Excel. Principal Component Analysis (PCA) has been used to analyze the replies as a data analysis technique.

Principal Component Analysis (PCA):A number of components that are not correlated are found by using factor analysis. The use of strongly correlated variables may have posed challenges for the subsequent analysis. The results of this factor analysis are used in a future multivariate study, especially a principal component analysis. The hypotheses are as follows:
Null hypothesis (H_0): Variables are uncorrelated.
Alternative hypothesis (H_a): The variables are highly correlated.

Reliability and Validity test:The reliability of the variables are shown in following table 2:

Table 2: Measurement of Reliability.

Variables	Statistics
Number of Items	17
Cronbach's Alpha	0.791
N	200

Source: SPSS output

The study adopts a more scientific measure of data and measurement reliability and validity test. Cronbach's Alpha is applied to measure the internal consistency and reliability, that is, do all the items in the scale really tap into one construct. The results in Table 2 show the Cronbach's Alpha reliability test statistics based on 17 items of 0.791. In the social science research,it is necessary to mention that the alpha value of Cronbach is ranged from 00 to 01, but to make the scale reliable the agreeable level must be more than 0.60. Thus, an Alpha of 0.791is preferred and considered a good reliability of the questionnaire measurement. The validity denotes the amount of differences in the scores of scale and explain whether right variation among the information of measured characteristics are reflected or not instead of occurring random or systematic error. Criterion validity will be considered in this research. This validity will indicate that various criteria of variables such as demographic features, behavioral aspect and attitudinal measures will be gathered simultaneously.

Empirical Results and Analysis:

Principle Component Analysis:In total, seventeen variables were employed in this study's Principle Component Analysis. The idea that the variables are uncorrelated in the population has been investigated using Bartlett's test of sphericity.

Table 3: Kaiser-Meyer-Olkin (KMO) and Bartlett's Test.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.761
Bartlett's Test of Sphericity	Approx. Chi-Square	631.861
	Df	136
	Sig.	.000

Source: Author's own calculation

Factor analysis wasappropriate since above table 3's KMO (Kaiser-Meyer-Olkin) value was 0.761, which was between 0.5 and 1.0. The Chi square test, on the other hand, was631.861with 136 degrees of freedom and significant at 0.000 (1% level). Hence, null hypothesis was rejected and alternative hypothesis was accepted. Therefore, it can say that factor analysis revealed the most important variables that influenced students' challenges to understand the business mathematical knowledge and to apply in BS.

Table 4: Total Variance Explained.

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.396	25.858	25.858	4.396	25.858	25.858
2	1.432	8.425	34.283	1.432	8.425	34.283
3	1.304	7.669	41.952	1.304	7.669	41.952
4	1.141	6.709	48.661	1.141	6.709	48.661
5	1.105	6.497	55.158	1.105	6.497	55.158
6	1.054	6.199	61.357	1.054	6.199	61.357
7	.862	5.068	66.425			
8	.837	4.921	71.346			
9	.767	4.511	75.857			
10	.691	4.062	79.919			
11	.672	3.951	83.870			
12	.587	3.454	87.324			
13	.568	3.342	90.666			
14	.479	2.816	93.483			
15	.397	2.335	95.818			
16	.375	2.206	98.024			
17	.336	1.976	100.000			

Extraction Method: Principal Component Analysis.

Table 5: Component Matrix[a].

	Component					
	1	2	3	4	5	6
Challenges-1	.376	-.478	.494	.286	.068	.166
Challenges-2	.521	-.142	.272	-.430	-.028	.212
Challenges-3	.697	-.092	.197	.013	-.328	-.029
Challenges-4	.229	.077	-.569	.378	.116	.557
Challenges-5	.661	.188	-.240	.083	-.082	.006
Challenges-6	.495	.003	-.190	-.185	-.399	-.170
Challenges-	.619	-.193	-.004	.106	.107	-.255
Challenges-8	.564	.103	-.374	-.152	.336	.117
Challenges-9	.600	-.052	-.055	.042	-.105	-.088
Challenges-10	.438	-.147	.099	.572	.317	-.278
Challenges-11	.655	-.245	.082	-.018	.088	.216
Challenges-12	.612	-.198	-.015	-.255	.108	.157
Challenges-13	.395	.118	-.101	-.445	.510	-.256
Challenges-14	.189	.611	.374	.071	.287	-.193
Challenges-15	.535	.478	-.007	.242	-.138	-.150
Challenges-16	.463	.285	-.018	.012	-.438	-.041
Challenges-17	.123	.515	.468	-.020	.060	.528

Extraction Method: Principal Component Analysis, Source: Author's own calculation

a. 6 components extracted.

The above Table 4, a principal component factor analysis was conducted on the 17 variables related to the challenges of the students to understand the mathematical knowledge and to apply in BS. This analysis yielded a 6-factor solution that explained 61.36% (cumulatively) of the variance that were represented. In the Table 5, According to the variables having higher load under one factor, the name of the six major challenges (factors) had been identified.

Table 6: Uncorrelated Factors.

Factor Name	Loaded factors	Eigen Values	% of Variance	Cumulative (%)
First important factor	ability to solve any mathematical problem, ability in related business studies of courses, ability to plan own work, what formula is appropriate for different situations, what formula is appropriate in solving business problems, BM syllabus is well developed for solving business problems, level of knowledge about the effects of different ways to ask questions, mathematical analysis, mathematical knowledge, and BM courses improve analytical ability.	4.40	25.86	25.86
Second factor	BM courses have relationship with finance or economics in the study of business, BM knowledge is effective to take preparation and helpful for upcoming carrier building in any financial or business institution, teaching method should be improved for studying BM.	1.43	8.43	34.28
Third	level of understanding of basic mathematical concepts	1.30	7.67	41.95
Fourth	decide how to perform ability by applying this knowledge to business studies courses	1.14	6.71	48.66
Fifth	Coversoutline the material to help in organizing BM course.	1.11	6.50	55.16

Factor Name	Loaded factors	Eigen Values	% of Variance	Cumulative (%)
First important factor	ability to solve any mathematical problem, ability in related business studies of courses, ability to plan own work, what formula is appropriate for different situations, what formula is appropriate in solving business problems, BM syllabus is well developed for solving business problems, level of knowledge about the effects of different ways to ask questions, mathematical analysis, mathematical knowledge, and BM courses improve analytical ability.	4.40	25.86	25.86
Second factor	BM courses have relationship with finance or economics in the study of business, BM knowledge is effective to take preparation and helpful for upcoming carrier building in any financial or business institution, teaching method should be improved for studying BM.	1.43	8.43	34.28
Third	level of understanding of basic mathematical concepts	1.30	7.67	41.95
Fourth	decide how to perform ability by applying this knowledge to business studies courses	1.14	6.71	48.66
Fifth	Coversoutline the material to help in organizing BM course.	1.11	6.50	55.16
Sixth	Devote a lot of time to study the this types of mathematical courses	1.05	6.20	61.36

Source: Researcher's own calculation

In the above Table 6, the study showed that 'First important factor of challenges' was the most important factors explaining the highest variance (25.86%) in the variables. The ten variables contained in this key factor were: ability to solve any mathematical problem, ability in related business studies of courses, ability to plan own work, what formula is appropriate for different situations, what formula is appropriate in solving business problems, BM syllabus is well developed for solving business problems, level of knowledge about the effects of different ways to ask questions, mathematical analysis, mathematical knowledge, and BM courses improve analytical ability. The second important factor of challenges explained 8.43% of the variation in students' problem for their understanding. This factor included 'BM courses have relationship with finance or economics in the study of business, BM knowledge is effective to take preparation and helpful for upcoming carrier building in any financial or business institution, teaching method should be improved for studying BM. The third important factor of challenges explains 7.67% of variance. These factors included in this component were 'level of understanding of basic mathematical concepts'. The fourth important factor of challenges accounted for 6.71% of the variance and covered 'decide how to perform ability by applying this knowledge to business studies courses'. The fifth important factor of challengesaccounted for 6.50% of the variance and covered 'outline the material to help in organizing BM course'. The sixth important factor of challengesaccounted for 6.2% of the variance andcovered 'devote a lot of time to study these types of mathematical courses'.

Multiple Regression Analysis: Six independent components emerged from the factor analysis: First factor, Second factor, Thirdfactor, Fourth factor, Fifthfactorand Sixth factor. For the multiple regression analysis, these factors were chosen as the independent variables, and the dependent variable was the overall challenges of students with the university.

Table7: Summary of Regression Analysis.

Variables	Beta Coefficients	't' Value	Sig
First factor	0.399	55.6	0.000
Second factor	0.388	51.3	0.000
Thirdfactor	0.357	49.2	0.000
Fourth factor	0.190	23.6	0.000
Fifth factor	0.266	37.0	0.000
Sixth factor	0.287	38.2	0.000
Observation=200 R Square=0.996 Adjusted R Square=0.992			

Source: Researcher's own calculation

In the Table 7, the value of RSquarewas0.996and adjusted R Squarewas 0.992. It suggested that other independent variables were not be added to explain the variation in students' overall challenges of mathematical knowledge in business discipline. This model was fit (adjusted R square=0.992) and significant statistically. In the column of beta Coefficients,a) First factor of challenges (β_1) = 0.399, b) Second factor of challenges (β_2) = 0.388, c)Third factor of challenges (β_3) = 0.357, d) Third factor of challenges (β_3) = 0.357, Fourth factor of challenges (β_3) = 0.190, Fifth factor of challenges (β_3) = 0.266, and Sixth factor of challenges (β_3) = 0.287.In the table, the all the factors of challenges were significant (1% level) statistically.
So, the regression model was:

The students' overall challenges = 0.032+ first factor of challenges (0.399) + second factor of challenges (0.388)+third factor of challenges (0.357)+third factor of challenges (0.357)+ fourth factor of challenges (0.190)+ fifth factor of challenges (0.266)+ sixth factor of challenges (0.287). Hence, it can conclude that allthe factors of challenges had a significant positive relationship with the students' overall challenges to apply mathematical knowledge in business discipline.

Conclusions: The study discovers that there are seventeen challenges of business students to apply mathematical knowledge in business discipline in BGC Trust University Bangladesh. In this study, the author has identified six uncorrelated factors ofchallenges such as first factor of challenges (0.399), second factor of challenges (0.388), third factor of challenges (0.357), third factor of challenges (0.357), fourth factor of challenges (0.190), fifth factor of challenges (0.266) and sixth factor of challenges (0.287). Among the factorsof challenges, first factor of challenges is the most significant which includes ability to solve any mathematical problem, ability in related business studies of courses, ability to plan own work, what formula is appropriate for different situations, what formula is appropriate in solving business problems, BM syllabus is well developed for solving business problems, level of knowledge about the effects of different ways to ask questions, mathematical analysis, mathematical knowledge, and BM courses improve analytical ability.Moreover, all the six factor of challenges are significant statistically and their impact is positive on the students' challenges.Hence, BM instructors andconcern authority are suggested to concentrate allthe factors of challenges especially first factor of challenges to apply business mathematical knowledge in business discipline of BGC Trust University Bangladesh.Thebiggest fault of the study is sample size (200). If the sample size had been larger, the research would have been more trustworthy. Only BGC Trust University Bangladesh was the sample of this study; other private and state owned universities were not taken into account. It might be proposed that further research may be undertaken to analyze the students' challenges to understand the mathematical knowledge of other private and public universities in Bangladesh.

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