
An Evaluative Study to the Practical Approach of Teaching Integral Calculus to Undergraduate Students

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Abstract

In today's business world it is the data which is widely sought after. However, of late there has been a tremendous concern over the data integrity problems and the fact that the base of the data integrity is the integral calculus which deals with the process of ensuring linkages among the real world artefacts which are linked together by means of a mathematical equation. This paper is designed to provide an evaluative study pertaining to the adoption of practical approach of teaching integral calculus to undergraduate students so that they are well exposed to the nuances of interlinked data. The design of the paper follows a structured approach. It starts with the introduction wherein the importance of data is presented to the reader. It then gradually moves into the design of the paper covering the aspects such assumptions used in the paper, basic terminologies and the like. The paper is developed on the basis of the experience of the authors who have taught mathematics and statistics at the under graduate stream of students.

Key words: *Data, data integrity, integral calculus, practical approach*

Introduction

The business world of today is significantly dependent on *information* which is nothing but processed data. In fact, the survival of business is highly *pivoted* on the quality of the data which must be capable of generating the requisite information so as to assist the executive management in taking *informed* decisions. In the absence of this core function of processing the data and generating the requisite information, business units due to hyper competition, struggle to survive and sustain in the market. It is in these scenarios they are required to perform critical analysis of their processes and work out action plan to sustain the market. The analysis is nothing but data processing (Thomas, Jerry, 2003).

Further, in order to ensure that data generates the necessary information for the purpose of taking crucial decisions, it needs to be integrated meaning that needs to be linked from several distinct sources. Thus, it is not only the data which is of prime importance but the integration of the data which assumes significance in the real business world. In order to ensure that the data leads the business executives to stage wherein they can take decisions, statistics and mathematics are widely applied. For, these specific subjects operate on the data and generate several insights which otherwise are impossible to visualize. For example, the statistical techniques pertaining to the generation of bar graphs, pie charts and trend lines provide visibility to the business processes or any other aspect of the business for which the data already exists or has been collected. On the other hand, the financial projections, the risks analysis and the impact of the functioning of the non-performing assets widely use mathematical techniques to ensure that corrective and preventive actions can be taken in a timely manner. But, all this requires the data to be integrated and mathematical techniques of integral calculus are widely applied in practical scenario.

It is in this context that this paper is developed to evaluate the practical approach of teaching integral calculus to undergraduate students.

Rationale for choosing the topic

The following are the reasons which necessitated the need to choose the topic of the paper.

- i. Ubiquities data. This is the prime reason as to why this topic was chosen. The data is present everywhere. In fact, every area of our life requires data in some form or the other. For example, we are carrying out net banking we are generating or using data. we go to market, we generate data. It is everywhere
- ii. Integrity of data. This is the main reason as to why this topic was chosen. Though the data is available in plenty it is not integrated. This lack of integrity poses several problems in day to day operations and practically all of us are victims of this non integration of data. For example, while embarking on a train journey, several websites show different status of the train in which are required to travel. While some of the websites show that the train is delayed by 10 minutes others show that the train is delayed by more than an hour. In a similar manner, most of us encountered the familiar scene when we had called up customer care centre of our cell provider regarding resolution to the problem which are facing or have faced. We are greeted, in most humble and pleasant voice, “*yes what can I do for you... please hold on while we transfer the call... your fault would be resolved in 2 days... within an hour or so*” and so on. The basic issue remains the same. There is no consistency about the nature of the answer, the customer care executives do not know as to who and how will the problem be solved and the like. In other words, data integration
- iii. The importance of Integral calculus and how it can be applied in practical scenario. In other words, bridging the gap between theory and practical component of mathematics and statistics

Basic terminologies

In order to develop the paper, the basic terminologies needs to be put into place. The following are terms which are widely used in this paper

- i. Data. it the raw facts and figures which do fail to carry any meaning on their own unless they are processes.
- ii. Information. It is the processed data. In other words, some data already exists and something is performed on the data so as to generate information. for example drawing the graph of the data that is available
- iii. Quantitative data. The data which is in the form of numbers. For example, marks obtained by the student
- iv. Qualitative data. The data which is non numeric. Examples include, Name, Cell phone number, Gender and the like
- v. Nominal data. Data which is used for indicative purpose. For example, the number on the jersey of the soccer players
- vi. Ordinal data. Data which is used for ranking of the items. For example, ranking the artefacts pertaining to the food quality in a restaurant such as ambience, quality of service and the like
- vii. Dichotomous data. Data which takes only one of the two inputs. For example, Yes or No, True of false

Objective of the paper

This paper is designed to address the following objectives

- i) To highlight the importance of data integration in today’s business world
- ii) To generate the importance of statistics and mathematics pertaining to the data generated due to several business processes
- iii) To adopt a practical approach in the evaluation of teaching of integral calculus to undergraduate students

Scope of the paper

The scope of the paper is limited to the following

- i) The target sample comprised of the students of the undergraduate stream who are currently pursuing their undergraduate program
- ii) The students are studying mathematics either as a core subject or as an elective subject
- iii) The students are familiar with the basic steps involved in the process of using the mathematical relations, mappings and functions and apply them in the process of arriving at the derivatives as well as performing the basic process of integral calculus
- iv) The students are familiar with algebraic equations
- v) The respondents to the questionnaire are the students from the NCR regions comprising of institutions imparting management as well as technical undergraduate courses

Assumptions used while developing the paper

The following assumptions were used in the development of the paper

- i) The students covered under the scope of the paper have studied mathematics and statistics in their secondary classes
- ii) The students are familiar with the basic theoretical concepts of differential and integral calculus
- iii) The students are familiar with the theoretical concepts of relations, mappings and functions and linear relationships among the associated variables

Research methodology

The following research methodology was adopted

- a. The first step was the formulation of the research topic. The research topic was taken care off on account of the several data integration problems which the students face in day to day operations
- b. Once the topic was frozen the next phase involved the process of defining the objective of the paper. The objective of the paper was formulated by keeping in mind the requirements of day to day operations
- c. Once the objective was formulated the next step involved the process of formulating the scope of the paper. the scope of the paper was developed by keeping in mind the issues and challenges which the students faced while applying the basic concepts of calculus in day to day operations
- d. Once the scope was formulated the next step was the research design process. This process included the formulation of the questionnaire for the purpose of data collection. The questionnaire comprised of two parts. The first part was designed to capture the demographic details of the respondents while the other part of the questionnaire to meet the research objectives
- e. Initially the sample size the target sample size was 100 but due to practical limitations it was reduced to 67. The practical limitations included the incomplete questionnaire, non serious of the students due to exam time and the other aspects.
- f. Once the data was collected, it was subjected to treatment and the findings were analysed by using MS Excel software
- g. The findings culminated into recommendations and future scope

Findings & interpretations

Table 1 below depicts the demographic details of the respondents.

Dimensions	Number of respondents
Age group	
) Below 20 years	12
) Between 20 and 22 years	40
) Above 22 years	15
Stream	
) Science	28
) Commerce	20
) Arts	15
) Others	4
Family background	
) Service	32
) Family Business	12
) Others	23

Table 1: Depiction of demographic information of the respondents

Interpretation of the demographic findings

The demographic findings indicate that the majority of the students are from the service background to the tune of 47% while those from the family business background are to the tune of 17%. On the other hand the majority of the age group which form the core of the sample survey included 59% which is significant considering the number of respondents. Also the majority of the students are from science stream followed by commerce stream.

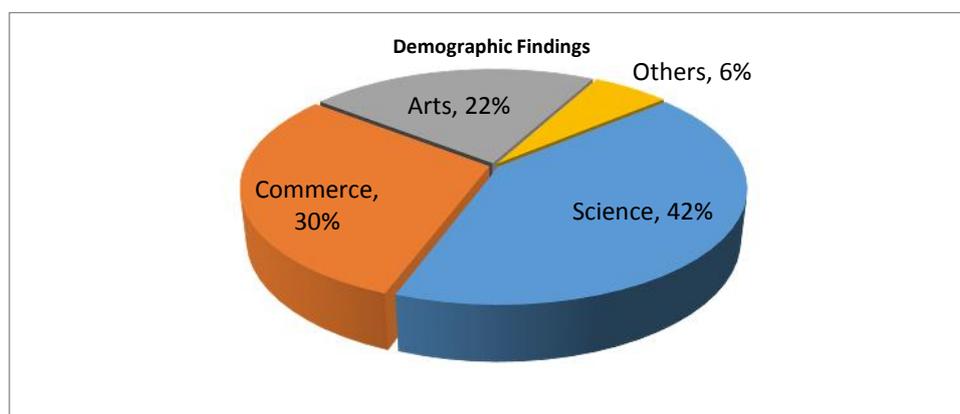


Figure 1: Depiction of demographic distribution of the respondents

Findings pertaining to the responses of provided by the respondents

Table 2 below depicts the count of the respondents pertaining to the questionnaire

Sr. No.	Question	Response	Count
1.	Are you aware that you are surrounded by data in various forms and flavour in day to day operations	Yes	40
		No	10
		Don't Know	17
2.	Are you aware of the terms data analytics, data integration and the like	Yes	20
		No	32
		Don't Know	15
3.	Are you aware of the importance of statistics and mathematics in the process of dealing with various forms of data	Yes	7
		No	33
		Don't Know	27
4.	Do you regularly face data integrity problems in day to day operations	Yes	53
		No	02
		Don't Know	12
5.	Do you think that integral and differential calculus should be taught to under graduate students by taking consideration practical examples	Yes	3
		No	4
		Don't Know	60
6.	Do you think that the evaluation of mathematical subjects should be done by giving practical examples rather than by giving theoretical approach	Yes	48
		No	12
		Don't Know	07
7.	In your opinion it the integration calculus which is now a days driving the business rather than other mathematical topics	Yes	20
		No	33
		Don't Know	14
8.	In your opinion there should be equal focus on the practical approach towards statistics and integral calculus	Yes	58
		No	02
		Don't Know	07

Findings and recommendations of the study

The findings of the analysis indicate that there is an implied need to adopt practical approach to the process of teaching mathematics and statistics so as to ensure that the students are able to link the basic concepts of the two streams which are widely used in the process of data integration. This is indicated by the 86% of the respondents. On the other hand the number of respondents who are unaware with respect to the process of linking with the practical scenario is to the tune of 10%. Probably these respondents are disinterested in the mathematics and statistics or they may lack the necessary aptitude to the study these courses.

On the other hand, there number of respondents who are of the opinion that integral calculus is not the core driver of the business world of today is to the tune of 67%. This is probably due to the fact that these respondents need to link the practical aspects. In other words, they are devoid of the exposure to the requirements of calculus in the real world. Contrary to the fact that the majority of the students wants exposure to the real applications. This is indicated by 71% of the respondents.

Further the analysis reveal that 79% of the respondents do face the data integrity problems and the reasons or probably the awareness is missing.

Recommendations

The findings do indicate that there is an urgent need to integrate the basic concepts of integral calculus with the real life applications

Limitations of the study

The timing of the study and the adequacy of the sample size posed the limitations of the study. This can be removed by adopting a pro-proactive approach.

Conclusion

Form the findings it evident that practical approach is required to be adopted so as to drive home the applications of the mathematical operations.

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