

Teaching Management Information Systems: A Reflective Study on Pedagogical Practices and Learner Engagement in Business Education

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Abstract: *Management Information Systems (MIS) education plays a critical role in preparing business graduates for data-driven organizational environments. However, empirical research on the impact of student-centered pedagogical strategies on learning outcomes in undergraduate MIS courses is limited, particularly in emerging educational contexts. This study investigates the effectiveness of integrating inquiry-based learning, gamification, experiential laboratory sessions, and technology-enhanced instruction in teaching MIS and Applied Data Analysis to Bachelor of Business Administration students. A case study methodology was adopted, combining qualitative observations with quantitative analysis of four internal assessments administered across the semester. Instruction incorporated spreadsheet applications and Jamovi software to develop students' analytical competencies in measures of central tendency, dispersion, correlation, regression, hypothesis testing, non-parametric tests, and ANOVA. Gamified classroom activities and structured question-analysis strategies were employed to enhance engagement and conceptual clarity. Results indicate a consistent improvement in student performance, with the class mean increasing from 14.0 to 18.4 (out of 20) across four assessments. A repeated-measures ANOVA revealed a statistically significant effect of assessment occasion on performance, $F(3, 21) = 8.98, p < .001, \eta^2 = .56$, accompanied by reduced score dispersion over time. These findings suggest that integrating student-centered pedagogy with applied analytics tools significantly enhances learner engagement, analytical skills, and academic achievement. The study contributes empirical evidence to the MIS education literature by demonstrating that experiential and technology-supported instructional strategies can effectively strengthen data-driven decision-making competencies in undergraduate business programs.*

Keywords: Management Information Systems, Business Education, Student-Centered Learning, Jamovi, Gamification, Data Analytics

1. Introduction

Today's vast multinational corporations require technologies that integrate with other business practices to meet evolving management requirements. To achieve the organization's needs, the feasible solution is a Management Information System (MIS). It comprises a collection of computer-based flow-processing techniques, combined with other methods, to provide efficient and timely information, thereby greatly aiding decision-making and other crucial management tasks [1]. The mechanisms and tools needed to efficiently create, process, analyse, exchange, store, and protect such data are provided by Information Technology (IT). It also enables smooth communication and collaboration across different time zones and locations by using video conferencing, instant messaging, and cloud-based platforms.

Employees with competence in both computing and information technology, as well as in business sectors such as accounting, finance, and marketing, are necessary for the digital transformation of organizational data and operations. Information technology's integration into the corporate environment has made it possible for organizations to process, store, and retrieve vast volumes of data at decreasing prices [2]. The subject of management information systems (MIS) stands at the intersection of the computer and business disciplines. -*As businesses transition from paper-based to computerized systems, MIS is becoming a more and more significant field. The success of MIS in education also depends greatly on five important perspectives, such as students, recruiters, administrators, technology, and instructors [3]. Despite the recognized importance of MIS education, limited empirical studies examine how student-

centered pedagogical strategies influence learning outcomes in undergraduate business programs within emerging educational contexts. This study seeks to address this gap.

According to [3] Understanding students' behaviours, interests, and pastimes and incorporating them into MIS courses is immensely helpful for MIS instructors. Behavioral management plays a key role by helping teachers understand students' behavior and respond with care, and allows them to create spaces where all learners thrive [4]. This prompted us to engage students more actively in classroom discussions by connecting their dream goals to MIS. At the core of every successful learning environment lies strong, positive relationships between educators and learners, because when students feel genuinely valued, understood, and supported, they are more likely to engage, persevere, and achieve at higher levels [5]. Student-centered learning empowers students to take ownership of their education by fostering exploration of personal interests, connecting them to broader subjects, and igniting curiosity and deeper understanding [6].

This study investigates the teaching and learning processes of the courses *Management Information Systems* and *Applied Data Analysis* offered to undergraduate students enrolled in the Bachelor of Business Administration program at Sahyajothi Arts and Science College. A case study methodology was employed, integrating both qualitative and quantitative approaches to ensure comprehensive data collection and analysis. The pedagogical framework was grounded in student-centered learning principles, incorporating inquiry-based exploration, collaborative discussions, and instructional strategies informed by constructivist theory, experiential learning, and technology-

enhanced learning frameworks. The findings highlight the effectiveness of these pedagogical approaches in achieving the intended learning outcomes and in strengthening students' analytical and decision-making competencies.

The course on Management Information Systems and Applied Data Analysis introduces the fundamental concepts of Management Information Systems (MIS) and their role in organizational decision-making through data analysis. The curriculum integrates the use of spreadsheet applications and JAMOVI software to facilitate practical learning. Students are introduced to key statistical techniques and are guided in applying these methods to real-world business scenarios. Through this approach, the course seeks to develop students' analytical competencies and enhance their capacity for data-driven decision-making and business analytics.

The primary objectives of this study are threefold: (1) to evaluate the effectiveness of student-centered pedagogical strategies in Management Information Systems (MIS) education; (2) to assess the development of students' analytical competencies through applied data analysis training; and (3) to examine the impact of integrating statistical software on student engagement and learning outcomes. By addressing these objectives, the study contributes to the MIS education literature by offering empirical evidence on the combined implementation of student-centered pedagogy and applied analytics instruction within undergraduate business programs. This contribution enhances current understanding of how integrative teaching approaches can support competency development in digitally oriented business education.

2. Methodology

Student-centered approaches, which promote active learning and student-led inquiry, are gradually replacing teacher-centered methods in modern education, emphasizing the instructor as the sole source of knowledge. This approach encourages students to reflect on their own learning process. Creating an inclusive classroom isn't just about academics but about fostering a positive environment where every learner feels supported and understood [4]. In the aspects of student engagement and interaction, an environment that allows students to use their smartphones to find answers to questions discussed in the classroom, where students actively participate by engaging themselves with the material to build their own understanding through Inquiry-Based Learning. The classroom assessments were conducted through gamified activities that allowed students to use their mobile phones to answer questions independently or in teams. It encourages critical thinking by posing open-ended questions and challenging students to find their own solutions, fostering independent thought, research skills, and a passion for exploration [6].

The first gamification activity was implemented following Chapter 1 of the Management Information System course. Gamification refers to the application of game-thinking principles and game design elements in non-game contexts to enhance learners' engagement and motivation [7]. The activity was conducted using the Wayground platform and consisted of ten objective-type questions.

Table 1: Gamification Activities from Chapters 1 and 2

Students	Activity 1 score	Activity 2 score	Improvement
Student A	3600	7100	3500
Student B	5000	11520	6520
Student C	4800	9280	4480
Student D	6700	11530	4830
Student E	2400	8730	6330
Student F	6200	12050	5850
Student G	4800	9890	5090
Student H	5600	13600	8000

The class achieved an average score of 79%, and students reported minimal difficulties in navigating and using the Wayground tool. The second gamification activity was conducted after the completion of Chapter 2. This activity comprised fifteen questions in multiple formats, including multiple-choice, true/false, and fill-in-the-blank items. The class average for this activity increased to 82%. Table 1 presents a summary of student performance across the gamification activities. The inquiry-based learning approach in the classroom enabled students to read the assigned course book and discuss the topic through questions. When students were unable to answer the question, they were allowed to use their smartphones to find the answer. The method of interaction enabled them to understand the topic, and they were able to connect with the real-world examples.

An internal exam consisting of 20 marks was conducted to test students' knowledge in the first three chapters: Introduction to Management Information (Fundamental Concepts of MIS System, E- Commerce and Introduction to Data Analysis). The question pattern was focused on 10 objective-type questions and two five-mark questions, with a duration of one hour. All students attempted the test and scored well in the exam; the results are shown in Table 2. Table 2 presents the performance of eight students in the First Internal Assessment (maximum score = 20 marks). The individual scores ranged from 9 to 18 marks, corresponding to percentages between 45% and 90%. The mean score was **14.0 marks** (70%), indicating an overall satisfactory performance of the cohort. The median score was **15.0 marks** (75%), which is slightly higher than the mean, suggesting that more than half of the students scored at or above 15 marks. The standard deviation was **3.16**, reflecting moderate variability in student performance. Student D achieved the highest score (18 marks; 90%), whereas Student A obtained the lowest score (9 marks; 45%). The majority of students (5 out of 8) scored 15 marks or above, demonstrating generally good academic achievement in this assessment.

Table 2: First Internal Test-Marks

First Internal Assessment			
SI. No	Student	Marks (Out of 20)	Percentage
1	Student A	9	45
2	Student B	15	75
3	Student C	10	50
4	Student D	18	90
5	Student E	13	65
6	Student F	17	85
7	Student G	15	75
8	Student H	15	75
Mean			14
Median			15
Standard Deviation			3.16

Table 2 presents the performance of eight students in the First Internal Assessment (maximum score = 20 marks). The individual scores ranged from 9 to 18 marks, corresponding to percentages between 45% and 90%. The mean score was **14.0 marks** (70%), indicating an overall satisfactory performance of the cohort. The median score was **15.0 marks** (75%), which is slightly higher than the mean, suggesting that more than half of the students scored at or above 15 marks. The standard deviation was **3.16**, reflecting moderate variability in student performance. Student D achieved the highest score (18 marks; 90%), whereas Student A obtained the lowest score (9 marks; 45%). The majority of students (5 out of 8) scored 15 marks or above, demonstrating generally good academic achievement in this assessment.

Overall, the distribution of marks indicates a reasonably strong performance with moderate dispersion and no extreme outliers. Review of the answer scripts revealed that some students' handwriting lacked clarity and legibility. To address this issue, several instructional sessions were conducted to strengthen students' recall of relevant information and their ability to present their responses clearly and legibly. Students were allotted 10 minutes for preparation before the administration of the test. Observations further suggest that students demonstrate a willingness to improve their handwriting, and their responses are generally relevant and appropriate to the questions posed.

It was also noticed in the internal exam answer sheets that the answers were not relevant to the questions they answered. Even in the classroom discussions, students are making more attempts to answer the question. To overcome such challenges, a new technique was used to help students understand the question clearly. At the end of every chapter in the textbook, there are multiple-choice, short, and long-answer questions. Asked students to read the question twice, and check the key words like (who, what, how, explain, compare, why) and command words (define, describe, analyze, calculate, justify, list). Asked students the meaning of every keyword and command with a simple example. Encouraged students to say it in their own words and explain it to a partner before answering. Taught common question types by connecting with the lesson.

- Describe - What it is like, give more information about the topic.
- Explain - Define it, show how it works, or just tell what it is.
- Compare - focuses on similarities, finds what things they have in common.
- Differentiate - focuses on differences, identifying how things are not alike.
- Justify - Give reasons or evidence to prove or show to be just, right, or reasonable.
- Discuss - talk about a particular topic, or have a conversation about.
- Analyse - to examine in detail to discover meaning.

This allowed students to understand the question and prepare them to answer accordingly. It has been seen that one student appeared consistently exhausted during the sessions. Upon further inquiry, it was found that the student was engaged in part-time night-shift employment during the festival season. Given that the institution's academic schedule operates from

9:00 a.m. to 1:30 p.m., students are permitted to undertake part-time employment during the afternoon; however, night shifts may adversely affect academic engagement and well-being. The student was therefore advised to manage his schedule more effectively, with greater emphasis on health and academic responsibilities.

Additionally, despite the prevailing seasonal climate, the classroom environment was uncomfortably cold, which appeared to affect overall comfort and attentiveness. Consequently, the session was relocated to an outdoor setting that offered a more moderate temperature and suitable seating arrangements. The session was structured around business-focused discussions, and it was observed that all students participated actively. This engagement aligns with the pedagogical perspective advanced by [8], who emphasizes that learning potential is enhanced through the integrated use of physical, visual, and naturalistic modes of instruction.

In alignment with the course requirements, the syllabus incorporates practical sessions on data analysis using spreadsheet applications and Jamovi software. Accordingly, computer laboratory sessions were conducted to provide students with hands-on experience, enabling them to apply theoretical concepts introduced in the classroom. Experiential learning emphasizes practice as a foundation for knowledge development, allowing learners to observe, review, and reflect on their activities, and to critically connect these experiences with established theory or prior knowledge [9].

The students are non-computer professionals, so the first practical session was given as an introduction to computers by explaining hardware, software, operating system, system software, and application software. The session continued with the Windows Office packages, in which Microsoft Excel was employed to compute measures of central tendency (mean, median, and mode). Students utilized built-in functions and relevant formulas to determine the central values of given datasets. The conceptual purpose and interpretative significance of these measures were also explained to reinforce their theoretical understanding.

- 1) **Mean:** The mean provides a single summary statistic that represents the overall average of a dataset, offering a concise measure of central tendency.
- 2) **Median:** The median is the central value in an ordered dataset, dividing the data into two halves. Unlike the mean, it is robust to extreme values and outliers.
- 3) **Mode:** The mode denotes the most frequently occurring value within a dataset and is particularly informative for categorical variables, where it identifies the most common category.

By using the same set of data explained the amount of variation or dispersion in the data set relative to the mean. Students used the formula to find the standard deviation and variance and explained the importance of these measures in the data set.

Standard deviation: It is a statistical measure that quantifies the amount of variation or dispersion in a set of data values relative to their mean. A low standard deviation indicates data points are tightly clustered around the mean, while a high

standard deviation suggests they are spread over a wider range.

Variance: In statistics, variance is a measure of how far away a set of numbers is from its average, or mean. All deviations are guaranteed to be positive since it is computed as the average of the squared differences between each data point and the mean. When data points have a low variation, they are grouped near the mean; when they have a high variance, they are more dispersed.

After the completion of Chapters 4 and 5, the second internal exam was conducted on 20 marks to test students' knowledge in Introduction to Data Analysis: Types of Data (Ordinal, Interval, Ratio), Descriptive Statistics: Measures of central tendency (Mean, Median, Mode), and dispersion (Quartile Deviation, Variance, Standard Deviation). The results of the second internal test are shown in Table 3 below.

Table 3: Second Internal Test Marks

SI. No	Student	1 st Internal Marks (out of 20)	2 nd Internal Marks (out of 20)
1	Student A	9	12
2	Student B	15	18
3	Student C	10	17
4	Student D	18	17
5	Student E	13	14
6	Student F	17	18
7	Student G	15	15
8	Student H	15	17

The paired-samples *t*-test was conducted to compare the first Internal Marks and the second Internal Marks. There was **no statistically significant difference** between the two sets of internal marks, $t(7) = -2.31, p = .054$. Since the obtained *p*-value (.054) is greater than the conventional alpha level of .05, the null hypothesis cannot be rejected.

Although the result approaches significance (marginal/non-significant trend), it does not meet the standard criteria for statistical significance. Therefore, a paired-samples *t*-test indicated that the difference between the first Internal Marks and the second Internal Marks was not statistically significant, $t(7) = -2.31, p = .054$.

The next chapters were focused on data analysis using Jamovi software, where students need to understand types of data, qualitative and quantitative data, measures of central tendency, and dispersion. As of now, students are familiar with handling the desktop computers, so they downloaded the software Jamovi and installed. The jamovi software is a free, open statistical platform that provides the latest developments in statistical methodology [10]. It has a user-friendly interface, which enables students to perform the central tendency and dispersion measures easily.

The originally scheduled theory sessions were redesigned as hands-on practical sessions, resulting in increased student engagement and interest in learning within the computer laboratory environment through an experiential learning approach. Chapter 8 (Correlation and Regression), Chapter 9 (Non-parametric Tests and ANOVA), and Chapter 10 (Practical Data Analysis Using Spreadsheet) were delivered in the computer laboratory, where students actively applied

statistical concepts using Jamovi and Microsoft Excel to perform data analysis.

Students were able to identify the differences in using a spreadsheet and Jamovi. With respect to statistical testing, including procedures such as *t*-tests and ANOVA, Jamovi offers built-in and user-friendly functionality. In contrast, Excel provides only limited capabilities that often require manual configuration. In terms of variable analysis by column, Jamovi enables fast and reliable analysis through its integrated tools, while Excel can perform similar analyses but typically necessitates the use of formulas. For data visualization, including boxplots and histograms, Jamovi automatically generates outputs, streamlining the analytical workflow; in contrast, Excel requires manual setup to produce comparable visualizations. Regarding row-wise calculations, Jamovi can perform these operations but may require additional effort to compute, whereas Excel facilitates such calculations efficiently through its formula-based structure. Overall, the comparison highlights Jamovi's strengths in statistical analysis and automated visualization, while Excel remains advantageous for straightforward, formula-driven row-wise computations.

The third internal examination, conducted for 20 marks, covered Chapters 6 to 8. These chapters addressed data analysis using Jamovi, measures of central tendency and dispersion, and correlation and regression. The assessment emphasized practical-oriented data analysis and included oral questions to evaluate students' conceptual understanding and their proficiency in using spreadsheet application software and Jamovi. The results of this examination are presented in Table 4. Following the completion of Chapter 9, the fourth internal examination was administered as a practical assessment. The examination included questions on the *t*-test, non-parametric tests, analysis of variance (ANOVA), Pearson's correlation, various charting techniques in Jamovi, and regression analysis. The results are also presented in Table 4.

Table 4: Consolidated Internal Test Marks

Student	1 st	2 nd	3 rd	4 th	Total	Avg (/20)
Student A	9	12	15	19	55	13.8
Student B	15	18	16	18	67	16.8
Student C	10	17	17	18	62	15.5
Student D	18	17	16	19	70	17.5
Student E	13	14	16	18	61	15.3
Student F	17	18	17	19	71	17.8
Student G	15	15	17	18	65	16.3
Student H	15	17	16	18	66	16.5
Class Average	14.0	16.0	16.3	18.4	-	-

Table 4 summarizes the consolidated scores from four internal assessments (each scored out of 20) for eight BBA students, reporting total scores, individual means, and class means. The class mean increased progressively from 14.0 in the first assessment to 18.4 in the fourth, representing a 4.4-point gain. Concurrently, the standard deviation declined from 3.16 to 0.51, indicating reduced score dispersion and greater performance consistency over time. The overall class mean across assessments was 16.0/20 (80%), with individual mean scores ranging from 13.8 to 17.8.

A repeated-measures analysis of variance (ANOVA) demonstrated a statistically significant effect of assessment

occasion on student performance, $F(3, 21) = 8.98, p < .001, \eta^2 = .56$, indicating substantial differences in mean scores across the four internal tests. The between-subjects residual sum of squares was 47.5 ($df = 7$), reflecting variability in overall student performance. No between-subjects factor was included in the model, as the analysis focused exclusively on within-subject changes over time. Collectively, the findings indicate strong overall performance and a consistent upward trend, suggesting that instructional adjustments were associated with measurable improvements in student outcomes.

3. Conclusion

This study examined the effectiveness of student-centered pedagogical strategies in teaching Management Information Systems (MIS) and Applied Data Analysis to undergraduate business students. By integrating inquiry-based learning, gamification, experiential laboratory sessions, and technology-enhanced instruction using spreadsheet applications and Jamovi, the study sought to enhance learner engagement and analytical competency within a digitally oriented business education context.

The findings indicate a consistent improvement in student performance across four internal assessments. The progressive increase in class mean scores from 14.0 to 18.4, accompanied by a reduction in score dispersion, reflects not only academic improvement but also greater performance consistency among students. The repeated-measures ANOVA confirmed that these improvements were statistically significant, suggesting that the instructional interventions were associated with measurable gains in learning outcomes. The integration of practical sessions and statistical software facilitated deeper conceptual understanding, particularly in areas such as correlation, regression, hypothesis testing, and ANOVA.

Gamification activities and inquiry-based classroom discussions further contributed to enhanced student motivation and participation. Allowing students to engage with real-world examples, utilize smartphones for guided inquiry, and participate in collaborative problem-solving fostered active learning and ownership of the learning process. Additionally, targeted instructional strategies—such as explicit training in understanding command words and question interpretation—addressed observed challenges in response relevance and academic presentation, leading to noticeable improvements over time.

The comparative use of Microsoft Excel and Jamovi enabled students to appreciate the practical strengths and limitations of different analytical tools. While Excel supported formula-based computations and row-wise calculations, Jamovi provided user-friendly statistical testing and automated visualization features, thereby strengthening students' applied analytical skills. This blended technological approach aligns with the evolving demands of business environments that increasingly rely on data-driven decision-making.

Overall, the study contributes empirical evidence to the MIS education literature by demonstrating that the integration of student-centered pedagogy with applied analytics instruction

can significantly enhance learner engagement, analytical competence, and academic performance in undergraduate business programs. The findings underscore the importance of aligning instructional design with experiential learning principles and digital tools to prepare students for contemporary organizational challenges. Future research may extend this work by examining larger cohorts, incorporating longitudinal tracking, and exploring comparative institutional contexts to further validate and generalize these findings.

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