

An Investigation to Identify the Problematic Areas in Mathematics Curriculum of Under Graduate - Level Students of Kamrup (M), Assam

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Abstract: *Mathematics is considered to be one of the significant subjects that play a vital role in developing the analytical skills of the students. However, lack of understanding, concept clarity, language barriers, abstract ideas affect the student's performance and prevent them from obtaining a detailed understanding of the subject knowledge. In the current study, students' learning problem has been considered to be the dependent variables while teaching material, teaching method and content knowledge has been considered as the Independent variables to address the study objectives. The issues are also found regarding the pure mathematics of applied mathematics topics, which shows the unbalanced application of curriculum and teaching infrastructure. The teaching method along with teaching materials plays a significant role in developing interest among the students and motivates them to learn. While on the other hand, the implementation of innovative teaching strategies contributes toward enhanced learning by mitigating the knowledge gap of the students. The study has also focussed upon conduction of correlation, regression, KMO and Bartlett test to determine the interrelationship between the variables and addressing the research hypothesis. P - value obtained in the study has been reported to be less than 0.05 thereby indicating rejection of the null hypothesis while acceptance of the alternative hypothesis. The key findings include that there is a great importance of mathematics to secure a desired position in this market. It has been seen that the demand for technology and science in the present competitive world is rapidly increasing. Positivism research philosophy and deductive research approach have been followed in this research. Content knowledge, teaching materials, and teaching methods play a dominating role in influencing the mathematics learning of the students.*

Keywords: Cognitive learning theory, Behavioural learning theory, Constructivism learning theories, content knowledge gap, teaching methodologies, Cognitive learning

1. Introduction

Investigating the major problematic areas of the students related to learning is necessary for the teachers to improve their academic performance. In this study, the problems that are faced by the teachers and students of UG level Kamrup are described. The Aim and objectives of this study are clearly stated along with highlighting appropriate rationale and research significance. The collected literature for this study is also reviewed. The relationship among the variables is highlighted by performing appropriate statistical analysis.

1.1 Aim and Objectives

The *aim* of this study is to investigate the problematic areas of the students of UG level at Kamrup in learning mathematics. The *objectives* of this study are described below.

- To identify mathematical topics, conceptual frameworks, and procedures that are challenging for undergraduate students at colleges,
- To determine the resources that students are currently using, those that teachers recommend helping students overcome these significant problems.
- To determine the impact of teachers' content knowledge on the learning process of the students at UG - level Kamrup
- To analyse the impact of different teaching methods on the learning process
- To evaluate the use of different teaching materials to enhance the learning process

- To provide appropriate strategies for mitigating the teaching and learning problems among the students of UG - level at Kamrup.

1.2 Research Hypothesis

1H0: *Teachers' content knowledge has no significant influence on the learning process of students of UG - level at Kamrup.*

1H1: *Teachers' content knowledge has a significant influence on the learning process of students of UG - level at Kamrup.*

2H0: *The teaching method has no significant influence on the learning process of students of UG - level at Kamrup.*

2H1: *The teaching method has a significant influence on the learning process of students of UG - level at Kamrup.*

3H0: *The use of teaching materials has no significant influence on the learning process of students of UG - level at Kamrup.*

3H1: *The use of teaching materials has a significant influence on the learning process of students of UG - level at Kamrup.*

2. Research Methodology

Sampling method

This research has been completed following the *random sampling technique*. As per the view of Argyreset *al.* (2020), in research, a random sampling technique is followed to minimize the rate of sample biases. In this study, the total population size was 3000 students and 64 teachers. The sample size of this study was selected as 338 student respondents and 64 teachers by using the Cochran formula, which has been described below.

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$$n_0 = \frac{Z^2 pq}{e^2}$$

- e** Margin of error
- p** Population proportion
- z** Use Z Table

Cochran formula

In this study, the value of e and confidence level is highlighted below. With the help of calculating accurate precise sample level, the proportion of expected attribute, and confidence level the sample size of this research has been determined. The value of p in this research was 3000.

Marginal error (e) =5% Confidence level = 95%

3. Data Collection, Analysis and Discussion

Mathematical learning development of the students is largely governed by innumerable factors from teacher's knowledge; teacher's method and teaching material, student's cognition that affect the learning behaviours and development of the student's perception towards mathematical learning. The study has focussed upon the conduction of a survey on nearly 338 students and 64 teachers to understand their perception and opinions about mathematics learning and the challenges. Survey results analysis has been performed to understand the significant impact of the teaching methods, teaching materials on the learning development of the students of Kamrup district, Assam.

SPSS data analysis

a) KMO TEST and Bartlett test

KMO test is performed to determine the appropriateness of the data for the conduction of the factor analysis. As opined by Watson (2017), a KMO value between 0.8 and 1 is adequate sampling while a value less than 0.6 indicates inadequacy in the sampling princess. Bartlett test on the other hand examines the null hypothesis considered in the study.

Teacher response

Table: KMO test and Bartlett test from teacher response

	KMO test	Bartlett test
Variable 1: Student learning problems	0.659	Approx chi - square value: 38.420
		Df: 3
		Significance value: 0.000
Variable 2: Content Knowledge	0.615	Approx chi - square value: 30.791
		Df: 3
		Significance value: 0.000
Variable 3: Teaching method	0.669	Approx chi - square value: 92.910
		Df: 3
		Significance value: 0.000
Variable 4: Teaching material	0.577	Approx chi - square value: 33.216
		Df: 3
		Significance value: 0.000

KMO and Bartlett test results as depicted in table 4.1 indicate that the KMO value for students learning problems and knowledge is 0.659 and 0.615 respectively while that of the teaching method and teaching material is 0.669 and 0.577 respectively. The significance of the Bartlett test of sphericity indicates the p - value to be less than 0.05 for a student's learning problem, knowledge, teaching method and teaching material. Thereby, indicating adequate sampling of the data

set and appropriateness of the factors analysis. Thus it can be concluded that teaching methods, teaching materials and knowledge play a significant role in mitigating students' learning problems.

Student's response

Table: KMO test and Bartlett test from Students response

	KMO test	Bartlett test
Variable 1: Student learning problems	0.623	Approx chi - square value: 38.420
		Df: 3
		Significance value: 0.000
Variable 2: Content Knowledge	0.632	Approx chi - square value: 141.539
		Df: 3
		Significance value: 0.000
Variable 3: Teaching method	0.676	Approx chi - square value: 220.311
		Df: 3
		Significance value: 0.000
Variable 4: Teaching material	0.629	Approx chi - square value: 87.561
		Df: 3
		Significance value: 0.000

In context to the student's response, KMO and Bartlett test values as depicted in table 4.2 indicate that the KMO test value for students learning problems is 0.623. At the same time, the p - value is less than 0.05. Furthermore, the KMO test value for teaching method, material and knowledge has been reported to be 0.676, 0.629 and 0.632 respectively. While the p - value from the teaching method, materials and knowledge are 0.000. Since the Bartlett test significance value is less than 0.05 while the KMO value is more than 0.6, indicating adequate sampling of the data set has been done and appropriate factor analysis has been done. Thus it can be stated that from a student's perspective, teaching material, method, and knowledge serves to be effective in mitigating the mathematics learning problems of the students.

b) Chi - square Analysis

Chi - square analysis is the statistical calculation that has been performed to understand whether statistically significant differences exist between the expected and the observed study frequencies. As opined by Sur *et al.* (2019), chi - square test results analysis focuses upon determining whether differences between the expected and observed data are by chance or due to the existence of a relationship between the variables. P - values being less than 0.05 results in highlighting that observed distribution and expected distribution are dissimilar.

Table: Chi - Square analysis: teacher factor

Items	Pearson Chi - Square value	Asymp. Sig. (2 - sided)
UG level math: Assessment level	70.793	0
UG level math: Differing teacher knowledge	47.957	0
UG level math: Cognitive teaching method	41.548	0
UG level math: ICT learner efficiency	45.286	0

Table: Chi - Square analysis: Students factor

Items	Pearson Chi - Square value	Asymp. Sig. (2 - sided)
Self factors learning: Teaching attitude	88.314	0
Self factors learning: Learner motivation	74.029	0
Self factors learning: Technology tool learning	69.798	0

c) Hypotheses Interpretation

H1: Teachers' content knowledge has a significant influence on the learning process of students of UG - level at Kamrup.

Teachers' content knowledge can be determined by the deferred teachers' knowledge as well as cognitive teaching method. The Chi - square values are greater than the minimum expected values. Additionally, the alpha significance value is less than 0.05. This indicated that the null hypothesis can be rejected while establishing the positive relation between content knowledge and improved learning process at UG level considering both pure and applied mathematics topics.

H1: The teaching method has a significant influence on the learning process of students of UG - level at Kamrup.

Teaching method, teaching attitude and ICT based learning efficiency by the students to the influence of the teaching method. The Chi - square values of each case are 41.548, 88.314 and 45.286, which are high than the minimum expected count showing the possibility to accept the alternative hypothesis. Additionally, the significance values observed are all less than 0.052, the standard of p - value for accepting or rejecting hypotheses. The result indicated that the null hypotheses can be rejected.

H1: The use of teaching materials has a significant influence on the learning process of students of UG - level at Kamrup.

The teaching materials used can be depicted with ICT learner efficiency, learner motivation with the tools and technology tool learning. The Pearson Chi - square values showed higher values than the chi - square critical values, which are 45.286, 74.029 and 69.798 respectively. Considering the p - values in each case, it can be seen that the obtained values are 0.00 or near to it, indicating that these are lower than the standard p - value of 0.05. The low alpha significance value indicated that the null hypothesis can be rejected directly.

Pearson chi - square value for Assessment level, Differing teacher knowledge, Cognitive teaching method, ICT learner efficiency is 70.793, 47.957, 41.548, 45.286 respectively. While the significant value is 0.000 for the items Assessment level, ICT learner efficiency, Differing teacher knowledge and Cognitive teaching method. Since the p - values are less than 0.05 thereby indicating that a relationship exists between the categorical variables. It can be stated more specifically that cognitive teaching method, ICT learning efficiency, assessment procedures and teacher knowledge play a crucial role in mitigating the maths challenges faced by the UG - level students.

Consideration of the self - factor learning for instance reveals Pearson Chi - Square value for teaching attitude, learner

motivation and technology tool to be 88.314, 74.029 and 69.798 respectively. While the significance value is 0.000 for all the components of the self - factors learning. Since, the p - value is less than 0.05 thus indicating the existence of a relationship between teaching attitude, learner motivation and technology tools and mathematics problems learning of the students. Learner motivation, technology tool usage and teaching attitude positively impact mathematics learning among students.

4. Discussion

Mathematics learning is essential for the students as it helps students to understand and relate to other subjects with enhanced clarity. As stated by Amalia *et al.* (2017), in - depth mathematics knowledge helps students in gaining deeper concepts and helps them to explore subject matter from diverse perspectives that further enhance their performances. The study in context to challenges faced by students during mathematics learning has focussed upon consideration of teacher knowledge, teaching materials, and teaching method as the independent variables and student's mathematics learning problems as the dependent variables.

Educators are the crucial members who play a vital role in the life of the students and help them to identify the process and the strategies that might help students in meeting their learning needs (Acharya, 2017). Teacher's knowledge includes not only the subject knowledge but also a detailed understanding of the teaching methodologies in context to mathematics topics that help students in enhancing their performances. Furthermore, teaching materials highlight the usage of ICT tools like videos, PPT serves to be influential in addressing the diverse need of the learners. Interactive learning sessions develop an interest among the students that further motivates them to opt for the subjects and pay more attention toward solving the mathematical problem.

Correlation and regression analysis has been performed in the study to identify interrelationship between the variables and determine the facts that play a significant role in acceptance or rejection of the null hypothesis. Significance value has been reported to be less than 0.05 for teacher's knowledge, teaching material and teaching strategies thereby indicating acceptance of alternative hypotheses. Thus it can be clearly stated that a teacher's knowledge along with teaching material and teaching strategy plays a dominating role in enhancing the mathematics learning outcome of the students. Since, teaching strategies, learning materials play a dominating role in creating interest among the students thus it is essential for the educators to understand the requirements of the diverse learners and accordingly implement innovative teaching strategies to mitigate and resolve the difficulties faced by the students. Furthermore, it is also essential for educators to implement ICT tools in the current digitization era to enhance the mathematics learning outcome of the students.

5. Summary

Mathematics is considered to be one of the complicated subjects by the students that affect the student's performance and prevent them from undertaking mathematics subjects in higher studies. The study in context to analysing the problems

faced by UG level students during mathematics class has focused upon consideration of teacher's knowledge, teaching material and teaching strategies as the factors that affect the rate of mathematics learning among the students. Teaching strategies play a crucial role in determining appropriate methodologies that are to be implemented by the educators to address the learning difficulties of the students. Furthermore, the study has focussed upon successful conduction of KMO, Bartlett test, Chi - square test, correlation and regression analysis to address the study objectives. Acceptance and rejection of study hypotheses have been further determined in the study through the calculation of the significance values. Data analysis results revealed that teacher's knowledge, teaching material and teaching strategies positively impact the students mathematical learning. Effective usage of teaching material, teaching strategies and enhanced subject knowledge can prove to be effective in enhancing student's performance by mitigating mathematical challenges.

6. Conclusion

Mathematics is considered to be one of the challenging subjects in UG level institutions by the majority of the students. Mathematics is built on the sequential learning of the concepts. If previous concepts are not clear to the students, they often struggle with newer concepts thus making it a challenging subject for the students. The study in context to the identification of mathematics problems faced by students in Kamrup (M), Assam has focussed upon understanding the factors that affect the student's ability to solve mathematics problems. The study has even focussed upon conduction of primary and secondary data accumulation through the survey on students and educators and consideration of the archival study respectively for addressing the study objectives. The current section focuses upon linking objectives with the study findings and recommendations that would be effective for mitigating mathematics problems being faced by the students in Kamrup, Assam.

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