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Abstract

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Students' Perception of Declining Learner's Enrollment in Mathematics : A Context of Universities in Nepal

¹Thakur Prasad Pokharel

The students' perception of declining learner enrollment at higher levels of mathematics is one of the significant factors to deal with them successfully. Therefore, this study aims to investigate the bachelor second-year students' perception of difficulty in subject matters, the attitude of teachers, the efficiency of subject matters and teaching methodology, the application of mathematics, and existing exam patterns. This investigation is based on the survey research design consisting of 198 respondents of mathematics of second-year students that includes 108 male and 90 female students from different colleges in Pokhara valley. A five-point Likert-scale survey questionnaire, related to independent variables was prepared with 22 structured questions and administered by the researcher to the students. This study used a descriptive research design, where the data were collected and analyzed. The finding of this study concludes that declining student enrollment in higher levels in mathematics was significantly positively correlated with the difficulty in subject matters, attitude of faculty members, efficiency in subject matters, application of mathematics, and existing exam patterns. The study also revealed that most learners positively believe that mathematics was relevant to further studies as it supported to the development of the creative, imaginative, logical, and constructive skills of learners. However, most of the respondents realized that mathematics educators did not support the weakness of learners' problems properly, and most teachers had insufficient skills to connect mathematics knowledge to learners' real lives.

MATHEMATICS IS ONE of the central parts of the curriculum in the world. It plays a significant role in the personal and professional life of each human being. It particularly, studies the relations and properties of symbols, number, and

1. Assistant Professor, School of Engineering, Pokhara University, Pokhara.
Email : pokthakur287@gmail.com

their application. It also provides the process of finding the solution to every problem to solve. Furthermore, it is a science that deals with quantity, arrangement, and the logic of shape. It is used in computers, mobile devices, calculators, money, art, sports, software, architecture, and engineering.

The awareness, feeling, comprehension, or understanding of something is called perception. It is also a belief or opinion based on how things are seen. Declining student enrolment in Mathematics is reducing the number of learners who are admitted to the university level. However, Mathematics is based on learners learning key interdisciplinary knowledge such as engineering technology and science Ker (2013). It is the foundation of science and technology. The significant role of Mathematics is also focused on a tertiary study where the study argued that higher-level studies success depends on the level of Mathematics learned at the secondary level (Nicholas et al., 2015; Ryland & Coady, 2009). Different disciplines of higher-level studies have achieved their objectives based on their knowledge of Mathematics at the secondary level.

Mathematics is more rigorous and less viable than other disciplines. Bhusal (2021) found that most of the faculty members of mathematics taught Math only exam-oriented. They were unknown to connect mathematics problems with the daily life of learners. They were also unknown of the application part of mathematics. However, they focused only to calculate the problem. A few of the faculty members of Mathematics have sufficient knowledge of research activities. Most of the learners had misconceptions about mathematics. They had poor knowledge of the mathematical background and were unable to learn at home. Faculty members of mathematics and students should be updated and trained in mathematics.

Low scores on tests or exams, faculty members' harshness, and carelessness are the main factors to dislike mathematics learners (Ukobizaba et al., 2021). Learners should be guided, motivated, and praised to achieve high scores in the examination. Kunwar (2021) concluded that low-achiever learners have a negative perception of mathematics and they were unable to prefer to learn mathematics to their friends. High-scorer learners were found more confident and positive towards mathematics. However lower achievers were found anxious and negative. Most learners' learning experience, lower scorers on the test, fear of failure in Math exams, and negative attitudes of faculty members, parents, and friends towards mathematics may cause to be a negative perception of mathematics. Liking or disliking mathematics depends on the positive or negative perception of mathematics of learners. Further, Kunwar (2020) argued that achievement in mathematics was found according to their education, and occupation is directly linked to their children's performance in mathematics. The education and occupation of parents play a significant role in the achievement in mathematics of their children.

The changes in the school were one of the main reasons; they had difficulty in adjusting to the new environment affecting their mathematical learning (Shrestha et al., 2011). According to the study, learners recognized that mathematics was monotonous and challenging subject. They felt mathematics did not apply to their life. The teaching-learning methodology, mathematical anxiety, faculty member personality, and extra load in the housework environment of school and home also affect the output of mathematics. The perception of mathematics is affected due to one or more reasons which are discussed above. Wahid et al. (2013) suggested that anxiety about mathematics and the attitudes of students in a university play a significant role in their academic achievement. Environment factors emotions and assessment are related parts of mathematics anxiety. Performance of learners learns on mathematics anxiety. A lower score in mathematics

achievement is the reason for a higher score in math anxiety. A highly motivated and self-confident learner minimizes math anxiety. Learners who have average anxiety can achieve high scores. It suggested that all faculty members should identify the anxiety level of learners before starting meaningful teaching and learning activities.

Mathematics supports people to give valid interpretations of their views and conclusion by using the numerical and computation part of people's life and knowledge in mathematics (Yadav, 2019). It provides several ideas to individuals as well as social development. Gafoor and Kurukkan (2015) revealed that mathematics was not a favorable discipline for most learners due to boredom, low self-efficacy, fear, and negative expectation of mathematics. More positive effects like interest, positive expectations, higher self-efficacy order, and personal values play a significant role in favorite mathematics learners. Hine (2018) explained that capable learners did not enroll in higher-level mathematics courses due to not being required for the higher-level entrance of other more viable and low-rigorous disciplines. Most high scorer learners prefer other disciplines nowadays. So the curriculum of mathematics should be changed on the of more viable and less rigorous. Applied part of mathematics in other subjects should include in the course content of mathematics.

The behavior of faculty members of mathematics played a significant role in students learning mathematics. Further, the research work concluded that updating the way of teaching and demonstrating the behavior of teachers of math support increases the number of students to like mathematics at a higher level (Ukobizaba et al., 2020). The behavior of teacher should be changed for learners. Students centred teaching method, internal motivation, learning by doing approach should be applied in teaching learning activities. Silva et al. (2019) explained that the teaching practice should be experimentation and contextualization where the learners understand by doing, feeling, and living from their reality. Learning by reality is long-lasting. Wang et al. (2019) revealed that the desirable beliefs towards mathematics and the achievement level of mathematics of learners should be strongly positively correlated to the praise of learners by the teacher. Furthermore, the study found that too little anxiety or too much anxiety showed a strong negative correlation to learner achievement. Average anxiety and complement of pupils by teachers play a significant role to obtain a high score in Math.

Pupils had a negative attitude toward mathematics due to an ineffective mathematics curriculum, the lack of potential and competence of most faculty members at the mathematics of primary level and this largely contributed to the lack of interest among learners (Chand et al., 2021). The achievement in mathematics in primary and secondary was poor. If the foundation of mathematics in lower classes is weak then it develops a negative perception of math at a higher level. The foundation of mathematics in primary level should be improved by doing different research activities. Gupta (2019) said that finance and banking, computer and its game, weather prediction, search engine, logistics, music, Transportation, satellite navigation, crime prediction, military, and Defense are the most common and essential applications also advanced applied fields of mathematics in real life. Basic and advanced knowledge of mathematics is required in diverged fields.

The circumference and width of the flat structure were taught by the CPA (concrete, pictorial, and abstract) approach, enhanced the mathematics learning by observing and taking test cycles I and II and explained the example of an abstract situation to provide the knowledge of abstract (Salimi et al., 2018). All mathematics curricula should be suitable for approaching

CPA rules to achieve the objective. The course content of mathematics related with CPA should include in different level.

So much research in many countries of the world has been carried out to find the components that impact students' achievement in mathematics. Among these components, difficulties in subject matters are one remarkable element. The subject matters of mathematics are partially relevant to the learners who wish to apply further studies in another field. Also, the attitudes of faculty members of mathematics are a second remarkable factor. Wang et al. (2019) concluded that liking mathematics and high scorer achievement in mathematics are impacted by to praise of the learners by the teacher. However, a few teachers are unknown of this and they are harsh and careless. To different research finding, some mathematics teacher is inefficient and unable to connect the subject matter to real life. Similarly, the application part of mathematics is the third affected factor for the student's achievement in mathematics. Learners are not interested in some topics of mathematics if they will not find it relevant to their daily real life. Shrestha et al. (2021) revealed that learners knew that mathematics is a monotonous and challenging subject and also not applicable to their life. Gupta (2019) explored that math is applicable in diverse fields. But the existing curriculum of mathematics includes only a few parts of applied mathematics. Furthermore, the existing exam pattern of the university is also affected elements of students' achievement. It was unable to measure the vigorous ability of learners.

Furthermore, for some of the above-mentioned reasons, most of the learners have negative perceptions of mathematics and its application. Some educators have also the same perception as learners. Due to this cause, most of the students dislike mathematics and they do not prefer their friends to take mathematics at a higher level. Different research papers at different times, by different people, and at different places in the world revealed that students' enrollment in Mathematics at a higher level is reducing. The same case is happening at the University of Nepal. However, there are no documented research papers on this issue in Pokhara. Therefore, an in-depth and far-reaching formal fact-finding needs to be focused to find difficulty in the subject matter, attitudes of faculty members, application part of subject matter, and existing exam patterns which play a weighty role in the decline of student enrollment in mathematics in higher level.

These fact-finding studies raised the problem decline in student enrollment in mathematics at a higher level due to the difficulty in subject matters, attitude of faculty members, efficiency of subject matters, application of mathematics in the diverse field, and existing exam pattern. The main aim of this investigation is to scrutinize the problem of reducing student enrollment at a higher level due to the influence of trouble in Math, frame of mind and efficiency of educators, implementation role, and existing part of the evaluation system.

Research Methodology

This study applied descriptive and analytical research design as a quantitative research method. Finding the perception of learners to decrease the student's enrollment at the higher level in mathematics was aimed to recognize this investigation. The researcher prepared nine demographic variables and 22 structured questionnaires among them 4 for the difficulty of subject matters, 5 for the attitude of faculty members, 5 for efficiency of faculty members and teaching methodology, 5 for the application of mathematics, and 3 for existing exam patterns based on the research questions. Questionnaires were administered in English languages by using 5- types of Likert scales, 1-strongly disagree, 2-disagree, 3- neutral, 4-agree, and 5-strongly agree.

The target population for this study embodied the students in mathematics at the bachelor level of one Government College and three private Colleges at Pokhara valley. The Government College is Prithwi Narayan Campus (PNC) Bagar, and three private colleges are Pokhara Engineering College (PEC) Phirke, Nepal Tourism and Hotel Management College (NTHMC) Gairapatan, and Himal Management college, Bagaletole. These four colleges were taken for sample spaces. Four art students took Mathematics as a major subject, twelve education students had Mathematics as a major subject, and sixty-seven students of Science of the physical group of the second year of a bachelor of PNC participated in this study. Fifty-two students in the fourth semester of Civil Engineering at PEC were used to fill the research questions. Forty-seven learners of bachelor in business administration in the fourth semester of NTHMC and sixteen students of bachelor of business studies of second years of Himal Collage were involved in the fact-finding. The researcher collected the data himself through a field visit in 2022. Thus, 198 students including 108 boys and 90 girls were selected by using non –probability judgment sampling.

The primary data were collected from the questionnaires and analyzed by using the statistical tool SPSS version 20. Thus, the data from questionnaires check the validity and trustworthiness of the results. Internal consistency of the perceptions category:

Table 1

Reliability Analysis

Items	n	α -value
Difficulty in subject matters	4	0 .719
The attitude of faculty members	5	0 .769
The efficiency of subject matters and teaching methodology	5	0 .781
Application of mathematics	5	0 .724
Existence of question pattern	3	0 .601
Total items	22	

Table 1 shows that the reliability of the constructs is the highest at 0.781 and the lowest at 0.601 which is more than 0.600 so the constructs of the study are highly reliable.

This plan was especially used to investigate the rigorously feeling of students facing mathematics on the topic of difficulty in subject matters, attitudes of educators, efficiency and teaching methodology of faculty members, application of mathematics, and evaluation system. The arithmetic mean and standard deviation of each questionnaire of each construct were calculated by using the statistical tool SPSS version 20 and the results were analyzed. The relationship of constructs variables was calculated by using a correlation matrix. Respondents of PNC had pure mathematics and others had applied mathematics backgrounds. The data of respondents are collected only for research purposes. The individual information is confidential according to the research rule. The result of this study will support revising subject matters of mathematics, updating the individual behavior of faculty members, elaborating the application part of mathematics, applying student center teaching methodology, and modifying the evaluation system.

Results and Discussion

Demographic Profile of Respondents

There were 198 respondents involved in this sample. Out of the total respondents selected for the survey, 54.5 percent were male and 45.5 percent were female, the number of female respondents was less than the number of males. The different age groups have been taken in the sample survey. The age groups below 20 hold 18.18 percent, 21-23 hold 79.29 percent maximum of the total respondents, and 24 and above hold 2.53 percent of the total respondents of whom 20.70 percent live in village and 79.30 percent live in the municipality.

The educational background of the sampling students is different such that 34.34 percent study bachelor in science, 0.20 percent study bachelor in art, 5.55 percent study bachelor in education, 26.76 percent study bachelor in engineering, 24.24 percent study bachelor in administration and 9.00 percent study bachelor in business studies. 40.90 percent studied in a government school and 59.10 percent of respondents studied in Private schools up to the secondary level. Students in private schools are more than students in government schools.

The occupations of the parents of respondents are different such that 30.30 percent in agriculture, 23.23 percent in business, 10.06 in teaching, 12.63 percent abroad, 14.65 percent in a government job, and 9.5 in others. The qualifications of education of their parents are 39.90 percent below SLC, 37.90 percent intermediate, 12.62 percent bachelor, and 8.59 percent master of degree and 0.99 percent above master of degree.

Descriptive Analysis of Difficulty of Subject Matters

For descriptive analysis of the study means and standard deviation have been applied for testing the position of constructs of the perception of students on declining the enrollment of students in higher levels in different colleges of Pokhara valley.

Table 2

The Difficulty of Subject Matters

Items	n	Mean	S.D
I am interested in studying Mathematics.	198	3.263	0.974
I always understand mathematical problems.	198	3.262	0.862
I prefer my friends to study mathematics.	198	3.641	0.829
I think that mathematics is relevant to further studies.	198	3.924	0.956

Table 2 shows that the descriptive analysis of students' perceptions with the highest mean of 3.924 with an SD is 0.956 and the lowest mean of 3.262 with an SD of 0.862. It reveals that most students think mathematics is relevant to further studies however fewer students understand mathematics problems. The smallest and largest standard deviation are 0.829 and 0.974 respectively. It explains that most respondent provide the most consistent response for preferring their friends to study mathematics.

Table 3 shows that the largest mean of 4.091 along with an S.D. is 0.879 and the smallest mean of 3.152 having a standard deviation of 1.134. Most of the respondents realized that their faculty members made them positive towards mathematics by explaining the scope of mathematics. However, only a few respondents supported that teachers of mathematics always provide positive feedback for their weaknesses. The greatest and smallest standard deviation are 1.134 and 0.879 respectively. It reveals that most of the learners deliver the most equitable response about their teacher made them positive towards mathematics by explaining its scope.

Table 3*The Attitude of Faculty Members*

Items	n	Mean	S.D
I feel that mathematics teachers understand our problems and provide good suggestions to us.	198	3.414	1.043
I think that mathematics teachers are happy to be math teachers.	198	3.965	0.881
I realize that my mathematics teachers made me positive towards mathematics by providing its scope.	198	4.091	0.879
I think that math teachers always provide positive feedback for my weakness in Mathematics.	198	3.152	1.134
I think that math teachers give good suggestions for every problem of students	198	3.495	1.001

Table 4*The Efficiency of Faculty Members and Teaching Methodology*

Items	n	Mean	S.D
I feel that mathematics teachers are well-qualified and trained.	198	3.636	0.992
I feel that mathematics teachers can connect the subject matters of mathematics to my real life.	198	2.828	1.081
I feel that mathematics teachers provide special take care for weak students in mathematics.	198	2.919	1.168
I feel that mathematics teachers use technology to teach mathematics lessons.	198	2.566	1.141
I got new ideas about mathematics when my mathematics teachers presented a research paper.	198	3.010	1.062

Table 4 shows that the greatest and lowest average of 3.636 and 2.566 respectively. It explored that most of the answerers agreed that mathematics teachers are trained and well-qualified nevertheless fewer answerers realized that the faculty members of mathematics use technology in their teaching-learning activities. The standard deviation with the largest and smallest values are 1.168 and 0.992 respectively. It concludes that most of the students provide the most variable reaction about providing special take for weak students.

Table 5*Application of Mathematics*

Items	n	Mean	S.D
I feel that mathematics is a more applicable subject than other subjects.	198	3.414	1.042
I think that mathematics knowledge can help the study of another subject.	198	3.965	0.881
I feel that mathematics ideas help learners to develop more creative, imaginative, problem-solving, constructive, and logical skills than other subjects.	198	4.091	0.879

I think that the Curriculum of mathematics is focused on job-oriented, behavioral, and life oriented.	198	3.152	1.134
I feel that the Curriculum of mathematics gives sufficient examples and ideas about Science, Technology	198	3.495	1.001

Table 5 showed the largest average of 4.091 with the smallest standard deviation of 0.879 and the smallest mean of 3.152 with greatest SD of 1.134. Most of the replies felt that mathematics ideas helped the learners to enhance more creative, imaginative, constructive, logical skill, and problem-solving than other subjects with more consistency. Only a few replies concurred that the curriculum of mathematics was focused on the job-oriented, behavioral, and life oriented.

Table 6

The Existing Exam Pattern

Items	n	Mean	S.D
I think that pass out the percentage of mathematics in exams is higher than in other subjects.	198	2.641	0.955
I enjoy mathematics exams.	198	3.268	1.128
I think that the question pattern of mathematics is easier than other Subjects.	198	2.854	1.049

Table 6 displayed the topmost average of 3.268 having a standard deviation of 1.128 and the lowest average of 2.641 with a standard deviation of 0.955. The topmost responder agreed that they enjoyed mathematics exams but minor repliers thought that the rate of passing out students in mathematics is higher than in other subjects with more uniformity.

The Relationship among the Constructs Variables

Table 7 presents the relationship among the variables under study.

Table 7

The Correlation Matrix of Constructs Variables

	Difficulty in subject matter	The attitude of faculty members	Efficiency in subject matter and teaching methodology	Application of mathematics	Existing exam pattern
Difficulty in subject matter	1	0.373**	0.353**	0.533**	0.359**
		0.000	0.000	0.000	0.000
		198	198	198	198
The attitude of faculty members		1	0.670**	0.360**	0.310**
			0.000	0.000	0.000
			198	198	198

Efficiency in subject matter and teaching methodology	1	0.377**	0.387**
		0.000	0.000
		198	198
Application of mathematics		1	0.447**
			0.000
			198
Existing exam pattern			1

From the correlation matrix of constructs variables, the *p*- the value of each constructs variable is 0.000 with other constructs variables. It reveals that each constructs variable is highly significant with other constructs variables. The correlation between the attitude of a faculty member and efficiency in subject matters and teaching methodology is 0.670 which is strongly positively correlated however only positively correlated with other constructs variables. Similarly, the correlation between the application of mathematics and difficulty in subject matters is 0.533 which is highly positively correlated. Nevertheless, each construct variable is positively correlated with other construct variables.

Discussion

From the finding of the research, there is a positive and significantly correlated between the attitude of a faculty member, efficiency of subject matters and teaching methodology, difficulty in subject matters, application of Mathematics, and existing exam patterns with each other's. Langoban (2020) concluded that mathematics became difficult due to the students themselves, teachers, and the environment that limits their interaction. This study found similar results students did not always understand mathematics and they were not interested to learn mathematics. Therefore, learning activities of mathematics were significantly impacted by learners themselves, faculty members, and the learning environment. However, they knew that mathematics is relevant to further studies, prefer their friends to study mathematics, and were interested also to learn mathematics. Acharya (2017) revealed that learners, educators, and parents have to impact a significant role in the improvement of the pass rate of learners. It provides a similar result. This study also found that most educators of mathematics did not provide positive feedback to their individual learner's weaknesses for their improvement. Most of them had insufficient knowledge to understand their learner's problems and provide good suggestions. Therefore, the pass percentage in mathematics is less than in other subjects.

The learners enrollment at university level in mathematics in Nepal have been decreasing nowadays. Moreover, Chand et al. (2021) revealed that learners had no positive attitude toward mathematics due to the unscientific curriculum, and inefficiency of educators at the mathematics of primary level, and this largely contributed to reducing interest in mathematics among students. This study found mixed results, educators were well-qualified and trained but they had insufficient knowledge to use technology in teaching and learning activities in mathematics. Also, they were unknown to connect mathematics ideas and skills to their real lives. Gupta

(2019) argued that mathematics was an essential application in diverse fields of real life also advanced applied fields. The finding of this study got a similar result to impact the remarkable role to develop the learner's creative, imaginative, problem-solving, logical skills and constructive knowledge of mathematics. The computing of numerical skills is supported to achieve the high score in other disciplines also.

Nevertheless, the existing curriculum of mathematics did not focus sufficiently to job oriented, behavioral, and life oriented. Ukobizaba et al. (2021) found that low achievement on tests or exams, educators' harshness, and carelessness are the pivot point to hate mathematics by learners. This study gave a similar result, the response of most respondents supported that the pass-out rate in mathematics examinations at higher levels was lower than in other subjects, and the question pattern of mathematics was more difficult than in another subject. Then, most learners dislike mathematics. The most educated person said that learners did not enjoy mathematics exams but this study found that learners enjoyed mathematics exams. Effective regular evaluations such as internal assessments, tests, and retests with feedback, fieldwork, project work, and presentation were not rigorously applied for these reasons that most learners achieved poor grades in the exam.

Conclusion

Students' perception of declining student enrollment in the university in Mathematics in Nepal is due to the difficulty in subject matters, attitude of faculty members, efficiency in subject matters and teaching methods, applications of mathematics, and existing exam patterns. Reducing the learner's enrollment to a higher level is a significantly positive impact on the difficulty in subject matters, the attitude of educators, efficiency in related subject matters and teaching ways, uses of mathematics, and way of evaluation systems. The study concluded that most learners positively believe that mathematics was relevant to further studies it supported to development of the creative, imaginative, logical, and constructive skills of learners.

The fact-finding of this study revealed that learners felt that they had a problem understanding mathematics always, mathematics educators did not support the weakness of learner's problem properly, most teachers were unable to use technology in teaching-learning activities of mathematics, insufficient skill to connect mathematics knowledge into learner's real lives. Respondents indicated that the curriculum of mathematics contents is fewer jobs oriented and real-life-oriented. However, People need different types of mathematics knowledge to apply to their personal, daily, and professional life. Some of the learners have insufficient knowledge about the basic concept of mathematics and they do minor mistakes in writing. Learners feel enjoy mathematics exams however they know low pass-out rates and difficult question patterns than other equivalent exams.

Thus, the faculty members of mathematics should support every problem of the student and take care of their weaknesses in mathematics by providing positive feedback and good suggestion. And they should be updated to use technology and connect the subject matters of mathematics to real life. Also, existing exam patterns should be updated to increase the pass-out rate and decrease the difficulty level of questions in exams. Thus concerned organizations should organize different types of workshops in the applied field of Mathematics frequently to motivate the new generation of students towards mathematics and establish a significant role in society. Also, new learners at a higher level should be guided and motivated to enroll in mathematics.

This study was unknown about the learning environment, economic status of learner's, and family influence. Some educated person told that faculty members of mathematics are not qualified, or trained, and they could not motivate learners towards mathematics but this study found a contradictory view. Further research should be done to validate this result.

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