Innovative Teaching in Business Analytics: Bridging Theory, Practice, and Student Engagement

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Abstract

This study explores innovative teaching methodologies in Business Analytics, integrating active, problem-based, and collaborative learning to enhance student engagement and skill acquisition. Tools such as JMP, Python, and Google Colab were employed to bridge theoretical concepts with practical applications, allowing students to manipulate real datasets and develop predictive models. Real-world case studies, industry-relevant projects, and machine-learning techniques fostered critical thinking, teamwork, and technical expertise. Student feedback emphasized the transformative impact of interactive learning, highlighting improvements in data analysis, communication, and ethical decision-making. Key achievements included developing dashboards, conducting market segmentation, and optimizing inventory management. Challenges, such as diverse learning needs and the rapid evolution of analytics tools, underscore the importance of continuous curriculum adaptation. This study affirms the role of experiential learning in preparing students for dynamic, data-driven careers, advocating for further research to scale these approaches for broader accessibility and integration of emerging technologies in education.

Keywords: Business analytics, interactive learning, collaborative teaching, real-world applications, student engagement, data analysis

1 INTRODUCTION

Business Analytics is a transformative discipline at the intersection of data science, technology, and strategic decision-making. As businesses increasingly leverage data to gain competitive advantages, the demand for professionals with advanced analytical skills has surged. This growing relevance underscores the importance of effective teaching methodologies that impart technical proficiency and foster critical thinking, collaboration, and real-world problem-solving abilities among students.

The pedagogical approaches adopted in Business Analytics education have evolved to meet the complexities of this dynamic field. Traditional lecture-based models give way to more interactive, technology-driven, and collaborative frameworks. Educators are bridging the gap between theoretical knowledge and practical application by integrating tools like JMP, Python, and Google Colab. These tools empower students to engage with real datasets, perform sophisticated analyses, and create predictive models, preparing them to navigate industry challenges confidently.

This paper delves into innovative teaching strategies to enhance student engagement and learning outcomes in Business Analytics. These strategies include interactive learning, problem-based learning, and collaborative projects that simulate real-world scenarios. For instance, team-based market segmentation or product forecasting exercises enable students to apply theoretical concepts while honing their teamwork and communication skills. Additionally, the curriculum incorporates case studies from industries such as healthcare and retail, providing students with insights into the practical implications of data analytics.

Moreover, integrating machine learning concepts and visualization tools offers students a comprehensive understanding of modern analytics. By working on tasks such as customer segmentation or inventory optimization, students develop technical expertise and cultivate the ability to derive actionable insights from complex data. This multifaceted approach ensures that graduates are proficient in analytics tools and equipped to address the ethical and strategic dimensions of data-driven decision-making.

This study explores the outcomes of these pedagogical innovations, highlighting their impact on students' analytical proficiency, confidence, and engagement. It also examines the broader implications of these methodologies for Business Analytics education, emphasizing the need for continuous adaptation to technological advancements and industry demands. Through this exploration, the paper aims to contribute to the discourse on effective teaching practices in this ever-evolving domain.

2 METHODOLOGY

Interactive Learning Tools

Interactive Learning is an educational approach in which students actively engage in learning through activities, discussions, collaboration, and hands-on experiences rather than passively receiving information. It emphasizes interaction between students, instructors, and peers to foster deeper understanding, critical thinking, and practical application of knowledge (Bonwell & Eison, 1991).

A comprehensive meta-analysis of 225 studies in (Freeman et al., 2014) demonstrates the effectiveness of interactive learning in undergraduate STEM education. Results show that

interactive learning improves exam performance by nearly half a standard deviation and reduces failure rates by 55% compared to traditional lectures. The analysis found these benefits consistent across disciplines, class sizes, and course levels, with the highest gains in smaller classes and concept mastery. Active learning also addresses the STEM pipeline problem by increasing retention and performance, particularly benefiting underrepresented groups. These findings strongly advocate replacing traditional lectures with interactive teaching strategies.

The studies in (Gao et al., 2022, and Srivastava, Smith, Ghimire, & Gao, 2019) demonstrated that interactive learning is highly effective in undergraduate courses, particularly computer science and computer information systems. The research highlighted how engaging teaching methods, such as collaborative activities and hands-on problem-solving, significantly enhance students' comprehension, retention, and practical application of knowledge. Interactive learning fosters a more profound understanding and prepares students for real-world challenges by actively involving them in the educational process. Moreover, their findings emphasize its positive impact on critical thinking, teamwork, and academic performance, showcasing its potential as a transformative approach to modern education in technical disciplines.

Integrating tools like JMP, Colab, and Python are central to our teaching. These platforms enable students to manipulate real datasets, conduct statistical analyses, and create predictive models. For instance, students were tasked with analyzing sales data to forecast trends, blending theoretical knowledge with hands-on experience. The adoption of Google Colab further facilitated collaborative coding and seamless access to resources, fostering inclusivity and efficiency (Freeman et al., 2014).

Interactive simulations and visualization tools were employed to make abstract concepts tangible. Students used Python's libraries, such as Matplotlib and Seaborn, to create compelling visual narratives that supported data-driven decision-making. These tools encouraged exploration and critical thinking, empowering students to experiment with diverse approaches (Kuh, 2008).

The authors also integrated machine learning basics into the curriculum, introducing students to frameworks like Scikit-learn and TensorFlow. By working on supervised and unsupervised learning tasks, students gained exposure to the power of algorithms in deriving actionable insights from large datasets.

Collaborative Learning Environment

The authors actively cultivate a collaborative classroom environment. Team-based projects like market segmentation analyses and regression modeling mimic real-world analytics tasks, encouraging peer-to-peer learning and communication. This approach enhances understanding and prepares students for interdisciplinary collaboration in professional settings (Bonwell & Eison, 1991).

Collaborative exercises extended to cross-functional projects, where students simulated roles within an analytics team. For example, groups were assigned tasks replicating scenarios in product forecasting, requiring coordination across roles like data engineer, business analyst, and project manager. These exercises highlighted the interconnected nature of analytics roles and refined teamwork skills (Chickering & Gamson, 1987).

Peer evaluations and reflective reports further ensured accountability and helped students critically assess their contributions and learning experiences.

Problem-Based Learning/Project-Based Learning

Problem-based learning (PBL) is an instructional method that introduces relevant problems at the beginning of the instructional cycle and provides the context and motivation for the learning that follows. It is “always active and usually (but not necessarily) collaborative or cooperative…" (Prince, 2004) learning. PBL has many advantages, such as boosting students' motivation, facilitating enjoyment of the learning process, and understanding and applying the acquired knowledge (Pawson et al., 2006). PBL in class can enhance students' problem-solving skills and promote critical thinking (Gao et al., 2022; Srivastava, Smith, Ghimire, & Gao, 2019).

For instance, students work in teams to solve a real-world business problem for a retail company. The company faces declining sales and needs a data-driven strategy to improve customer retention and increase revenue.

Integrative Learning

Integrative learning is an educational approach that emphasizes connecting knowledge and skills across multiple disciplines to address complex problems or create cohesive understanding. It encourages students to apply learning from different academic, personal, and professional contexts to develop a holistic perspective and solve real-world challenges effectively (Huber & Hutchings, 2004).

For instance, Students are tasked with developing a predictive model for a retail company. The goal is to optimize inventory management, reduce stockouts, and minimize excess inventory costs. The project integrates knowledge from multiple disciplines, such as business strategy, data analytics, marketing, and operations management.

Real-World Applications

The curriculum integrates finance, healthcare, and retail case studies. Students apply analytic techniques to solve these problems, bridging the gap between academic learning and professional practice. One notable example involves applying clustering methods to identify customer segments for a retail company, an exercise that garnered high praise from participants (Biggs & Tang, 2011).

Guest lectures from industry professionals gave students insights into current trends and challenges in analytics. These interactions enriched the curriculum, fostering a deeper understanding of practical constraints and innovations in the field (Prince, 2004).

Unplugged activities like "More Processors are Not Always the Best" and "Penny Sorting Exercise" demonstrate practical applications of Parallel and Distributed Computing (PDC) concepts. These activities enable students to visualize and understand theoretical concepts like workload distribution, parallel sorting, and scheduling, enhancing their practical problem-solving abilities and using statistical analysis to study the impact of age, gender, and class standing (freshman, sophomore, junior, or senior) on student engagement toward active learning (Srivastava, Smith, Ghimire, and Gao, 2019).

Incorporating internships and capstone projects further cemented the connection between theory and practice. Partnering with companies for hands-on assignments allowed students to experience the intricacies of data analytics in a professional environment.

Student Support and Engagement

The authors complement our technical focus with an emphasis on student well-being. Open office hours, prompt feedback, and gamification techniques, such as leaderboard challenges for project accuracy, contribute to a supportive and engaging learning environment (Freeman et al., 2014).

He (Kuh) recognized diverse learning preferences and incorporated asynchronous resources like recorded lectures and step-by-step tutorials. This flexibility ensured all students could engage with the material at their own pace (Kuh, 2008).

Gamified learning extended to in-class coding challenges and quizzes, making learning enjoyable while reinforcing key concepts. Students appreciated the balance between structured guidance and opportunities for creative problem-solving.

3 GOOGLE CLOUD PLATFORM: COLAB

The authors want to introduce you to Google Cloud Platform's Colab (Gao et al., 2024). Google Compute Engine provides Virtual Machines (VMs) that run on Google's cutting-edge data centers and global fiber network. These VMs boot quickly, offer persistent disk storage, and deliver high performance. You can set up and start using Colab by following these four simple steps:

Step 1: Ensure your device is connected to the internet. You can use a computer, laptop, smartphone, tablet, Mac, PC, Chromebook, iPad, or even a Raspberry Pi.
Step 2: Log in to your Gmail account using Google Chrome or any other web browser.
Step 3: Open the same web browser where you are logged into your Gmail account.
Step 4: In the search bar at the top of the browser, type http://colab.research.google.com and press Enter.
Let us solve the following question in Colab.

You opened an investment account with an initial deposit of $1,000. Assuming a monthly return rate of 0.8% and a monthly contribution of $30, what will the account balance be after 720 months?

```
balance = 1000
for k in range(720):
  balance = balance *1.008 + 30
print(balance)
# Your name
```

```
1469500.9454376907
```

Let us ask the ChatGPT to solve the above question.

ChatGPT's Response (5:40 PM on 12/19/2024)**:**

The total balance in the account after 720 months is approximately $1,160,342.85.

Remark:

ChatGPT provided a wrong answer.

Thanks to its intuitive syntax and robust libraries, Python has become indispensable in addressing complex mathematical and computational challenges. Gao et al. (2024) emphasized the integration of Python in exploring the interplay between AI and human logic for mathematical problem-solving, demonstrating its role in enhancing algorithmic reasoning. Su et al. (2024) applied Python to investigate dominion on grids, showcasing its effectiveness in tackling graph-theoretical problems. Moreover, Gao, Malomo, Donald, and Eyob (2024) illustrated how Python facilitates problem-solving by combining logic, mathematics, algorithms, and generative AI. Python's utility in educational and computational environments, such as IDLE, Jupyter Notebook, and Colab, was highlighted in studies comparing matrix multiplication methods (Gao, Malomo, Allagan, Eyob, & Su, 2023). Additionally, Gao et al. (2023) and Gao et al. (2022) demonstrated Python's efficiency in generating Pell and Fibonacci numbers, offering valuable insights into numerical computations. These studies underscore Python's vital role in advancing computational research and its applications in various scientific domains.

4 PLOTTING DATA WITH MATPLOTLIB

The matplotlib package is a Python library for creating two-dimensional charts and graphs. Since it is not included in Python's standard library, you need to install it separately after installing Python on your system.
To install matplotlib:
On Windows: Open the Command Prompt and run the following command:

```
pip install matplotlib
```

On macOS or Linux: Open the Terminal and run:

```
sudo pip3 install matplotlib
```

Importing the pyplot Module
The matplotlib package includes a module called pyplot that is essential for creating the graphs and charts demonstrated. There are several ways to import this module, but the most straightforward approach is:

```
import matplotlib.pyplot
```

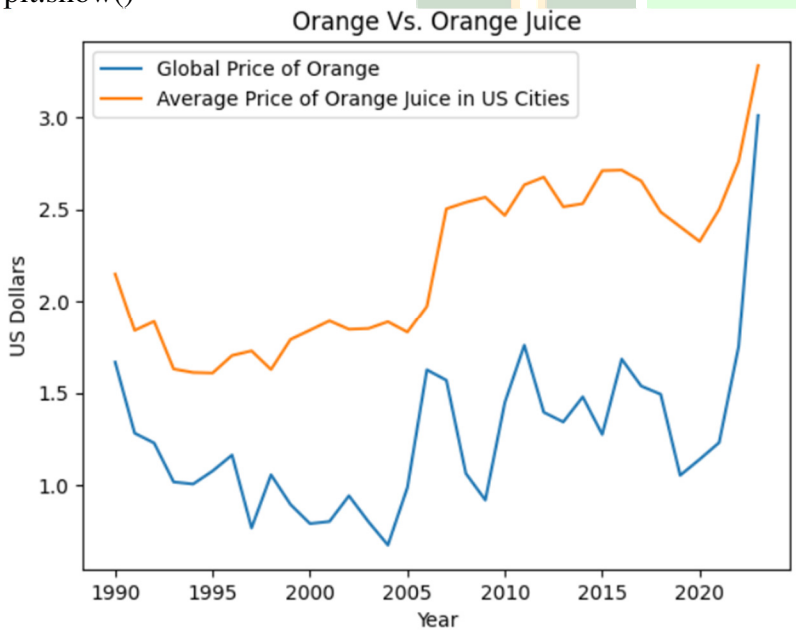
The pyplot module provides various functions for building and displaying graphs. If you import the module this way, you must prefix each function call with matplotlib.pyplot.
The authors will show examples of using the plot function in the following.

Creating a Line Graph

The authors will plot the following data: the global price of oranges per pound and the average price of orange juice (frozen concentrate, 12-ounce can, cost per 16 ounces or 473.2 milliliters) in U.S. cities from 1990 to 2023 (Federal Reserve Bank of St. Louis 1&2, 2024). Here is the Python program.

```
import matplotlib.pyplot as plt
```

```
Years = [1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000,
        2001,2002,2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012,
        2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023]
Orange = [1.666969642, 1.28299375, 1.229794606, 1.019286401, 1.007888599,
         1.078445768, 1.164906352, 0.770810993, 1.057988149, 0.897508985,
         0.794017772, 0.805457642, 0.944485292, 0.804321441, 0.67798805,
         0.989541165, 1.625439058, 1.569090168, 1.065363698, 0.921418254,
         1.448703914, 1.758696866, 1.39576627, 1.343555969, 1.479302856,
         1.276118888, 1.683079465, 1.537643893, 1.493225688, 1.055089654,
         1.141503045, 1.23203276, 1.750987762, 3.00884265]
plt.plot(Years, Orange, label = "Global Price of Orange")
Juice = [2.149, 1.839, 1.888, 1.63, 1.611, 1.608, 1.703, 1.728, 1.627, 1.79,
        1.84, 1.891, 1.845, 1.849, 1.886, 1.83, 1.973, 2.503, 2.538, 2.566,
        2.467, 2.633, 2.675, 2.514, 2.531, 2.71, 2.713, 2.654, 2.486, 2.406,
        2.326, 2.5, 2.761, 3.28]
plt.plot(Years, Juice, label = "Average Price of Orange Juice in US Cities")
plt.xlabel('Year')
plt.ylabel('US Dollars')
plt.title('Orange Vs. Orange Juice')
plt.legend()
plt.show()
```



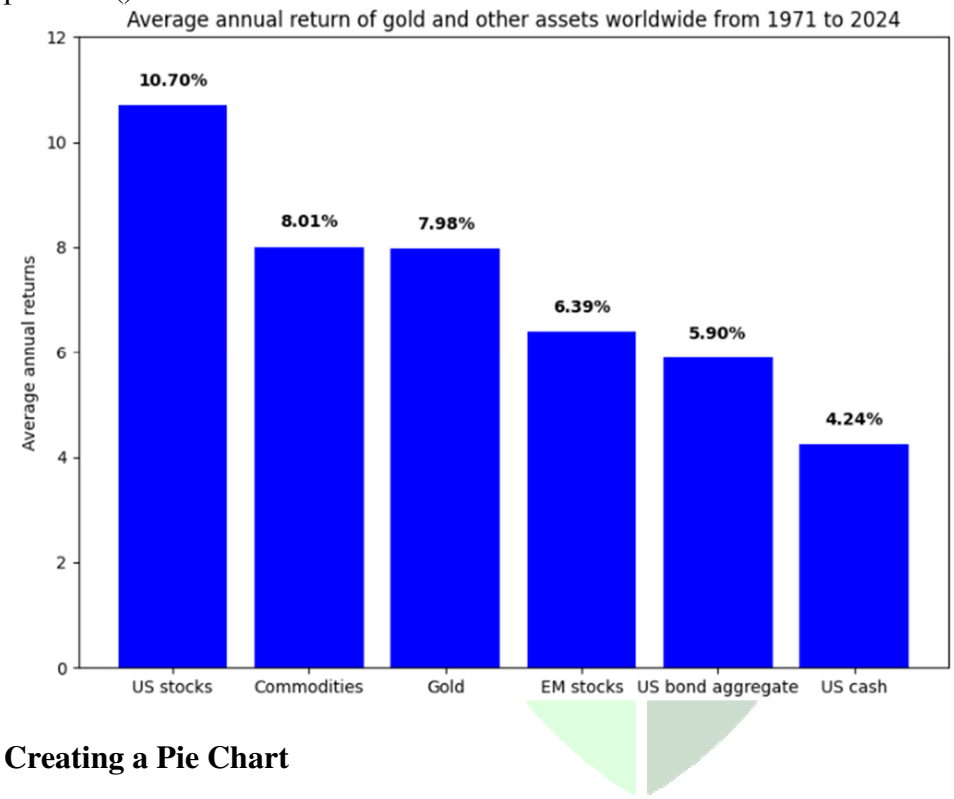
Creating Bar Chart

The authors will use the data on the average annual return of gold and other assets worldwide from 1971 to 2024 (Statista, 2024).

Here is the Python code.

```
import matplotlib.pyplot as plt
assets = ['US stocks', 'Commodities', 'Gold', 'EM stocks', 'US bond aggregate', 'US cash']
returns = [10.70, 8.01, 7.98, 6.39, 5.90, 4.24]
fig, ax = plt.subplots(figsize=(8, 6))
```

```
bar_colors = ['blue'] * len(assets)
ax.bar(assets, returns, color=bar_colors)
ax.set_title('Average annual return of gold and other assets worldwide from 1971 to 2024')
ax.set_ylabel('Average annual returns')
ax.set_ylim(0, 12)
for i, value in enumerate(returns):
    ax.text(i, value + 0.3, f"{value:.2f}%", ha='center', va='bottom', fontsize=10,
fontweight='bold')
plt.tight_layout()
plt.show()
```

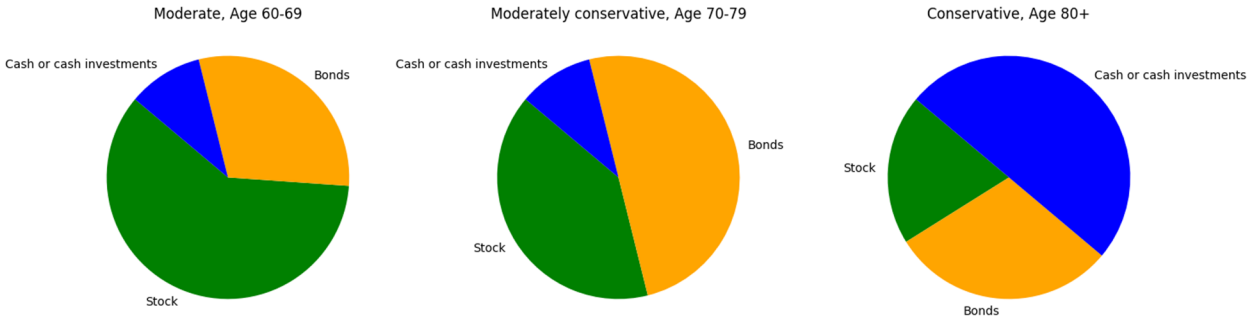


Creating a Pie Chart

The authors will use the data from (Willams, 2023) to create a pie chart. Here is the Python code.

```
import matplotlib.pyplot as plt
labels = ['Stock', 'Bonds', 'Cash or cash investments']
moderate = [60, 30, 10]
moderately_conservative = [40, 50, 10]
conservative = [20, 30, 50]
colors = ['green', 'orange', 'blue']
fig, axes = plt.subplots(1, 3, figsize=(15, 5))
axes[0].pie(moderate,labels=labels,autopct=None,startangle=140, colors=colors)
axes[0].set_title('Moderate, Age 60-69')
axes[1].pie(moderately_conservative, labels=labels, autopct=None,
        startangle=140, colors=colors)
axes[1].set_title('Moderately conservative, Age 70-79')
axes[2].pie(conservative, labels=labels, autopct=None,
```

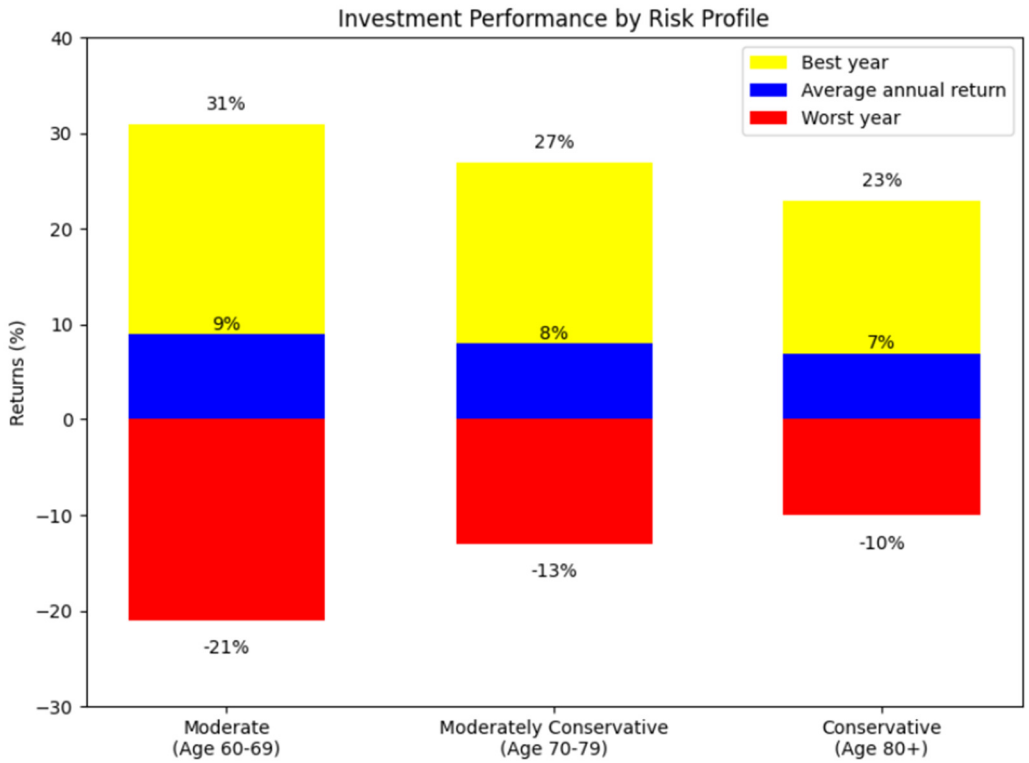
```
        startangle=140, colors=colors)
axes[2].set_title('Conservative, Age 80+')
plt.tight_layout()
plt.show()
```



The following Python program creates the above three pie charts vertically.

```
import matplotlib.pyplot as plt
sales = [5, 35, 65]
slice_labels = ['Cash or cash investments', 'Bonds', 'Stock']
plt.pie(sales, labels=slice_labels)
plt.title('Moderate, Age 60-69')
plt.show()
sales = [10, 50, 40]
slice_labels = ['Cash or cash investments', 'Bonds', 'Stock']
plt.pie(sales, labels=slice_labels)
plt.title('Moderately conservative, Age 70-79')
plt.show()
sales = [50, 20, 30]
slice_labels = ['Cash or cash investments', 'Bonds', 'Stock']
plt.pie(sales, labels=slice_labels)
plt.title('Conservative, Age 80+')
plt.show()
```

Note:
Retirees who adopted the plan would have seen the following results in their portfolios (Willams, 2023):



The authors created the above graph using Python code.

```
import matplotlib.pyplot as plt
categories = ["Moderate\n(Age 60-69)", "Moderately Conservative\n(Age 70-79)",
              "Conservative\n(Age 80+)"]
best_year = [31, 27, 23]
average_return = [9, 8, 7]
worst_year = [-21, -13, -10]
x = [0, 1, 2]
bar_width = 0.6
fig, ax = plt.subplots(figsize=(8, 6))
ax.bar(x, best_year, bar_width, label="Best year", color='yellow')
ax.bar(x,average_return,bar_width,label="Average annual return",color='blue')
ax.bar(x, worst_year, bar_width, label="Worst year", color='red')
ax.set_ylabel('Returns (%)')
ax.set_title('Investment Performance by Risk Profile')
ax.set_xticks(x)
ax.set_xticklabels(categories)
ax.set_ylim(-30, 40)
ax.legend()
for i, pos in enumerate(x):
    ax.text(pos, best_year[i] + 1, f"{best_year[i]}%", ha='center',
            va='bottom', color='black')
    ax.text(pos, average_return[i] + 1, f"{average_return[i]}%", ha='center',
            va='center', color='black')
    ax.text(pos, worst_year[i] - 2, f"{worst_year[i]}%", ha='center',
```

```
        va='top', color='black')
plt.tight_layout()
plt.show()
```

5 JMP SOFTWARE
6

JMP is a suite of software tools for statistical analysis developed by JMP, a subsidiary of the SAS Institute. Renowned for its intuitive interface, JMP is widely utilized in academic research, business analytics, and scientific industries to explore data, conduct statistical modeling, design experiments, and produce insightful visualizations effectively (Gao, 2023).

The authors created a data file named "Price of Gold, Bonds, and Real Estate" using the prices of gold, bonds, and real estate from 1928 to 2023 (Damodaran, 2024). They will use this data file in the following.

Scatter Plot Matrix

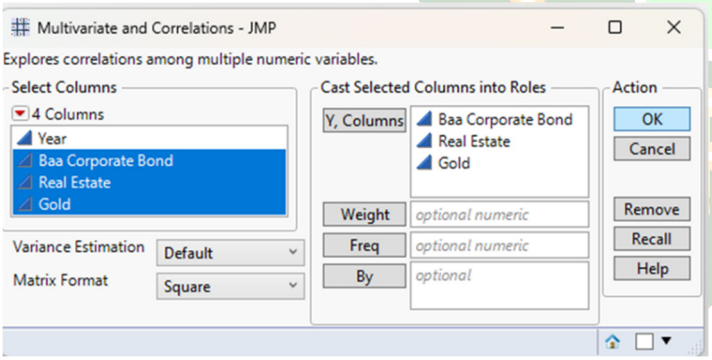
The authors will use JMP to generate a Scatter Plot Matrix.

The authors opened the file "Price of Gold, Bond, and Real Estate" with JMP software and followed the instructions below.

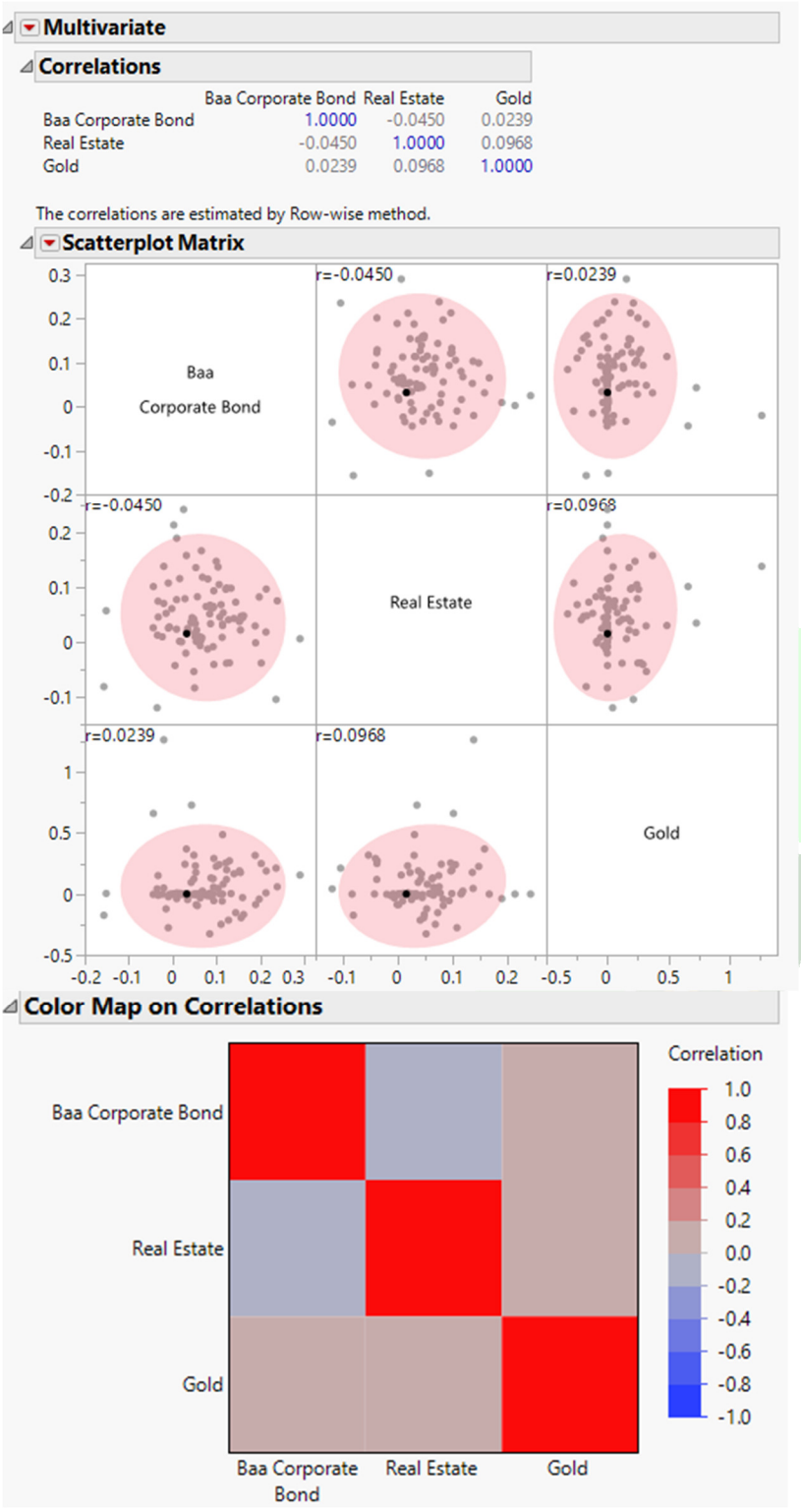
Analyze --> Multivariate Methods --> Multivariate

Highlight all the quantitative variables and then click Y, Columns

Then click OK



Now, the authors see all the pairwise scatter plots and the correlation matrix.



Hierarchical Clustering

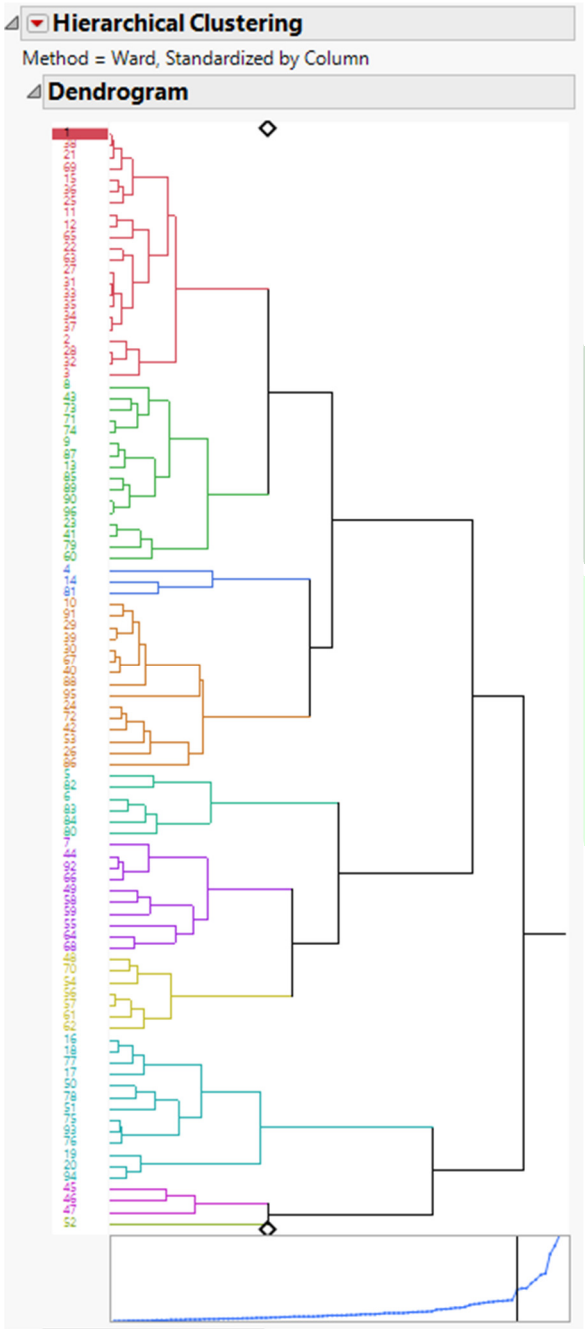
The authors opened the file "Price of Gold, Bond, and Real Estate" with JMP software and followed the instructions below.

Analyze → Clustering → Hierarchical Cluster

Select one or more variables (we use three variables: Baa Corporate Bond, Real Estate, Gold) from Select Columns and click Y, Columns.

Select the desired method (bottom left corner) and click OK.

You can observe the following: a dendrogram that illustrates the clusters formed at each step, a scree plot displaying the distance covered at each step, and the clustering history, which provides statistical details for each step.



Clustering History

Number of Clusters	Distance	Leader	Joiner
95	0.019158089	1	38
94	0.024494755	31	33
93	0.032572920	34	37
92	0.044884111	28	32
91	0.049625645	27	31
90	0.050966069	90	96
89	0.067983115	1	21
88	0.068525302	27	35
87	0.077097243	30	67
86	0.102767479	56	57
85	0.102779721	71	74
84	0.106234456	29	39
83	0.126699205	23	41
82	0.133545712	11	12
81	0.137917377	15	36
80	0.148028865	16	18
79	0.153799979	44	92
78	0.156067533	9	87
77	0.178978989	75	93
76	0.189860852	30	40
75	0.212581234	24	72
74	0.213491663	27	34
73	0.216255081	1	69
72	0.221163832	75	76
71	0.225422623	22	63
70	0.237410350	15	25
69	0.246412877	10	91
68	0.252667616	85	89
67	0.253200107	44	66
66	0.276632555	9	13

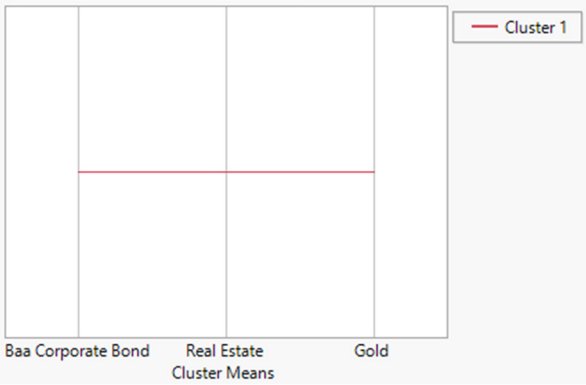
Cubic Clustering Criterion

	Number of Clusters	CCC	.2 .4 .6 .8
->	1	0.000	
	2	-3.149	
	3	-4.693	
	4	-5.967	
	5	-5.950	
	6	-5.375	
	7	-4.789	
	8	-4.191	
	9	-3.800	
	10	-3.095	

Cluster Means

Cluster	Count	Baa Corporate Bond	Real Estate	Gold
1	96	0.069537	0.044181	0.065542

Cluster Standard Deviations



K-Means Clustering

The authors opened the file "Price of Gold, Bond, and Real Estate" with JMP software and followed the instructions below.
Analyze → Clustering → K-Means Cluster → OK
Please select one or more variables (the authors use three variables: Baa Corporate Bond, Real Estate, Gold) from Select Columns and click Y, Columns.
In the resulting Control Panel, choose K Means Cluster Under Method.
Enter the number of clusters. Click Go. Here, the authors chose 3.
JMP will summarize each variable's cluster sizes and tables of cluster means and standard deviations.
Click the red triangle for the K Means heading to obtain biplots, parallel plots, or request other options.

Iterative Clustering

Cluster Comparison

Method	NCluster	CCC	Best
K Means Cluster	3	-4.8862	Optimal CCC

Columns Scaled Individually

Control Panel

K Means NCluster=3

Columns Scaled Individually

Cluster Summary

Cluster	Count	Step	Criterion
1	51	9	0
2	3		
3	42		

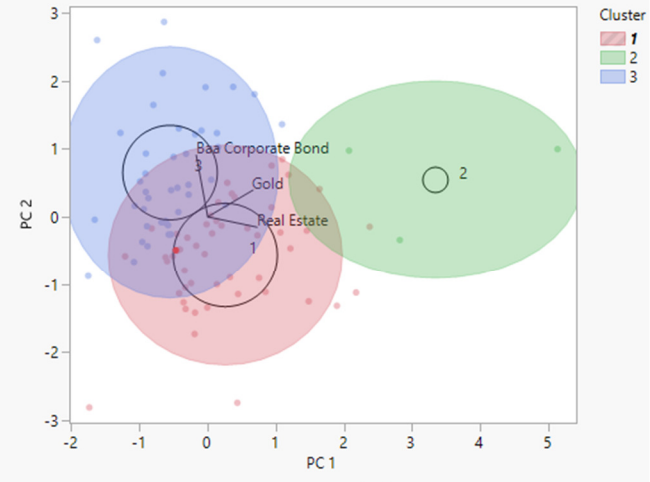
Cluster Means

Cluster	Baa Corporate Bond	Real Estate	Gold
1	0.0340209	0.07169954	0.02208975
2	-0.006906	0.0907935	0.88551354
3	0.11812315	0.00743721	0.05973553

Cluster Standard Deviations

Cluster	Baa Corporate Bond	Real Estate	Gold
1	0.05974549	0.05822233	0.12630363
2	0.036716	0.04271536	0.27011676
3	0.06865427	0.04626323	0.15054474

Biplot



7 SELECTED STUDENT'S FEEDBACK AND COMMENTS

The following are comments from students after taking the business analytics course.

This course has been an amazing experience for me. I enjoyed attending class and learning something new while improving my grade in every class. The teaching style of this course also played a major role in how I feel about the course overall. The most impactful moment in this course was learning how to use JMP, which makes solving equations and functions so much easier. I know I will need JMP along with my accounting journey. I will use the techniques I learned from this course in my accounting career. I will always be sure to look over my notes, as they are very detailed. Great job teaching this course, Professor!

The Business Analytics course was highly engaging, thanks to our professor's dynamic teaching style and collaborative group projects that fostered teamwork. Learning about data visualization and predictive modeling was particularly impactful, deepening my analytical skills. I plan to apply these insights into strategic decision-making and problem-solving in future professional roles.

One of the most important things I learned was how to use critical tools like JMP Software and Google Colab in real life. These tools not only helped me learn more about data analysis but also gave me hands-on training that I can use in the real world. It has been helpful and motivating to learn how to use JMP Software to visualize and understand data and Google Colab to work together on projects.

My favorite thing I learned in this course was the JMP program. I've never heard of it before this course. You made it easy to understand and easy to work in. You've also shown me to think more outside the box through the time I've spent with you. Again, I appreciate the hard work and dedication you put in through your work and your students. Very appreciative of you!

The professor created an enjoyable and collaborative learning atmosphere, and I liked my time in this class. The subjects covered in this course were especially important to me because it was closely tied to business statistics. I thought these teachings were particularly helpful because business statistics is the basis of business analytics. Throughout my academic career, I intend to use the abilities I've gained here in other classes.

My Business Analytics class has been engaging and insightful this semester. He carefully breaks down problems, ensuring we understand each step. His teaching style helped me understand the course material and complete the assignments. We gained hands-on experience using Excel, JMP, and Colab to solve problems and develop valuable skills, making the learning process practical and applicable to real-world scenarios.

The Business Analytics class was enjoyable. Hands-on use of Google Colab and JMP software enhanced technical skills and visualized complex datasets. Understanding the notion of standard deviation and its significance in examining data distribution was an important learning experience for me.

The most significant learning moments were with the students and my teacher. It was amazing how you took your time to help us understand everything in the course. Even the students helped one another, and we were able to build new friendships. Learning Business Analytics was more than just helpful; it was also fun.

Some good things that happened in my class were the people I met. During my time in class, I met many kinds of people and learned from them as the semester went by. Overall, I enjoyed this semester.

The Professor's dedication to his students' growth, combined with his approachable and inspiring teaching style, made a significant difference. The practical skills and knowledge I gained in Business Analytics have set a solid foundation for my future studies and career in finance, opening doors to exciting opportunities. The hands-on experience with tools like JMP and Colab was invaluable, and I am excited to build on this foundation as I advance in my academic and professional pursuits.

The most significant idea would be to use JMP Software. That is because we could use that same software during our careers. Knowing how to navigate that software will become very handy in the future.

I learned in business analytics that analytics can be used not just in the business world but also in daily life. I intend to use what I learned in the classroom for my future job in information technology, and I feel like it will be used more effectively there.

In the Business Analytics class, I enjoyed how the lessons were practical and based on real-world examples. Your engaging teaching style made complex topics easy to understand. One key takeaway was learning how to analyze and present data clearly. I plan to use these skills in future jobs to help make better decisions and improve business outcomes.

The experience of taking this course has been fulfilling and enriching. Building a strong foundation in the subject matter was made simple by the carefully organized content, which made it simple to understand complicated ideas. Active engagement was encouraged by the dynamic and captivating teaching approach, which improved my comprehension and memory of the subject matter. Peer collaboration exercises not only promoted teamwork but also offered a variety of viewpoints, which enhanced the learning process. I particularly valued the case studies and real-world applications, which made it easier to relate theoretical understanding to real-world situations. This class has been motivating and crucial to my academic and personal development.

I want to start by saying that you've been the best teacher I had this semester; if it weren't for your good teaching skills, I wouldn't have made it far, so thanks for that; this class helped me better my problem-solving skills when it came to solving problems.

In my Business Analytics class, I thoroughly enjoyed the hands-on approach to learning, particularly how data analysis was applied to real-world business problems. Collaborative learning through group projects enhanced my understanding of analytics tools. The most impactful moment was mastering predictive analytics, which I plan to use in my future business ventures to make data-driven decisions and identify market trends effectively.

After taking this class, I learned that different equations from calculus and statistics can be applied to solve industry applications. My major is in accounting, so applying what I've learned from business analytics will benefit me while enrolled in college and after graduation. It will assist me in the position that I'll assume, which is to interpret data**.**

One way I intend to apply what I learn in future endeavors is to use it in my business and find hidden patterns in large datasets. use it for tracking, measuring, and plenty more. I can use what I learn in marketing strategies and product design. I learned how to use data to make decisions and provide possible outcomes on data charts. I learned to make better decisions and plan more.

I enjoyed business analytics this semester. As an accounting major, I find it very important to break down and analyze data. The professor offered a dynamic learning environment that made me feel comfortable expressing what I misunderstood and understood what was being taught.

I enjoyed taking Business Analytics with you. You were very engaging, and we learned how to use the JP software. The one thing I took from this class that I am going to take with my future clashes is the skill of time management, as well as the skill of asking my professor for help when needed.

8 RESULTS

Enhanced Analytical Proficiency

Students reported significant improvements in their ability to handle complex datasets and apply statistical and machine-learning techniques. Feedback highlighted mastery of tools like JMP, alongside the ability to critically interpret results and derive actionable insights. For instance, students successfully built models to predict customer churn and optimize marketing strategies (Laurillard, 2012).

Confidence in Real-World Problem Solving

Assignments simulating industry scenarios bolstered students' confidence. Projects like creating dashboards for business intelligence were frequently cited as transformative experiences, preparing students for data-centric roles. Notably, students showcased these projects in portfolio reviews, receiving positive feedback from prospective employers (Bransford et al., 2000).

Case studies derived from current market trends enabled students to understand the dynamic nature of analytics and its application to decision-making processes. These experiences provided valuable talking points for interviews and networking events.

Improved Teamwork and Communication

Collaborative tasks enhanced students' interpersonal and teamwork skills. Peer reviews revealed that group discussions helped clarify complex concepts and diversified problem-solving approaches. Moreover, these interactions fostered a sense of community, encouraging mutual support (Bonwell & Eison, 1991).

Regular group presentations and team-led Q&A sessions simulated boardroom scenarios, equipping students with the confidence to articulate their findings effectively. These exercises also emphasized the importance of data storytelling in business contexts.

High Levels of Engagement

Innovative teaching strategies ensured sustained interest throughout the course. Interactive sessions and real-time feedback on projects kept students motivated and proactive in their learning journey. Students particularly valued the dynamic discussions facilitated during case study analyses (Kuh, 2008).

Summary:

Active learning, an instructional approach that actively engages students in the learning process through discussions, problem-solving, and hands-on activities, has significantly improved academic outcomes. Research indicates active learning strategies enhance students' grades, attendance, and classroom participation. These methods shift the focus from passive reception of information to active involvement, fostering a more profound understanding and retention of material. For instance, activities like group work, peer teaching, and real-world problem-solving encourage collaboration and critical thinking. Students are more likely to attend classes when they find the learning process engaging and interactive, leading to higher attendance rates. Furthermore, the inclusive and participatory nature of active learning creates an environment where students feel motivated to contribute, enhancing classroom dynamics. This pedagogical approach benefits diverse learners and is increasingly recognized as a vital component of effective teaching (Freeman et al., 2014).

9 GENERATIVE AI

You may have heard a story like the one below. Is the story meant to be a joke?

Ryan, an enthusiastic undergraduate majoring in Business Analytics, had just completed two semesters in the program. His dedication and high GPA earned him an award for outstanding academic performance.

At the award ceremony, Ryan was interviewed. When asked about his career goals, he confidently declared, “I want to be the Chief Data Scientist at Google.”

Impressed by his determination, the chair of the Business Analytics Department handed Ryan a business card featuring sophisticated data visualization. Ryan examined the card with a perplexed expression and asked, “What does this show?”

Assuming it was a lighthearted remark, the chair chuckled and replied, “It’s a performance dashboard, an essential tool in data analytics. Could you walk me through how you might design one?”

Ryan paused before responding, “I can’t explain it right now, but I could email you a sample dashboard template.”

The chair, curious about his response, asked, “What would you say is your greatest strength ssas a future data scientist?”

Ryan smiled confidently and said, “ChatGPT. I’m really good at using it.”

Intrigued, the chair asked, “What tools are you proficient in?”

Ryan replied, “Two: iPhone and ChatGPT.”

Later, another faculty member inquired, “What’s the most important thing you’ve learned during your analytics courses?” Ryan glanced at his phone, hesitated, and said, “One moment. Let me check… Okay, ChatGPT says I’ve learned how to use ChatGPT.”

Let’s ask ChatGPT to verify whether the story is authentic.

ChatGPT's Response (7:40 PM on 12/19/2024)**:**

The story is likely fictional and appears to be crafted as a humorous or satirical narrative rather than an authentic account.

Given the rapid pace of technological advancements and the increasing reliance on AI tools in education and professional settings, a scenario like this could happen in five years.

Maximizing Potential: Wise and Ethical Use of Generative A

Generative AI can enhance problem-solving, decision-making, and innovation across various fields when used wisely. Gao et al. (2023, 2024) emphasize the importance of combining generative AI with foundational skills like logic, mathematics, and algorithms for effective problem-solving. This integration ensures that AI is a complementary tool rather than a replacement for critical thinking. In investment and financial decision-making, Gao and Gao (2024) highlight how generative AI can provide insights by analyzing vast datasets while requiring users to apply foundational knowledge for sound judgments.

Moreover, Gao et al. (2024) stress the interplay between human logic and AI, advocating for a balanced approach that leverages AI's computational power without sidelining human creativity and reasoning. Russ (2021) underscores the need for a sustainable framework that aligns AI applications with ethical and societal goals. Wise use of generative AI involves critical evaluation, ethical considerations, and fostering human-AI collaboration to maximize its potential.

10 DISCUSSION AND CONCLUSION

The pedagogical strategies adopted in teaching Business Analytics highlight a shift toward experiential and collaborative learning, preparing students to excel in data-driven roles. The curriculum bridges theoretical concepts and practical applications by integrating tools such as JMP, Colab, and Python. Students engage in real-world scenarios, developing critical thinking, teamwork, and communication skills essential for translating data into actionable business strategies. These methodologies enhance analytical proficiency and boost students' confidence in tackling industry-relevant challenges.

Despite these successes, challenges persist. Diverse learning places necessitate tailored support while emerging tools like Tableau and Power BI call for regular curriculum updates. Expanding industry partnerships could enhance relevance, providing students mentorship and exposure to contemporary practices. Ethical considerations, including data privacy and algorithmic bias, must be embedded in the curriculum to prepare students for responsible analytics practices. Global case studies and sustainability analytics could further enrich learning, exposing students to cross-cultural challenges and the role of data in addressing environmental concerns.

The future of Business Analytics education lies in leveraging innovations like augmented and virtual reality for data visualization, gamified learning platforms, and AI-driven teaching assistants. These advancements promise to deepen student engagement and align academic outcomes with evolving industry standards.

This approach equips students to thrive in an increasingly complex analytical landscape by fostering a balance of technical expertise, ethical responsibility, and industry awareness.

Future research should focus on scaling these methods for larger class sizes and fully online environments, ensuring broader accessibility and sustained impact. The continued integration of cutting-edge tools, practical case studies, and interdisciplinary approaches will be pivotal in maintaining the relevance and effectiveness of Business Analytics education, preparing students to address dynamic challenges in a rapidly evolving field.

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