International Journal of Applied Mathematics

Volume 38 No. 4s, 2025

ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

TEACHING BUSINESS STATISTICS TO MULTIDISCIPLINARY LAW STUDENTS USING CONSTRUCTIVISM APPROACH

[1]Dr. M Rajanikanth, [2]Dr Y Kishore Kumar, [3]Srujana Vanga

[1]Assistant Professor

Department of Marketing, Symbiosis Centre for Management Studies, Hyderabad

Symbiosis International (Deemed University), Pune

Email: rajanikanthreddym@gmail.com

[2]Assistant Professor

Department of Marketing, Symbiosis Law School, Hyderabad

Symbiosis International (Deemed University), Pune

Email: kishorekumar.yathamsetty@slsh.edu.in

[3]Freelance Lecturer and Administrative Officer,

Tergum Solutions, Hyderabad

Email: vsrujana26@gmail.com

Abstract

Aim/Purpose: The aim of this research is to study the performances of the inter-disciplinary law students in Business Statistics course and investigate the student's academic performance and attitudes towards the course when taught using constructivist approaches and traditional class room approach.

Background: Multidisciplinary progarmmes are offered to undergraduate students across various universities. Business statistics is one of such course offered to BBA LLB, which is a multidisciplinary course, students as part of their curriculum by these universities. The students who join in such course have some inhibitions and anxiety to learn Business Statistics. This study has tested whether constructivism approach is better than traditional classroom approach to make these multidisciplinary Law students understand Business Statistics.

Methodology: The class size was 120 for each batch (Thos who are studying Business statistics in 2021-22 academic year and 2022-23 academic year) and a random sample of 32, 16 from each batch has been chosen for administering STAS questionnaire to test their attitudes towards the statistics course. To study the performance of the student all the 120 students of each batch was considered.

Received: August 7, 2025

International Journal of Applied Mathematics

Volume 38 No. 4s, 2025

ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

Contribution To consider the changes in teaching methodology to teach business statistics for multidisciplinary law students.

Findings

The study found that those students who received the instructions through constructivist approach have a high mean score in terms of their attitude and marks received compared to those who received instructions through traditional class room method.

Recommendations for Practitioners To make necessary changes in the teaching methodologies while teaching multidisciplinary students.

Recommendation for Researchers To look for more creative and innovative teaching methodologies that suits to the students' requirements

Key words*: Constructivism, Undergraduate students, Multi-disciplinary, Pedagogy, Statistics*

Teaching Business Statistics to Multidisciplinary Law Students using Constructivism Approach

1. Introduction

Many students have a high level of anxiety about statistics; usually, college students dislike and avoid statistics, given its association with numbers (Slootmaeckers et al., 2014). They demonstrate negative responses like fear, confusion, tough-to-crack mindset, etc., while studying statistics. (Prayoga & Abraham, 2017). Students display phobia or anxiety towards the course of statistics as they feel that statistics are based on Mathematics (Gal & Ginsburg, 1994; Garfield, 1995; Verhoeven, 2006; Cue et al., 2019), and this would affect their grades negatively (von Rotten & de Rotten, 2023). Many students carry the same negative attitude toward statistics throughout their lives (Tishkovskaya & Lancaster, 2012). Many studies were conducted to investigate the causes of anxiety and concluded that this anxiety is a multidimensional construct, but still, much about it is not known. (Onwuegbuzie & Wilson 2003). Thus, every student who is studying statistics experiences some difficulties in the initial days of learning to understand the topics.

Since Statistics is one of the important quantitative subjects at the university level (Watson, 1997), teaching it is challenging given the negative experiences students have with quantitative subjects; individual differences in their abilities add to the negativity, and thus, anxiety is created during the achievements (Tremblay et al., 2000). The student's anxiety can be reduced if real-life situations are applied while teaching statistics (Yager & Wilson, 1986; Schacht & Stewart, 1992). They learn better if these things help them to evaluate the difference between their beliefs and the empirical results they are getting. Studies have found that relating statistical concepts to real-life situations yields better results (Mvududu & Kanyongo, 2011). Past studies demonstrated that students' grades are higher when they work in small cooperative groups. Students learning is better when they have the experience of applying ideas in different situations. If students are permitted to do things in different contexts, repeating the same can enhance their critical thinking, information analysis, communication, capacity to generate

Received: August 7, 2025

International Journal of Applied Mathematics
Volume 38 No. 4s, 2025
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

different arguments, and tackle novel situations (Garfield & Ben-Zvi, 2007).

Given the above, it is imperative that teaching the course is central to learning because the objective of statistics education is not merely imparting computational skills but to develop problem-solving and analytical skills (Moore, 1998). Traditional lecture-based methods do not serve the purpose of teaching statistics, and teachers and learners need to modify their roles to be up-to-date and serve the societal purpose.

Teachers need to create an atmosphere where students can explore, hypothesize, and brainstorm so that they can see the use and impact of statistical knowledge in understanding the environment in which they live and also learn and develop sufficient competence to understand and draw proper meaning from the statistical arguments. This effort makes them motivated towards statistics (Tishkovskaya & Lancaster, 2010). Anxiety can be reduced in a structured learning environment through different assignments to reinforce the learned concepts (Pan & Tang, 2004; 2005).

The research in teaching and learning statistics articulated various learning principles that offer a framework that can be used in a wide variety of courses. To learn statistics in the context of 'Constructivism' theory, a theory wherein individuals make sense of the information that they perceive and construct their meaning from the obtained information, ten general principles were proposed by Garfield (1995) (Bada & Olusegun, 2015). In this context

The implications of Constructivism are enormous. For instance, the basic principle of Constructivism influences the organization of the classroom, teaching and learning methodologies, and curricula in schools and colleges. The teachers following Constructivism encourage students to continuously assess how these activities help them gain knowledge. Student-centered learning (SCL) has been adopted in many courses, including problematic subjects like Mathematics and Statistics (Hendry et al., 1999; Zain et al., 2012; Freeman et al., 2013).

The present study narrates the author's experience of teaching Statistics to Law students (BBA LLB) in a reputed Law School in India, using Constructivism in an integrated undergraduate course that is multidisciplinary in nature. Business Statistics is one such multidisciplinary course offered to BBA LLB students. The paper discusses the various tools and techniques used by the faculty member to teach statistics and the results obtained compared to regular classroom teaching.

1.1 Need for the Study: At the outset, statistics are being used in various social science disciplines, including Law; the integration of social sciences has created a platform for statistics in multidisciplinary programs (Dow, 2004). "The ability to interpret, evaluate, and communicate about statistics information and messages" is a minimum requirement these days (von Rotten & de Rotten, 2023).

Lawyers in the present day need to grapple with arguments that are framed in quantitative terms, and they have to evaluate and present quantitative data, especially when dealing with

Received: August 7, 2025

Volume 38 No. 4s, 2025
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

straddling issues beyond Law (Jackson, 2003). They need to equip themselves with statistical concepts such as measures of central tendency, correlation, regression, probability, expected values, risk aversion, etc. Learning statistics and bringing quantitative information to the courtrooms can become a competitive advantage for lawyers.

With a basic knowledge of statistics, it is easier for law students to fully grasp some fields, such as employment discrimination, product liability, and many parts of torts and evidence. Law enforcement officers are required to target specific individuals for extra scrutiny. There are many instances where legal professionals need to check the constitutionality of the profiles used by law enforcement authorities to target specific individuals for additional scrutiny. Furthermore, in many cases, evidence needs to be demonstrated by the government or the defense attorney to check the accuracy of such profiles. In such cases, statistics can help the Lawyers to perform their tasks effectively.

1.2 Background to the study:

The discipline of Law began to offer five-year integrated courses like BA LLB and BBA LLB to combine the knowledge and applications of two disciplines to endow Law students with complete knowledge of Law and other related disciplines to meet societal and professional demands. A diverse set of students (different educational backgrounds) opt for this integrated program. It is a multidisciplinary programme, and the knowledge drawn from different disciplines (Parti K & Szigeti. A, 2021) has to be taught to the student. At this juncture, teaching two different disciplines is always a challenge. Statistics is one such course included in the Law curriculum.

From past studies, it is believed that the concepts of statistics are very difficult for students from other disciplines to learn (Garfield, 1995; Garfield & Ben-Zvi, 2007). The present study also accounts for students from different educational backgrounds and with different attitudes and beliefs about statistics courses.

In this regard, Constructivism, as a method to make the students construct their own knowledge, was adopted to teach Statistics at the law school. As Constructivist approaches values the contributions of the students and enhance their ability to apply the learned concepts in real world (AlAfnan, M. A., & Dishari, S., 2024). Though there is no specific strategy that can be used to teach through Constructivism, any strategy that supports the student to construct knowledge can be used. (Miller, 2002).

1.3 Review of Literature - Constructivism

As the 21st century needs critical thinking, collaboration, creativity, and communication are important parts of learning skills, new strategies to teach interdisciplinary and multidisciplinary courses are emerging (Glancy & Moore, 2013). The teachers are becoming facilitators in the new learning environments. (Kara M, 2018). Students are to be given opportunities to observe and understand the complications of real-life situations to understand the subjects (Kamphorst, 2018).

Received: August 7, 2025

International Journal of Applied Mathematics
Volume 38 No. 4s, 2025
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

Constructivism is a type of pedagogy that creates learning opportunities for students by giving meaning to what they observe in the environment. Constructivism is a learning theory that believes that learning is an active process, and learners construct their own knowledge from observing, experiencing, and interpreting the environment. (Christie 2005). It emphasizes the importance of an individual's knowledge, beliefs, and skills that an individual brings to the process of learning (Garbett, 2011; Bada & Olusegun, 2015).

In Constructivism, the environment in which the learner learns plays a key role (Cornu & Peters, 2005). It focuses on the learner's interaction with the environment, individually or in a group (Packer & Goicoechea, 2000). Students constructing their own knowledge is central to Constructivism, and it is done when students actively participate in the tasks of learning (Kirschner et al., 2006). Constructivism helps learners acquire information through social interactions and transforms them by providing constant opportunities. (Akar and Yildrum, 2005).

The core idea of Constructivism is that knowledge is constructed by students' active participation (Prawat & Floden, 1994). The student's learning process is closely associated with peers, teachers, and other human beings around them (Hein, 1991). In the process of learning, knowledge is not directly transmitted from the teacher to the student, but students can generate information through different learning activities, and Constructivism holds this as the core belief (Biggs, 1999). Students fit the new information with the existing information that they already have (Bada & Olusegun, 2015). While learning statistics, to achieve the cognitive and non-cognitive goals of the student, the classroom environment is crucial (Mvududu, 2003). Constructivism is a framework for thinking about the student's learning in a given environment and how others mediate in this learning process (Tobin, 2000). Constructivism provides an opportunity for the self-development of teachers (Le Cornu & Peters, 2009; Kara, 2018), along with giving a wide scope of learning experiences for the learners (Marlow & McLain, 2011; Rahmat et al. 2022). In this regard, Constructivism was adopted to teach Statistics courses at the law school as a method to make the students construct their own knowledge. The methodology was suggested by and implemented under the guidance of the head of the department.

1.4 Statement of the Problem

Given that the students in the Law college come from different educational backgrounds with different attitudes towards Statistics, Constructivism is used as a strategy to help students construct their own knowledge to keep them motivated to learn and imbibe statistics in a Law school. The problem is based on Harvey et al., 1985 (Gal & Ginsburg, 1994) finding that creating a supportive environment can help achievement in statistics irrespective of the student’s attitude towards statistics.

1.5 Research Question

1. What strategy is followed to include Constructivism to teach Statistics to Law students?
2. Does the constructivism strategy prove to be better than traditional classroom methods?

Received: August 7, 2025

International Journal of Applied Mathematics
Volume 38 No. 4s, 2025
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

2. Significance of the Study and Methodology

The paper provides a starting point in learning and teaching approaches so as to align with the development of critical analytical thinking among students and equip students to become quantitatively enriched. It is based on the efforts made and experiences of the faculty members (the authors) while teaching two different batches based on two different approaches. The study calls for a radical transformation of the learning space and the teaching space to meet the challenges in statistics for law students.

The study is conducted in a reputed Law school in India for the BBA LLB programme only. Two years of students were considered for the study. The first batch who studied the course in 2021- 22 received statistics education through regular classroom lectures. The second batch, who studied the course in 2022-23, was taught the course using the constructivism approach. The study compared the internal as well as external marks of the students. There was not much difference in the pattern of external examination, but the first batch received the internal evaluations using regular classroom tests, whereas the second batch took the constructivism approach. The difference in the internal, as well as external scores, was tested at a 0.05 level of significance.

The hypothesis was framed as follows:

Null hypothesis (H_01): There is no difference in the mean scores of the students who receive instructions through constructivism approach and conventional classroom

It was also important to know the impact of Constructivism on the student's attitude towards the course of Statistics. For this, the author used the SATS questionnaire developed by Schau et al (1995) and enhanced by Schau (2003). A significant correlation between the subscales of SATS and the student's achievement in statistical courses was found in the previous studies (Emmioglu & Capa-Aydin, 2012; von Roten & de Roten, 2023). The class size was 120 for each batch. A sample of 16 from each batch, a total of 32, was chosen randomly, and the STAS questionnaire was sent to their emails to test their attitude towards the Statistics course. The 36 items of the questionnaire have six components that talk about the students' affective, cognitive, ability, value, difficulty, interest, and effect. The construct validity of the items was tested through previous studies (Schau et al., 1995; Hilton et al., 1999). The negative statements were transformed into positive ones for analysis purposes, which were used by Ashaari et al. (2011). The questionnaire employs a seven-point Likert scale, where 1=strongly disagree, and 7 = strongly agree. Reliability analysis of the survey instruments has given a Cronbach alpha of 0.901, which is considerably above the required value. The reliability index of the components are Affective (0.881), Cognitive ability (0.727), Value (0.845), Difficulty (0.810), Interest (0.8460, and Effort (0.916) - also high. A mean score was employed to conclude the feedback of the students towards each item in the questionnaire. Assessment of the interpretation of the student's attitude towards the statistics course was classified into three categories. If the mean scores below 3.50 are considered negative, the scores between 3.51 and 4.49 are considered neutral, and 4.50 and above are considered positive scores (Zamalia, 2009; Ashaari et al.,

Received: August 7, 2025

International Journal of Applied Mathematics
Volume 38 No. 4s, 2025
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

2011). The scores were tested at a 0.05 level of significance.

Null hypothesis (H_02): There is no difference between the mean attitude scores of the students who receive instructions through constructivism approach and conventional classroom.

3. Difficulty in using Constructivism

- The teacher of the course (also the author) has a Management degree with a Doctorate in the same; he doesn't have a Law degree. Therefore, creating knowledge scenarios relevant to legal space was a challenge.
- In India, most students enter undergraduate courses as passive learners, and it is very difficult for them to transform into active learners.
- It is very difficult for the student to challenge their existing assumptions (Tan et al., 2006). The students from the present study were not an exception.
- Students were reluctant to collect the data in the initial classes.
- There exist some disparities between the theory and practice of Constructivism due to the complexity of the constructive theory (Kritt & Budwig, 2022)

3.1 Preparation of teaching plan using OBE

The author has prepared a teaching plan using outcome-based education (OBE) principles, based on the syllabus that is pre-defined by the University. Business Statistics for BBA LLB students exists in semester III, and it is a 4-credit course (60 hours of teaching). The students are already exposed to courses like business studies, Principles of Marketing, and financial accounting before reaching the Statistics classroom.

The objective of the OBE is to define clearly what students must be able to do and develop curricula, learning processes, and assessments so as to make sure that these results are achieved. The OBE model facilitates Continuous Quality Improvement (CQI) (Spady, 1994). OBE is a holistic approach to the organization and management of education programmes that focus on and lays down successful demonstration of learning obtained from all learners. According to Bloom (1968), OBE deals with the input as well as the output processes. Spady (1994) proposed three critical areas of outcomes that help to plan curriculum content, namely, (i) Literacy Tools to acquire knowledge, skills, and attitudes needed to develop other competencies, (ii) Content, and (iii) Performance. Ultimate outcomes of performance A program objective, course objectives, and learning outcomes shall be included in the teaching plan.

The evaluation was done in two different components. The external evaluation was for 60% of the total marks and the internal evaluation was for 40% of the marks. The internal evaluation was divided into three different components.

1. Written test for 25% of the internal component
2. Assignment for 25% of the internal component and
3. Research project for 50% of the internal component.

Received: August 7, 2025

International Journal of Applied Mathematics
Volume 38 No. 4s, 2025
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

3.2 Teaching Environment

The students, though pursuing a BBA LLB course, the mindset of the students was that they were lawyers rather than business managers. There were two divisions, with approximately 70 students in each division, and each division had three lectures on Business Statistics per week. Each lecture session was 50 minutes (excluding class attendance) and the learning environment included Lecture halls, Computer labs, campus, nearby villages, etc. The instructor taught the introductory business statistics to two different batches. The first batch was taught the course using the traditional classroom teaching method. The students were given homework on a daily basis and were asked to submit the same on a subsequent day. The students were allowed to clarify doubts about the textbook and other reference books. For the second batch, only the concepts were explained, and the students were given prior tasks to collect the data, analyze the data, and present the data for discussion.

The mode of examination and evaluation for the internal assessment was altogether different, whereas the final assessment was the same. The difference in the marks obtained in internal as well as external examinations was used to find the difference between the conventional classroom method and the constructivism approach.

4. *Teaching through Constructivism*

The students need to be familiar with the way the statisticians thought, with a certain degree of skepticism, about the data sources, data collection methods, how the data has been distributed, and the variations in the data. There required continuous interaction between the teacher and the student. After an initial introduction to the subject of "Business Statistics," the students were asked to collect their own data for the rest of the classes. For this, the faculty member designed some questionnaires to help the students to collect their own data. The questionnaires consisted of some questions on the demographic profiles of the respondents along with employment and economic sources of people. The self-administered questionnaires help the students collect data and encourage active involvement of the students in the course in the introductory classes (Hernandez, 2006). These questionnaires were given to the students, who formed groups of 3-4 students, to collect the primary data from the nearby villages. These groups were made based on the interests and interest level towards the course as suggested by the previous studies to make the groups at the beginning of the course (Meyer, C, 2022). Some of the students were given a questionnaire to collect the reading habits of the Law students, Mobile usage and internet usage, and shopping habits of the Law students. Once the students collected the data, it was used to explain the concepts like editing, tabulation, and graphical representation data.

Microsoft Excel was used to teach these concepts in the classroom. The students uploaded the data into Excel to create cross-tables and graphs. The students were asked to interpret the data using a substantial literature base. This first step created an interest among the students in the statistics and boosted the confidence of the teacher to use Constructivism.

Received: August 7, 2025

International Journal of Applied Mathematics
Volume 38 No. 4s, 2025
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

4.1 Measures of Central Tendency and Dispersion

Measures of central tendency and Measures of Dispersion are called 'Summary Statistics.' They describe the characteristics of the data set in a single number (Levin & Rubin, 2011). Mean, Median and Mode were in the syllabus for the taught course. These concepts were explained using the collected data. For example, the calculation of Mean, Median, and Mode for the income of the respondents using the given formulae and the context where these three concepts were applicable was explained. Measures of dispersion like range, mean deviation, quartile deviation, and standard deviation were also calculated using the collected data. The reasons for the differences between different measures and the purpose of each measure were explained. For example, the age of the respondents, where the range is applicable, and where the standard deviation is used were explained. The related concepts, like the coefficient of variance and combined mean and standard deviation, were explained with the same data.

4.2 Probability

The basic concept of probability was explained using a fair coin, an unfair coin, and a deck of cards. For example, tossing a coin by a student - his assumptions before tossing it, after tossing it a few times, and after tossing so many times made them understand the basic theory of probability. The deck of cards helped to teach the students about statistical dependency and statistical independence. Students were asked to find out the probability of various combinations of cards in the classroom. Rolling the dice also helped the students to understand the concepts of probability. The concepts of probability distribution were introduced to the students with suitable examples, and students were asked to collect the data for the same from the real world. One of the activities included was to collect the data from Confonet (cms.nic.in) and to calculate the probability of disposal of a case based on the previous probabilities of related cases. Here, no data was given by the concerned faculty member; students interested in that area started collecting data and calculating probabilities. This made them not only understand the concept of probability but also the application of it in their legal career. In the other exercise, each student was given the research projects of their seniors, which were already evaluated, to check the spelling and grammar mistakes. The students learned about Poisson distribution concepts from this activity.

Bayes' theorem is one of the most used concepts of statistics for lawyers in their careers (Satake & Amato, 2008). The concept of Bayes' theorem was explained as updating the belief of guilt when new evidence emerges. Satake and Murray's (2014) research paper was taken as the basis for teaching Bayes' theorem. The faculty took the help of another teacher who has been teaching CrPC (Criminal Procedure Code) and Forensic Science and collected some cases of CrPC where the new evidence changed the probability of 'guilty' to the probability of 'nonguilty'.

Student assessment for the above concepts was done through a written test.

Received: August 7, 2025

International Journal of Applied Mathematics
Volume 38 No. 4s, 2025
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

4.3 Correlation and Regression:

The concepts of correlation and regression were initially taught in the classroom. However, the constructive activity was given through an assignment that carried 25% of the total marks. Students were asked to collect the data of their interest from the United Nations website and need to work on that. **(Appendix 1).**

This work helped the students to understand the importance of correlation. Though the data sets had their own limitations, they made the students learn the importance of correlation and regression. After choosing their topics, students collected related literature from the various sources available and framed the importance of studying the relationship between variables. Students analyzed the data using the numbers collected from the prescribed website; students compared their values with the literature available. This activity made them not only understand the concept of correlation but also how to interpret the results based on the obtained results and existing literature.

4.4 Testing the Hypothesis

The concept of testing the hypothesis was introduced after Binomial, Poisson, and Normal distribution. The concept of normal distribution was explained with the help of data collected by a group of students about the height of the students, faculty members, and administrative staff. A normal distribution curve (bell curve) was generated using the data. It became very easy for the students to understand the mean, standard deviation, and the area under the curve of a normal distribution once they observed the curve. The area under one standard deviation, two standard deviations, and three standard deviations were measured by the students. The values were approximately equal to the book values. Once this concept was clear, then the concepts of the level of significance, and confidence interval were explained with the same data using the Normal distribution table. Z-score value calculation and interpretation became easy once the students understood these concepts. The activities given here were more of the student's area of interest. For example, one student who was interested in Family Law was asked to test the hypothesis of whether the Indian average rate of divorce was significantly low when compared to the world average rate of divorce. The students collected data about India and the world and tested at a 0.05 level of significance using a z-test. Though these activities are small and take less time to collect the data and compute, they helped the students understand the applicability of the concept.

The Project, which consists of 50% of the total internal evaluations, was based on testing the hypothesis. **(Appendix 2)**

The students collected data about different companies from the respective company websites, and other internet sources. Students who chose other data sets collected information from various web sources available at the college. The data were analyzed in two stages. In stage one, the students found the correlation between different variables and constructed a regression equation. In the second stage, students tested the stated hypotheses. The results of the statistical tests were compared with the literature at hand to make proper conclusions.

Received: August 7, 2025

International Journal of Applied Mathematics
Volume 38 No. 4s, 2025
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

5. Results and Discussion

The marks of the students were compared to check the impact of teaching methodology. The marks scored by the students were collected and compared once the results were out. The simple mean of the data was considered to compare the results. An independent t-test was used to test the significance of the difference at $\alpha = 0.05$.

Internal Assessment results: The 120 students who received instruction through Constructivism (M = 35.95, SD = 7.594), compared to those 120 students who received instructions through conventional classroom teaching (M = 33.59, SD = 4.959), demonstrated significantly better internal assessment scores, t= 2.987, p = 0.0031. We can reject the null hypothesis based on the results obtained. The result of the statistical analysis shows that there is a significant difference between the scores of the students who received instructions through Constructivism and those students who received instructions through conventional classroom teaching. Though the results support that those students who received instructions through Constructivism performed better compared to those who received instructions through conventional classroom teaching, it was debatable as the mode of the test was different. The head of the department suggested comparing the results of the external assessment, as the mode of the examination for both the batches was the same, i.e., written test.

External assessment results: The results of the external assessment have shown that there is a significant difference in teaching methodology used, t(278) = 2.9688, p = 0.0033, where students who received instructions through Constructivism (M = 49.88, SD = 7.622) scored higher than those who received instructions through conventional classroom teaching (M = 46.83, SD = 9.586). As the difference is statistically significant, we can reject the null hypothesis that the scores of the students who receive instructions through the constructivism approach are not significantly different from the scores of the students who receive instructions through the conventional classroom. As the mean score of marks for the students who received the instructions through Constructivism is higher than the mean score of the marks for the students who received instructions through conventional classroom teaching, we can say that Constructivism is a better way to teach statistics to Law students. However, the effect size for this analysis (d=0.35) was found to exceed Cohen's (1998) convention for a small effect (d=0.2). The results of the test indicate that constructivism effects are not very high on students learning.

The student's attitude towards the statistics course was tested at a 0.05 level of significance. The 2022-23 academic year students who received the instructions through Constructivism (M = 5.585, S.D = 0.652) compared to the 2021-22 academic year students who received the instructions through classroom teaching (M = 4.703, S.D = 0.836) showed a significantly positive attitude towards the Statistics course, t (32) = 3.120, p = 0.0040. Hence, the Null Hypothesis, there is no significant difference between the attitude scores of the students who received instructions through Constructivism and those students who received instructions through conventional classroom teaching, is rejected. At the same time, the effect size for this analysis (d=1.17) was found to exceed Cohen's (1998) convention for a large effect (d=0.80).

Received: August 7, 2025

International Journal of Applied Mathematics
Volume 38 No. 4s, 2025
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

These results conclude that the constructivism approach has positively affected the students' attitude towards Statistics course.

The study has supported past research that suggested using different methods of teaching using assignments would reduce the anxiety among students in studying statistics (Pan, W., & Tang, M. 2004; 2005). The beliefs and attitudes of the student influence the student's ability to learn and apply the concepts of statistics (Freeman et al., 2013). The students' attitudes towards statistics have a significant impact on the interest to learn the course of statistics. Simply allowing the 'transmission of knowledge' to create an environment that encourages students to participate and discuss the concepts of statistics through the data collected by themselves improved their performance in the statistics course. This is in turn, supporting the results of the study conducted by Wilson S. G. Using flipped classroom (Wilson S. G. 2013)

The use of contemporary research works will help the teachers to make their students understand the concepts of statistics. When the students collect the data and analyze and interpret it, they gain the ability to discuss the concepts in the classroom (Hernandez, 2006). This will reduce the negative attitude towards the use of statistics in daily life. It has been observed in the students' attitude. The use of the Internet to collect data about the unemployment rate, customer price indices, and other relevant data was suggested as the data in hand for the students to understand and learn the concepts of statistics (Hernandez, 2006). We used a similar approach so that students collected the data on their own from various published sources and applied the same to learn the concepts of statistics. The emphasis on real data always helps the students (Garfield et al., 2000). use of group projects, use of a combination of assessment methods, and contemporary data in evaluating students' performance are needed for teaching statistics education (Garfield et al., 2000). Involving real-life situations and information and connecting it to statistical techniques to create interest among the students is an effective way to teach statistics to students (Bailey M A, 2019). The real-life situations used by the students to learn some of the concepts of statistics reduced the anxiety among the students (Yager & Wilson, 1986; Schacht & Stewart, 1992), which reflected in the students' attitudes. The past studies conducted by S. Mahesha and Ranu Mandal have found that the effectiveness of the students increased with the constructive approaches at different levels (Suman & Chauhan, 2022), and study conducted by Çibukçiu, B. (2025) has shown that there is a considerable improvement in the students who were taught with constructivists methods compare to traditional methods. The results of this study have supported the same as the student's effectiveness in the course improved.

6. Conclusion and Scope for Further Research

A statistics course is relatively easy, as perceived by many students (Bailey, 2019), but students' assumptions make it difficult for them to learn. An attempt was made to use Constructivism to teach Business Statistics to BBA LLB students. The environment created and methodology used to teach statistics helped the students to understand the subject and its real-life implications, too. The success of this teaching method was analyzed based on the quality of the assignment and the Project submitted by the students. It was also reflected by the students'

Received: August 7, 2025

Volume 38 No. 4s, 2025
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

feedback towards the faculty members, which was considerably high for a Business Statistics teacher in a Law School. The overall students' pass percentage was increased in the external evaluation, too. This paper concludes that making statistics relevant to the student's real-world will encourage them to learn and also reduce anxiety. Though the Constructivism approach to teaching statistics is not new, there was no evidence that it was used to teach statistics to law students. It is suggested to apply Constructivism to teach statistics to students who are pursuing pure law courses. Most of the universities across the globe are offering multidisciplinary Law courses to the students, where Statistics is one common course. Replication of these types of studies using Constructivism can reduce the anxiety among the Law students. The technique was used for one batch, which may not be sufficient evidence to say that Constructivism helps the students to understand statistics, as the study ignores other external factors. Further studies are required in the area to know the impact of Constructivism on learning statistics by law students.

References

1. Akar, H., & Yıldırım, A. (2005). Challenges of introducing a constructivist classroom culture in a predominantly teacher-centered environment. Paper presented at the European Conference on Educational Research, University College Dublin, 7-10 September 2005
2. AlAfnan, M. A., & Dishari, S. (2024). ESD Goals and Soft Skills Competencies through Constructivist Approaches to Teaching: An Integrative Review. *Journal of Education and Learning (EduLearn)*, *18*(3), 708-718.
3. Ashaari, N. S., Judi, H. M., Mohamed, H., & Wook, M. T. (2011). Student's attitude towards statistics course. *Procedia-Social and Behavioral Sciences*, *18*, 287-294.
4. Bada, S. O., & Olusegun, S. (2015). Constructivism learning theory: A paradigm for teaching and learning. *Journal of Research & Method in Education*, *5*(6), 66-70.
5. Bailey, M. A. (2019). Teaching statistics: going from scary, boring, and useless to, well, something better. *PS: Political Science & Politics*, *52*(2), 367-370.
6. Biggs, J. (1999). What the student does: Teaching for enhanced learning. *Higher education research & development*, *18*(1), 57-75.
7. Bloom, B. S. (1968). Learning for mastery. Evaluation Comment, 1(2), 1-12.
8. Christie, A. (2005). Constructivism and Its Implications for Educators (http:// alicechristie. com/edtech/learning/constructivism/index.htm)
9. Çibukçiu, B. (2025). The impact of constructivist methods on students' mathematical problem-solving. *Discover Education*, *4*(1), 1-8.
10. Cui, S., Zhang, J., Guan, D., Zhao, X., & Si, J. (2019). Antecedents of statistics anxiety: An integrated account. *Personality and Individual Differences*, *144*, 79-87.
11. Dow, S. B. (2004). There's madness in the method: A commentary on law, statistics, and the nature of legal education. *Okla. L. Rev.*, *57*, 579.
12. Emmioğlu, E. S. M. A., & Capa-Aydin, Y. E. S. I. M. (2012). Attitudes and achievement in statistics: A meta-analysis study. *Statistics education research journal*, *11*(2), 95-102.

Received: August 7, 2025

Volume 38 No. 4s, 2025
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

13. Freeman, J. V., Collier, S., Staniforth, D., & Smith, K. J. (2008). Innovations in curriculum design: a multi-disciplinary approach to teaching statistics to undergraduate medical students. *BMC medical education*, *8*(1), 1-8.
14. Gal, I., and Ginsburg, L. (1994), "The Role of Beliefs and Attitudes in Learning Statistics: Towards an Assessment Framework," *Journal of Statistics Education*, 2(2), DOI: 10.1080/10691898.1994.11910471
15. Gal, I., Ginsburg, L., and Schau, C. (1997), "Monitoring attitudes and beliefs in statistics education," in *The Assessment Challenge in Statistics Education*, eds. I. Gal and J. B. Garfield, Amsterdam: IOS Press, pp. 37–51
16. Garbett, D. (2011). Constructivism deconstructed in science teacher education. *Australian Journal of Teacher Education*, *36*(6), 3.
17. Garfield, J. (1995). How students learn statistics. *International Statistical Review*, *63*(1), 25-34.
18. Garfield, J., & Chance, B. (2000). Assessment in statistics education: Issues and challenges. *Mathematical Thinking and Learning*, *2*(1-2), 99-125.
19. Garfield, J., & Ben-Zvi, D. (2007). How students learn statistics revisited: A current review of research on teaching and learning statistics. *International statistical review*, *75*(3), 372-396.
20. Glancy, A. W., & Moore, T. J. (2013). Theoretical foundations for effective STEM learning environments, School of Engineering Education, Working papers, paper 1
21. Hein, G. E. (1991, October). Constructivist learning theory: The museum and the needs of people. In *CECA Conference, Jerusalem, Israel* (pp. 15-22).
22. Hernández, O. (2006). Teaching statistics to undergraduate students of the social sciences. *Working Cooperatively in Statistics Education*. 7th International Conference on Teaching Statistics (ICOTS – 7) Edited by Allan Rossman and Beth Chance
23. Hendry, G. D., Frommer, M., & Walker, R. A. (1999). Constructivism and problem-based learning. *Journal of further and higher education*, *23*(3), 369-371.
24. Jackson, H. E. (2003). Analytical methods for lawyers. *J. Legal Educ.*, *53*, 321.
25. Kamphorst, J. C. (2018). Multidisciplinary Cooperation by Students in a European University of Applied Sciences. *Journal of University Teaching and Learning Practice*, *15*(1), 5
26. Kara, Merve. (2018). A Systematic Literature Review: Constructivism in Multidisciplinary Learning Environments. International Journal of Academic Research in Education. 4(1), 19-26.
27. Kirschner, P. A., Sweller, J., & Clark, R. E. (2006). Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. *Educational psychologist*, *41*(2), 75-86.
28. Kritt, D., & Budwig, N. (2022). The future of constructivist education. *Human Development*, *66*(4-5), 291-305.
29. Kurniati, S. (2012). Program statistik: Upaya memotivasi mahasiswa untuk senang belajar statistika. Media Bina Ilmiah, 6(4), 62-67

Received: August 7, 2025

Volume 38 No. 4s, 2025
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

30. Le Cornu, R., & Peters, J. (2005). Towards constructivist classrooms: the role of the reflective teacher. *The Journal of Educational Enquiry*, *6*(1) 50-64.
31. Marlow, M. P., & McLain, B. (2011). Assessing the impacts of experiential learning on teacher classroom practice. Research in Higher Education Journal, 14, 1–15
32. Meyer, C. (2022). Bringing the world to the classroom: Teaching statistics and programming in a project-based setting. *PS: Political Science & Politics*, *55*(1), 193-197.
33. Miller, J. B. (2002). Examining the interplay between constructivism and different learning styles. *Retrieved on 20th October* 2018 (http://iase-web.org/documents/papers/icots6/8a4_mill.pdf).
34. Moore, D. S. (1998). Statistics among the liberal arts. *Journal of the American Statistical Association*, *93*(444), 1253-1259.
35. Mvududu, N. (2003). A cross-cultural study of the connection between students' attitudes toward statistics and the use of constructivist strategies in the course. Journal of Statistics Education, 11(3). DOI: 10.1080/10691898.2003.11910726
36. Mvududu, N., & Kanyongo, G. Y. (2011). Using real life examples to teach abstract statistical concepts. *Teaching Statistics*, *33*(1), 12-16.
37. Onwuegbuzie, A. J., & Wilson, V. A. (2003). Statistics Anxiety: Nature, etiology, antecedents, effects, and treatments--a comprehensive review of the literature. *Teaching in higher education*, *8*(2), 195-209.
38. Packer, M. J., & Goicoechea, J. (2000). Sociocultural and constructivist theories of learning: Ontology, not just epistemology. *Educational psychologist*, *35*(4), 227-241.
39. Pan, W., & Tang, M. (2004). Examining the Effectiveness of Innovative Instructional Methods on Reducing Statistics Anxiety for Graduate Students in the Social Sciences, *Journal of Instructional Psychology*, *31*(2), 149-159
40. Pan, W., & Tang, M. (2005), Students' Perceptions on Factors of Statistics Anxiety And Instructional Strategies, *Journal of Instructional Psychology*, *32*(3), 205-214
41. Parti, K., & Szigeti, A. (2021). The future of interdisciplinary research in the digital era: Obstacles and perspectives of collaboration in social and data sciences-An empirical study. *Cogent Social Sciences*, *7*(1), 1970880.
42. Prawat, R. S., & Floden, R. E. (1994). Philosophical perspectives on constructivist views of learning. *Educational Psychologist*, *29*(1), 37-48.
43. Prayoga, T., & Abraham, J. (2017). A psychological model explaining why we love or hate statistics. *Kasetsart Journal of Social Sciences*, *38*(1), 1-8.
44. Rahmat, N. H. (2022). Learning Group Writing Online: The Case for Cognitive Constructivism. *International Journal of Academic Research in Business and Social Sciences*, *12*(6), 1093-1108.
45. Satake, E., & Amato, P. P. (2008). An Alternative Version of Conditional Probabilities and Bayes' Rule: An Application of Probability Logic. *AMATYC Review*, *29*(2), 41-50.
46. Satake, E., & Murray, A. V. (2014). Teaching an Application of Bayes' Rule for Legal Decision-Making: Measuring the Strength of Evidence. *Journal of Statistics Education*, *22*(1).

Received: August 7, 2025

Volume 38 No. 4s, 2025
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

47. Schacht, S., and Stewart, B. J. (1992), "Interactive/user-friendly gimmicks for teaching statistics," Teaching Sociology, 20, pp. 329–332.
48. Schau, C. (2003, August). Students' attitudes: The "other" important outcome in statistics education. In *Proceedings of the joint statistical meetings* (pp. 3673-3681).
49. Slootmaeckers, K., Kerremans, B., & Adriaensen, J. (2014). Too afraid to learn: Attitudes towards statistics as a barrier to learning statistics and to acquiring quantitative skills. *Politics*, *34*(2), 191-200.
50. Spady, W. G. (1994). *Outcome-Based Education: Critical Issues and Answers*. American Association of School Administrators, 1801 North Moore Street, Arlington, VA 22209
51. Suman, N., & Chauhaan, S. (2022). Effect of Constructivist Approach in Education: An Analytical Review. *Techno Learn*, *12*(1), 55-58.
52. Tan, C. H., Bell, G., Dang, X. H., Kim, J., Teo, K. S., Thiruvengadam, A., Vijayakumar, V. V.; & Wang, J. (2006). Legal education in Asia. *Asian Journal of Comparative Law*, *1*, 1-22.
53. Tishkovskaya, S., & Lancaster, G. A. (2010, July). Teaching strategies to promote statistical literacy: review and implementation. In Data and Context in Statistics Education: Towards an Evidence-Based Society. Proceedings of the Eighth International Conference on Teaching Statistics. Voorburg, The Netherlands: International Statistical Institute. (retrieved from http://iase-web.org/documents/papers/icots8/ICOTS8_C193_TISHKOVSKAY.pdf)
54. Tishkovskaya, S., & Lancaster, G. A. (2012). Statistical education in the 21st century: A review of challenges, teaching innovations, and strategies for reform. *Journal of Statistics Education*, *20*(2) 1-24.
55. Tobin, K. (2000). Constructivism in science education: Moving on… In DC Phillips (Ed.), Constructivism in education: Opinions and second opinions on controversial issues (pp. 227-253).
56. von Roten, F. C., & de Roten, Y. (2023). Undergraduate sport sciences students' attitudes towards statistics: A gender perspective. *Journal of Hospitality, Leisure, Sport & Tourism Education*, *33*, 100452.
57. Verhoeven, P. (2006). Statistics Education in the Netherlands and Flanders: An Outline of Introductory Courses at Universities and Colleges, *In ICOTS-7 Conference Proceedings*.
58. Watson, J. (1997). Assessing statistical thinking using the media. In I. Gal & J. B. Garfield (Eds.), The assessment challenge in statistics education (pp. 107–121). Amsterdam: IOS Press.
59. Wilson, S. G. (2013). The flipped class: A method to address the challenges of an undergraduate statistics course. *Teaching of psychology*, *40*(3), 193-199.
60. Yager, G. G., and Wilson, F. R. (1986), "Ten suggestions on teaching research to counseling students," Paper presented at the annual meeting of the North Central Association for Counselor Education and Supervision, Kansas City, MO
61. Zain, S. F. H. S. (2012). Student-Centred Learning in Mathematics – Constructivism in the Classroom. Journal of International Education Research, 8(4), pp. 319-328

Received: August 7, 2025

International Journal of Applied Mathematics

Volume 38 No. 4s, 2025

ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

62. Zamalia, N. (2009). A discriminant analysis of perceived attitudes toward statistics and profile identification of statistics learners. Proceedings of the 2nd WSEAS International Conference on Multivariate Analysis and its Application in Science and Engineering. 41-47

Appendix 1

Assignment

Dear Students,

This notice is regarding your Tutorial II, for which you are asked to submit an assignment. Follow the guidelines given below, and submit the assignment

1. The Assignment is to find the **Correlation** and **regression equation** for the 2 variables and **Standard Error** (Y on X).
2. You are free to choose data from https://www.un.org/en/databases/#stats which helps you to find research topics related to human rights.
3. The following format is required for the assignment

i) Introduction of the topics
ii) Literature review of the topics chosen
iii) Research methodology (includes sources of data, data collection method, and data analysis method)
iv) Correlation, Regression equation, and standard error calculation
v) Interpretation with some comparisons
vi) Conclusion
vii) References

4. The assignment should be limited to 10-14 pages excluding the cover page.
5. The report should be devoid of plagiarism
6. Proper referencing should be given at the end. (Use APA style)
7. Reports submitted after the deadline will not be considered for evaluation.
8. Marks will be assigned based on the Quality, Originality, Justification, and ***Presentation*** of the data.
9. It is a team assignment and each team comprises a maximum of three members.
10. Consult the faculty for registration of the topic and also for clarifications.

Appendix 2

Business Statistics

III semester

Research Project Topics

Received: August 7, 2025

International Journal of Applied Mathematics

Volume 38 No. 4s, 2025

ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

1. The following table consists of the Titles of the research projects for Business Statistics
2. Select your topic and register with the concerned faculty.
3. Each team consists of a maximum of 3 members

Topics

1. A statistical analysis of crime offenses recorded in 10 different states, the per capita income, number of police, and literacy rate and compare with Indian statistics.
2. A statistical study on the relationship between Crime rate on women, literacy rate, per capita income, women representation in parliament, Sex ratio, years of schooling, etc. of 10 different countries (4 teams with at least 5 different countries) compare with Indian statistics.
3. A statistical analysis of the relationship between Sales, Profit, Revenue, expenditure on technology, labour costs, advertising expenses of any 10 companies from the following industries

1. Aerospace
2. Steel
3. Banking
4. Fertilizers
5. Textile
6. Software
7. Car Manufacturing
8. Electronics
9. Mobiles
10. Petroleum
11. Cement

And compare the data with any other country

Instructions:

1. The following format is required for the Project

I.Title Page
I.Declaration Certificate
I.Acknowledgment
I.Contents
I.Introduction
I.Literature review
I.Objectives
I.Research methodology

a. Research design
b. Sources of data
c. Method of data collection

Received: August 7, 2025

International Journal of Applied Mathematics

Volume 38 No. 4s, 2025

ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

d. Sample size and sampling procedure
e. Hypotheses
f. Limitations

[.Statistical analysis and hypothesis testing
[.Interpretation with some comparisons
I.Findings
I.Suggestions[$] and Conclusion
I.References
'.Appendix

2. Refer to the OBE for the format of the certificate
3. The report should be devoid of plagiarism
4. Proper referencing should be given at the end. (Use APA style)
5. Reports submitted after the deadline will not be considered for evaluation.
6. Consult the faculty for registration of the topic and also for clarifications.
7. ***Give appropriate literature review and use appropriate statistical tools***

[$] If, Require

Received: August 7, 2025