Determining an Index for Application of Basic Mathematics in Real Life Scenarios for Arts Students in Higher Education

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Abstract:

For arts students on higher educational institutes, mathematics has always been a subject which has failed to generate interest amongst the students. For they are always struggling with calculus, probability and the like while the teacher adopts every conceivable mechanism to address the issues of generating interest amongst the students towards mathematics. This paper is thus an attempt to determine an index which is based on the key concepts which the students learn at higher education. In particular, this paper, address the theatrical concepts of the mathematics as being taught in the class and links these concepts with the practical aspects of day to day lives. Thus, by linking the concepts with practical scenarios and awareness is generated which will provide the impetus to the students to take up mathematics as a challenge. In other words, mathematics becomes a fun to learn and apply. The design of the paper follows a structured approach. It starts with the literature review and tries to link the subject of mathematics with the importance it has for the arts students in higher educational institutes. The paper then moves to the process of allocating the weights to the various parameters and the ratings to the framework. Finally, it arrives at the index which will be depict the degree of the learning which the student has been able to link with the real world. Appropriates reference have been accounted for while developing the paper

Key Words: *Calculus, Index, Mathematics, Student*

Introduction

India, as of today, is undergoing revolution. It is in the process of being transformed into a country which hitherto had the potential to become a super power but somehow or the other, its latent strength just failed to click due to myriad reasons namely bureaucracy and lack of political will power. With the dynamic and charismatic Prime Minister, leading the transformation process and ensuring the potential which even the world had acknowledged, is now visible to the world and in the process our country has now started to walk onto the path of becoming super power.

For example, today in our country, we are now bombarded with the words, Skill India, Cashless economy, Digitalization, Bullet train and the most efficacious word *Demonetization*. All these words are the harbinger of the processes for change.

But whatever, be the scenario of today and the state of the county tomorrow that whether the rate of the progress, the rate of the transformation process will scale to new height one word that is invariably linked with these changes is mathematics. For without mathematics, the transformation process cannot be measured and consequently cannot be managed. And if it cannot be managed then all these initiatives will be transient and the country will limp back to normal.

Mathematics, it said to be the science which deals with numbers. And, since it is science it is applied in all the various fields such as digitalization, graphical art and designing and it is widely used in computer science. In other words, it is equally applicable to non-scientific fields also such as psychology, commerce and accounting.

This paper is thus an attempt to determine an index for application of basic mathematics in real life scenario for arts students in higher education.

Literature Review

From various studies, conducted from time to time, it has been established that students of arts do not fare well in the subjects where mathematics is directly or indirectly applied. Recent studies have emphasized the positive impact of arts integration in the classroom. As Mason et al. (2005) contends on his study based on the of the impact of arts education on social, cognitive, and academic skills, "the more math teachers integrate arts into mathematic lessons, the more students gain on their math tests" (p.4). The same thought has been expressed by Kosky and Curits (2008), Gullat (2008), and Werner (2001) there is a positive relationship between arts integration and academic achievement and participation. In other words, students who are taught through arts integration tend to be more actively involved in the process of learning and tend to score higher on various levels of assessment.

According to Baird, Dakota (2015) mathematics education has now come to the forefront of education which requires specific action to improve the student's mathematical accuracy and understanding. Also as per the suggestion of multiple intelligences theory there are many different ways of knowing, and the arts present a way to tap into these ways of understanding and learning information (O'Donnell, 2008, p. 117). (O'Donnell, 2008, p. 117).

Design of the paper

The design of the paper follows a structured approach. It starts with the process of identifying the areas wherein the mathematical concepts which are taught at the higher educational level are taken into consideration. Once these are identified then the weightages are assigned based on the criterion in the context of the relevance in the real life scenario. These weightages are arbitrary and can be modified accordingly. The teacher gives the rating and the final score is obtained. The final score is then interpreted for possible course of actions.

Identifying the core mathematical concepts which are taught at higher education level

The following core mathematical concepts are identified. These are depicted in table 1 below.

S. No.	Mathematical Concept identified	Reasons for including this concept in context of real life scenario
1.	Concepts of Probability	Probability is widely used in situations wherein the question of choice or predictions come into picture for example will it rain today (50% chance as the answer is Yes or No or most likely it will rain again probability) Will I be selected as a team member from 3 students (1/3 of a chance)
2.	Concept of Differential Calculus	It is widely used in situations where we are involved in the process of making decisions about the rate of change of one variable with respect to other variable based on some relationship. For example, the height of the steps is gradually increasing by an amount of 1% as compared to the previous step.
3.	Concept of relations, mappings and functions	This is used and applied everywhere. For example, if the rate of a particular vegetable is Rs. 10/- per kg. how many kgs. Can be bought if I have Rs. 155/-

Thus, having obtained the mathematical concepts, which are taught to arts students in the higher education classes; let us draft the criterion for the allocation of the weightages to the above.

In particular, the following is the criterion for assignment of weights along with the reasons as to why these parameters have been given the weight ages

- Highest weightage is to be given to the process of allocation of setting the objective. For, this is the most important stage. In a nutshell the process of setting the objective is the recognition of the fact that the student is able to determine exactly as to what is he looking for that is what part of the mathematical concept will be applied once the objective is clear
- Once the objective is set, then the next step is the determination of the appropriate mathematical concept which can be applied and which is based on the context in question. This is the next process of the weightage
- In case if there are multiple mathematical concepts to be applied then the weightages are assigned in hierarchy

Thus with this criterion, let us take a real life example which will apply these skills

Exhibit: Out of a class of 10 students, the teacher announces tomorrow the class is going to the picnic and the duration of the picnic would be 5 hours but the venue is a secret. The only condition is that the students are required to do some homework. The homework is identifying the mathematical concepts which you will use during the picnic and which you have studied

The application of the weightages will proceed in this manner as depicted in table 2 below

S. No.	Parameter	Weightage (*These weightages are temporary. But they can be changed as per the context*)
	Objective setting (*this could includeany one of the following*) Why the homework and that too with condition and sole focus on mathematics and that too what we ae studying right now? There is some hidden message behind this picnic stuff? Need to think about the maths topic being taught right now in this semester Why did the teacher stressed on the need to focus on maths and that too in picnic? What am I supposed to look for in maths books after all it is boring stuff? But if it is a condition for going to picnic, I must do something about it	70%
	Once the objective is set then the next process is the determination of the mathematical concept which can be applied in this scenario. Examples include Probability- Will the picnic actually take place Calculus: What will happen if the duration of the picnic 5 hours 10 minutes? 5 hours 12 minutes? 5 hours 13 minutes? Relations and mappings: What will the charges for parking services? Will it be flat Rs. 10 for every hour or beyond 2 hours it will increment by Rs. 1 per 15 minutes and so on	15% 7.5% 7.5%

Note: We may add more weightages according to the scenarios and the like

Thus, with the above things in place, let us now take onto the discussion of a template which would be actually applying the above process. Table 3 below depicts the template in detail

Table 3: Depiction of applied template for determining the index

Sr. No	Target Parameter	Assigned Weights	Visible or demonstrative indicators	Rating (out of 10)	Total
1.	Objective setting	70%	The student has at least pondered over the question as to why mathematics What in maths I have studied is likely to surface here in the picnic The teacher always links maths to common example, this time too I will learn something interesting in the picnic	6	4.2
2.	Mathematical subject objective setting				
	Probability	7.5%	In all probability, Suresh will not come to picnic as he dislikes mathematics.	3	0.23
	Differential Calculus	7.5%	The price of parking ticket is Rs. 20/- for 1 hours. Beyond one hour it will increase by 10% for every fifteen minutes	5	0.34
	Relations, Mappings and functions	7.5%	The price of cold drinks is Rs. 30/- per students. What will be the cost for 10 students	7	0.53
	Statistics	7.5%	The average duration for the picnic is 5 hours, so max range can be around 6 hours or so i.e. variance is being applied The number of students opting for cheese burger is 3, for onion burger is 4 and the rest are for tomato burger i.e. classification	8	0.6

Note: There can be numerous demonstrable indicators.

Cumulative rating = 7.5%*8+7.5%*7+7.5%*5+7.5%*3+70%*6

= 5.925

≈ 5.9

Hence Index value if 5.9

Interpretation of index

Having constructed the framework and after having arrived at a number which denotes theapplication of the mathematical principles in real life scenarios, let us now interpret the index

- The value of 5.9 indicates that the measures for linking the theoretical perspective of mathematics which is being taught in the higher education sector are actually being liked by the students and that when this is integrated with day to day activities it can go a long way in developing an interest amongst the arts students
- The value of 5.9 also demonstrates the fact that overall the effort imparted by the teacher is good but that it can be increased by conducting more activities wherein the theoretical portion of maths is linked with application based in real life situations

Future Recommendations

The value can be interpreted as under

- This number can be utilized as a benchmark which will depict that this value can be increased and the complexity of the situation can be made more difficult
- The low scoring parameter can be given more attention to ensure that this is areas of concern requires more attention from all the concerned
- This value can be used to compare other students in the class so as to draft a common system across the various groups of the students

Conclusion

The framework developed in this paper provides a means and mechanism to determine the degree and depth of the innovative measures that can be implemented to make the students aware of the theoretical concepts of mathematics being applied in real life situations. Topics which the students find it boring will therefore become interesting and hence maths will be fun to teach for the teachers and fun to learn for the students.

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