Integrating Data-Related Courses into Business Education: A Curriculum Analysis for Non-Tech Savvy Students

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Abstract

This paper analyzes the integration of data-related courses within business education, focusing on accommodating non-technical students. The study examines syllabi from four distinct courses: Business Intelligence, Tools for Data Analytics, Artificial Intelligence, and Machine Learning in Business, assessing their objectives, content, and teaching methodologies. Our analysis reveals a strategic emphasis on applied learning, practical skills, and the use of business-relevant tools, catering effectively to the educational needs of business students lacking a technical background. Furthermore, supporting cases are provided to illustrate the range of learning tools applied in each course. Additionally, insights and implications for curriculum development are discussed to help facilitating further advancement. However, the limitations i.e., rapid technological changes, methodological constraints are also mentioned for guiding future research. In conclusion, the combination of data-related courses tailored for non-tech savvy students within business education is not only viable but also highly useful. The strategies identified in this study provide a constructive blueprint for business schools to equip their students with essential data capabilities, ensuring they are ready to confront the challenges of a data-centric business world.

Keywords: Data-related; Non-Tech Savvy; Business Intelligence; Data Analytics; Business Education

การบูรณาการหลักสูตรที่เกี่ยวข้องกับข้อมูลเข้ากับการศึกษาธุรกิจ: การวิเคราะห์หลักสูตรสำหรับนักเรียนที่ไม่เชี่ยวชาญด้านเทคโนโลยี

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บทคัดย่อ

บทความนี้มีเป้าหมายเพื่อวิเคราะห์วิชาที่เกี่ยวข้องกับข้อมูลที่มีการเรียนการสอนในหลักสูตรบริหารธุรกิจ สำหรับนักศึกษาที่ไม่เชี่ยวชาญด้านเทคนิค โดยบูรณาการจาก 4 รายวิชาที่แตกต่างกันในหลักสูตร ได้แก่ ระบบธุรกิจอัจฉริยะ เครื่องมือสำหรับการวิเคราะห์ข้อมูล ปัญญาประดิษฐ์ และการเรียนรู้ของเครื่องจักรในธุรกิจ การประเมินวัตถุประสงค์ เนื้อหา และวิธีการสอน ผลการวิเคราะห์การบูรณาการรายวิชาของหลักสูตรชี้ว่า รายวิชาดังกล่าวเน้นกลยุทธ์ในการเรียนรู้แบบประยุกต์ ทักษะการปฏิบัติ และการใช้เครื่องมือที่เกี่ยวข้องกับธุรกิจ ที่จำเป็นสำหรับการศึกษาของนักศึกษาธุรกิจที่ขาดพื้นฐานทางเทคนิคอย่างมีประสิทธิภาพ มีกรณีศึกษาสนับสนุนประกอบการอธิบายเครื่องมือการเรียนรู้ต่างๆ ที่ใช้ในแต่ละหลักสูตร นอกจากนี้ยังมีการหารือถึงข้อมูลเชิงลึกและนัยต่อการพัฒนาหลักสูตรที่เป็นประโยชน์ในการพัฒนาต่อยอดหลักสูตร แม้จะมีข้อจำกัด เช่น การเปลี่ยนแปลงทางเทคโนโลยีอย่างรวดเร็ว ระเบียบวิธีในการวิจัย ซึ่งยังเป็นประเด็นถกเถียงในแนวทางในการวิจัยในอนาคต โดยสรุปแล้ว การผสมผสานรายวิชาในหลักสูตรที่เกี่ยวข้องกับข้อมูลที่ถูกออกแบบมาสำหรับนักเรียนผู้ซึ่งไม่มีความเชี่ยวชาญด้านเทคโนโลยีในด้านธุรกิจศึกษาไม่เพียงแต่ใช้งานได้จริง แต่ยังมีประโยชน์อย่างมากสำหรับผู้เรียน ซึ่งกลยุทธ์ที่เกิดขึ้นในการศึกษาครั้งนี้เป็นพิมพ์เขียวสำหรับการเรียนการสอนด้านธุรกิจ เพื่อให้นักศึกษามีความสามารถด้านข้อมูลที่จำเป็น พร้อมที่จะเผชิญกับความท้าทายของโลกธุรกิจที่เน้นข้อมูลเป็นศูนย์กลาง

คำสำคัญ: Data-related; Non-Tech Savvy; Business Intelligence; Data Analytics; Business Education

1. Introduction

The contemporary business landscape is increasingly data-driven, necessitating the integration of data competency across all levels of business education. This integration poses challenges when designing curricula for students without a technical background. This paper aims to explore how business schools can effectively incorporate data-related courses to equip non-tech savvy students with the necessary skills and knowledge to thrive in a data-centric business environment (Mauro & Valigi, 2020).

The rapid advancement of digital technologies has transformed the global business landscape, placing an unprecedented emphasis on data as a pivotal element of strategic decision-making. Modern businesses now rely extensively on data analytics, business intelligence, and artificial intelligence to drive operations, innovate services, and enhance customer experiences (Elger & Shanaghy, 2020). This shift necessitates a corresponding evolution in business education, where future leaders must be equipped not only with traditional management skills but also with a robust understanding of data-driven technologies.

However, integrating data-related courses into business curricula presents significant challenges, especially in educating students who do not possess a background in technology. These non-tech savvy students often find themselves at a disadvantage, struggling with the technical complexities inherent in data science and related fields. The gap in technical proficiency can hinder their ability to effectively engage with data-centric subjects, thereby impacting their readiness for the data-driven aspects of modern business roles (Sharda et al., 2020).

Addressing this educational gap requires a thoughtful curriculum design that balances the depth of technical knowledge with the accessibility needed by students with diverse academic backgrounds. The goal is to demystify the complexities of data analytics, artificial intelligence, and machine learning, making these subjects approachable and applicable to all business students regardless of their prior technical expertise.

This paper seeks to explore how business schools can effectively integrate data-related courses into their curricula to cater to the educational needs of non-technical students. By analyzing specific course syllabi—focusing on Business Intelligence, Tools for Data Analytics, Artificial Intelligence, and Machine Learning in Business—we assess how these courses are structured to achieve this integration. Our study examines the course objectives, content, and teaching methodologies to identify strategies that not only convey critical technical competencies but also ensure that these competencies are accessible and valuable to non-tech savvy students. Through this analysis, we aim to provide insights into curriculum development practices that can bridge the technical gap, fostering an inclusive educational environment that prepares all students for the challenges of a data-centric business world.

2. Literature Review

Several sources discussing aspects relevant to the framework, which emphasize applied learning, business context, accessible tools, progressive structures, assessment strategies, and supportive educational environments:

Adaptive and Blended Learning: Adaptive e-learning environments are designed to cater to individual learning styles, enhancing student engagement and outcomes by presenting content in ways that align with their preferences (El-Sabagh, 2021). Blended learning models combine face-to-face and online instruction, found to be effective in improving learning outcomes compared to purely online or traditional methods (Dziuban et al., 2018).

Technological Integration in Education: The integration of ICTs in education, particularly in non-traditional settings, increases accessibility to educational resources, catering to a wider and often underserved student base. This integration includes the use of e-learning technologies to facilitate interactive teaching and improve learning processes, particularly in regions with limited access to traditional educational facilities (Alenezi, 2023; Asad et al., 2021).

Learning and Development (L&D) Strategy in Business Contexts: Effective L&D functions align with a company's strategic goals, supporting business transformations such as digital shifts. These strategies are designed to fill capability gaps and are often integrated through blended learning platforms that combine digital and in-person training (Brassey et al., 2019).

Supportive Educational Environments: The role of supportive learning environments is crucial, as it fosters a culture of learning that accommodates diverse learning needs and backgrounds. Initiatives such as Universal Design for Learning (UDL) and inclusive pedagogies enhance accessibility and engagement for all students (UNESCO, 2021).

These elements, when integrated, create a robust framework for educational success, particularly in higher education and professional training contexts. Each component supports various aspects of a learner's journey, making education more inclusive, accessible, and aligned with current and future needs.

3. Methodology

The study conducted a qualitative analysis of course syllabi from a business school, focusing on courses related to Business Intelligence (IS312), Tools for Data Analytics (IS461), Artificial Intelligence (IS361), and Machine Learning in Business (IS785). The analysis aimed to categorize course content, objectives, and methodologies to assess how these courses are designed to accommodate non-technical business students.

By examining these courses, from foundational subjects to specialized applications, the methodology provided a comprehensive overview of the educational approaches used to integrate complex data-related topics in a manner that is accessible and engaging for business students without a technical background. The analysis was conducted through the following steps:

3.1 Selection of Course Syllabi

The selection of course syllabi for this study was designed to understand how data-related courses are integrated into business education for non-technical students. The process involved choosing courses that are crucial for teaching data skills within a business context, focusing on those relevant to core business functions and appealing to students without prior programming or technical experience.

Courses selected included those foundational to data analytics, business intelligence, artificial intelligence, and machine learning, ensuring they are essential for comprehending data application in business. The selection criteria aimed to provide a comprehensive view of how complex data concepts are effectively communicated to students from non-technical backgrounds, with each course syllabus offering detailed insights into course structure, objectives, teaching methods, and assessment criteria. The process for selecting the course syllabi involved several steps:

- **Identification of Relevant Courses:** Initially, a broad scan of the business school's course offerings was conducted to identify all courses related to data sciences as applied in business contexts. This included courses explicitly labeled under categories such as business analytics, artificial intelligence, and machine learning.
- **Assessment of Course Content:** Courses were then evaluated based on their syllabi to ascertain the depth and nature of the content provided. Priority was given to courses that explicitly mentioned methodologies, tools, and frameworks accessible to non-technical students. This assessment helped understand how many courses are designed to accommodate students without a strong technical foundation.
- **Course Selection:** The selection of the syllabi included:

    - IS312 Business Intelligence and Analytics: This course focuses on the strategic use of data and analytical tools to enhance business decision-making processes.
    - IS461 Tools for Data Analytics: It introduces various data analytics tools that are essential for business intelligence processes.
    - IS361 Artificial Intelligence: This course provides a foundation in artificial intelligence concepts and their applications in business.
    - IS785 Machine Learning in Business: It explores the application of machine learning techniques specifically tailored for business problems.

The chosen courses represent a mix of introductory and advanced topics in data-related fields, ensuring a comprehensive analysis of how business schools are equipping non-technical students with necessary data competencies. This selection process was crucial for ensuring that the study covered a range of pedagogical approaches and content areas, providing a robust foundation for the subsequent phases of the study.

3.2 Data Extraction

Key information was extracted from each syllabus, including:

- **Course Objectives:** What are the intended learning outcomes, and how do they align with the needs of non-technical students?
- **Course Content:** What topics are covered, and what tools and technologies are introduced?
- **Teaching Methodologies:** How are the courses delivered? What balance is struck between lectures, hands-on practice, case studies, and project work?
- **Assessment Methods:** How are students evaluated? What role do projects, exams, and participatory activities play in assessing student understanding and engagement?

The data extraction phase was pivotal in gathering detailed and relevant information from the selected course syllabi. This step was critical for understanding how each course is structured and delivered, focusing particularly on aspects that would impact the accessibility of course content for non-tech savvy students. Here is a summary of the key data points extracted from each course syllabus:

Business Intelligence (IS312)

- Course Objectives: To enable students to understand and apply business analytics processes and tools effectively.
- Course Content: Covers an overview of business intelligence, data mining, analytics, and visualization techniques (Chotisarn et al., 2022; Sharda et al., 2020; VanderPlas, 2016).
- Teaching Methodologies: Uses a combination of lectures, hands-on workshops, and case studies to facilitate understanding.
- Assessment Methods: Includes exams, project presentations, and participation in workshops.

Tools for Data Analytics (IS461)

- Course Objectives: To equip students with the necessary tools and models for conducting business analytics.
- Course Content: Introduces data manipulation tools like Pandas, as well as predictive and prescriptive analytics (Chotisarn et al., 2020; Yan & Yan, 2018).
- Teaching Methodologies: Balances theoretical lectures with practical exercises and lab sessions to enhance tool familiarity.
- Assessment Methods: Students are evaluated through midterm and final exams, assignments, and active participation.

Artificial Intelligence (IS361)

- Course Objectives: To familiarize students with fundamental AI concepts and their business applications.
- Course Content: Includes topics on machine learning, neural networks, robotics, and AI applications in various business sectors (Agrawal et al., 2018; Elger & Shanaghy, 2020; Gold, 2020; Hosanagar, 2019; Mauro & Valigi, 2020).
- Teaching Methodologies: Combines theoretical lectures with project-based learning, where students apply AI concepts to real-world scenarios.
- Assessment Methods: Assessment includes group projects, individual assignments, and exams focusing on both theory and application.

Machine Learning in Business (IS785)

- Course Objectives: To teach practical applications of machine learning in solving business-related problems.
- Course Content: Covers supervised and unsupervised learning, reinforcement learning, neural networks, and ethical considerations in machine learning (Chotisarn et al., 2023; Foster, 2022; Géron, 2022; Goodfellow et al., 2016).
- Teaching Methodologies: Offers a blend of lectures, guest lectures from industry experts, and practical application through case studies.
- Assessment Methods: Includes a significant component of project work, exams, and ongoing assessments through class participation.

The data extraction process highlighted several important trends across the courses. 1) Practical Engagement: All courses emphasize hands-on learning and practical engagement with the material, which is crucial for students without a technical background. 2) Integration of Real-World Applications: Each course includes components where students can apply what they've learned to real-world business scenarios, thereby enhancing the relevance and practicality of the content. 3) Focus on Accessibility: Courses are structured to gradually introduce complex

concepts, with continuous support from faculty and multiple forms of learning materials, making them accessible to all students. This information provides a solid foundation for the next phase of the analysis, where these elements are further examined for themes and patterns related to teaching methodologies and course effectiveness for non-tech savvy students.

3.3 Thematic Analysis

The thematic analysis of course syllabi focused on making data-related courses accessible to non-tech savvy business students and identified several key themes. These themes highlight the instructional strategies and educational approaches used to simplify complex technical content. The analysis showed that courses effectively integrate technical material by using practical examples and incorporating business contexts.

This approach not only makes the concepts more relatable but also facilitates a deeper understanding and application of data within a business framework. The identified themes underscore the importance of tailoring teaching methods to enhance comprehension and engagement among students with limited technical backgrounds. Here are the major themes identified:

1. Emphasis on Applied Learning (El-Sabagh, 2021)

- Across the courses, there is a strong emphasis on applied learning, where theoretical concepts are integrated with practical applications. This approach helps bridge the gap between academic theory and real-world business needs, making it easier for non-technical students to grasp complex data analytics and machine learning concepts.
- Example: In the Business Intelligence course (IS312), students engage in workshops that simulate real business analytics scenarios, which helps them understand the practical implications of their theoretical learning.

2. Integration of Business Context (Dziuban et al., 2018)

- The courses are designed to consistently link data-related content with business scenarios, highlighting the relevance of data skills in solving actual business problems. This contextualization is crucial for students to appreciate the value of data analytics and AI in their future careers.
- Example: The Machine Learning in Business course (IS785) incorporates case studies from current industry practices, providing students with insights into how machine learning is applied in various business sectors.

3. Use of Accessible Tools and Technologies (Asad et al., 2021)

- The syllabi show a deliberate selection of tools and technologies that are widely used in the industry yet are accessible enough for beginners. This ensures that students can build practical skills that are marketable and applicable in business settings without being overwhelmed by overly complex software.
- Example: Tools for Data Analytics (IS461) introduces students to Pandas and other Python libraries through guided exercises, making it accessible for those with limited coding experience.

4. Progressive Learning Structure (Alenezi, 2023)

- The courses are structured to introduce students gradually to increasingly complex topics, starting with foundational concepts before moving to advanced techniques.

This progressive learning curve helps ensure that students develop confidence and competence as they advance through the course.

- Example: Artificial Intelligence (IS361) starts with basic principles of AI and gradually introduces more complex topics like neural networks and machine learning applications.

5. Assessment Strategies Focused on Application (Brassey et al., 2019)

- Assessment methods across the courses are designed to evaluate the students' theoretical knowledge and their ability to apply this knowledge in practical, business-related scenarios. This dual focus on theory and practice in assessments helps reinforce learning and ensures students can translate academic concepts into business solutions.
- Example: In several courses, the final grade includes project work where students must tackle a real or simulated business problem using the tools and methods learned in class.

6. Supportive Educational Environment (UNESCO, 2021)

- The courses provide various support mechanisms, such as tutorial sessions, office hours, and online resources, to assist students in overcoming any difficulties they face in understanding or applying course content. This supportive environment is essential for non-tech savvy students who may require additional help to fully engage with the technical material.
- Example: All courses offer supplementary online materials and forums where students can discuss course content and solve problems collaboratively.

The thematic analysis highlights how these courses are strategically designed to make advanced data-related topics accessible and relevant to business students with non-technical backgrounds. This ensures that all students, regardless of their prior technical expertise, can effectively engage with the material and gain valuable skills that are directly applicable in their future careers.

3.4 Synthesis of Findings

The thematic analysis of course syllabi from courses like Business Intelligence, Tools for Data Analytics, Artificial Intelligence, and Machine Learning in Business provided insights into how data-related concepts are effectively integrated into the curriculum for non-technical business students.

The findings were synthesized to evaluate the effectiveness and challenges of current educational strategies in making these courses accessible to all business students, focusing on preparing them for data-driven roles in business settings. This synthesis highlighted the ways in which the courses address the skill requirements of modern business environments while ensuring inclusivity, allowing students from all backgrounds to engage with complex data concepts effectively. The major insights derived from the synthesis are as follows:

1. Effective Pedagogical Approaches: The courses utilize a mix of lectures, hands-on labs, and project-based learning, which has proven effective in helping students understand and apply complex data-driven concepts. This blended approach caters to various learning styles and ensures that students can see the practical impact of what they learn theoretically.

2. Relevance and Application: The curricula are closely aligned with real-world business needs, embedding data analytics and machine learning within the context of business decision-making and strategy. This relevance is vital for motivating students and

helping them see the practical benefits of their learning, thereby increasing engagement and retention of knowledge.

3. Accessibility and Progression: There is a conscious effort to make the content accessible to students with limited or no prior technical experience. This is achieved through the progressive structuring of course content, where foundational topics are covered thoroughly before advancing to more complex areas. This methodical build-up of knowledge helps mitigate the intimidation factor often associated with data science and related fields.

4. Practical Skill Development: The emphasis on using industry-standard tools and technologies ensures that students are not only learning theoretically but are also gaining practical skills that are directly applicable in the business world. This hands-on experience is crucial for building confidence and competence in students who may not see themselves as traditionally "tech-savvy."

5. Comprehensive Assessment Methods: The courses feature diverse assessment strategies that go beyond traditional exams to include projects, presentations, and participation in simulations and real-case scenarios. These assessment methods encourage students to apply their learning in diverse contexts, fostering a deeper understanding and greater ability to transfer skills across different business situations.

6. Support Systems: The educational environment includes extensive support systems such as additional tutoring, online resources, and active faculty engagement. These support mechanisms are essential for students who may struggle with the transition to technically complex subjects, ensuring that they do not fall behind.

Despite these strengths, challenges remain, such as ensuring consistent engagement from all students, especially those who may initially be hesitant about their abilities in technical subjects. There is also the ongoing need to update course content and tools to keep pace with rapid technological advancements in data science and artificial intelligence. These findings suggest that business schools should continue to enhance their curricula by integrating data skills throughout their programs, not just in specialized courses.

There is also a significant opportunity to use these insights to guide the development of new courses and learning modules that further bridge the gap between non-technical and technical education. The synthesis of findings from this study provides a valuable blueprint for how business education can evolve to better prepare all students for a data-driven world, ensuring they are equipped with the necessary skills and confidence to succeed, regardless of their technical background.

3.5 Course Analysis

This detailed course analysis reveals a thoughtful approach to curriculum design, aiming to demystify complex data-related subjects and make them accessible and applicable to business students, thus preparing them effectively for data-driven roles in the business world. The analysis is shown in table 1.

Table 1 Course Analysis

Course	Objectives	Content Highlights	Teaching Methodologies	Assessment Methods
Business Intelligence (IS312)	Equip students with the ability to apply business analytics tools for informed decision-making.	- Business Intelligence concepts - Data mining techniques - Analytics and visualization tools	- Hands-on workshops - Case studies - Interactive lectures	- Project work - Exams - Participation in discussions and practical sessions
Tools for Data Analytics (IS461)	Familiarize students with data analysis tools and statistical techniques to support business decisions.	- Data analysis tools (e.g., Python, Pandas) - Descriptive, predictive, and prescriptive analytics	- Practical exercises in labs - Lectures with tool demonstrations - Group projects on complex business scenarios	- Continuous assessments through quizzes and assignments - Capstone project
Artificial Intelligence (IS361)	Introduce fundamental AI concepts and their business applications to enhance processes and solutions.	- Basic AI, machine learning, neural networks - Robotics - AI applications like voice and visual recognition	- Project-based learning - Seminars by industry experts - Simulation and modeling activities	- Practical projects on AI solutions - Reflective essays on AI implications
Machine Learning in Business (IS785)	Apply machine learning techniques to solve business problems, focusing on theoretical and practical aspects.	- Machine learning algorithms - Supervised and unsupervised learning - Ethical considerations	- Case study analysis - Hands-on training with ML frameworks - Collaborative learning to develop models	- Development of machine learning models - Final comprehensive examination

3.6 Supporting Cases

These supporting cases demonstrate how tools and technologies are applied to each course. Those tools range from no-code level to mixed code and visualization level, which facilitates variety of learning level.

Business Intelligence (IS312) focuses on training students in the use of analytics and visualization tools to interpret and present data effectively. An example of this is demonstrated through the application of classification models on handwritten digit data using three different algorithms: Support Vector Classifier, Random Forest Classifier, and Stochastic Gradient Descent Classifier. The outcomes of these models are presented in the following sequence as shown in figure 1.

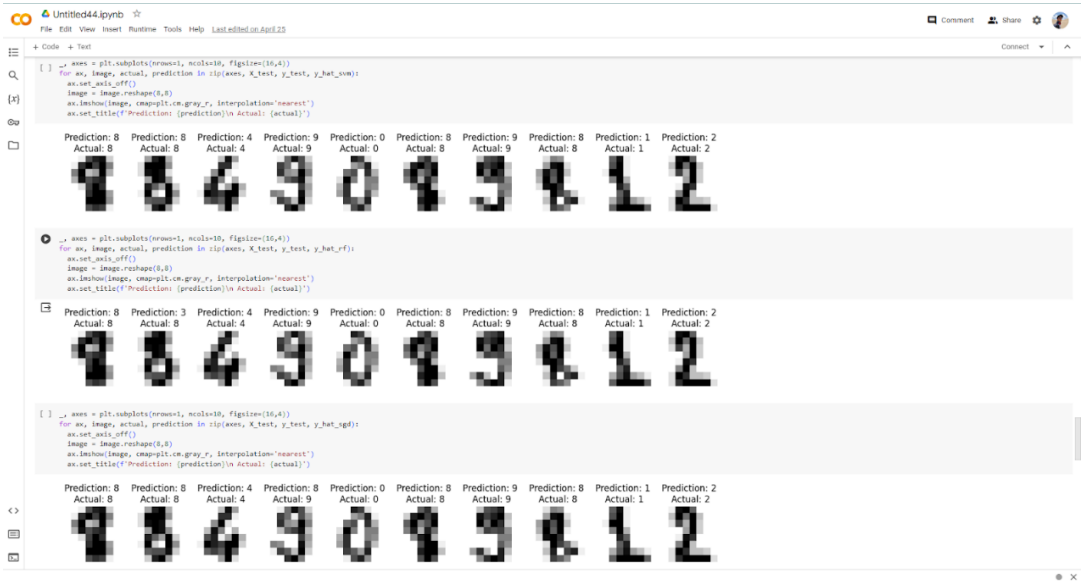
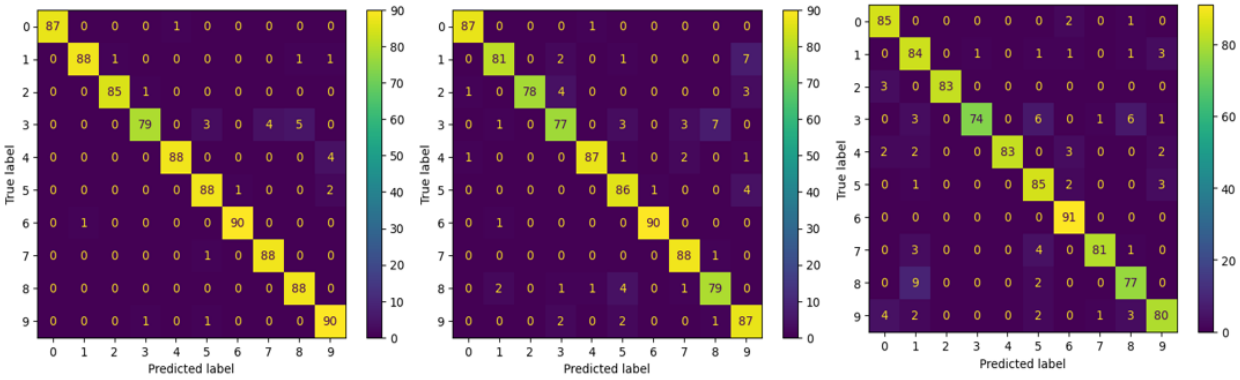


Figure 1 The outcomes of classification models from the Business Intelligence course (IS312), analyzing handwritten digits with three algorithms

The results of the three classification models—Support Vector Classifier, Random Forest Classifier, and Stochastic Gradient Descent Classifier—are further visualized using confusion matrices in Python (Chotisarn et al., 2020), providing a clear graphical representation of each model's performance on the test data as detailed in figure 2.



Support Vector Classifier Confusion Matrix | Random Forest Classifier Confusion Matrix | Stochastic Gradient Descent Classifier Confusion Matrix

Figure 2 Results from Support Vector Classifier, Random Forest Classifier, and Stochastic Gradient Descent Classifier visualized confusion matrices in Python, clearly displaying each model's test data performance

Tools for Data Analytics (IS461) provides training in descriptive, predictive, and prescriptive analytics. It covers techniques for data manipulation and analysis to support business decision-making. Specifically, it includes a practical application involving the use of the MiniZinc Tool (Nethercote et al., 2007) for solving optimization problems, such as planning ingredient purchases for a small coffee shop's inventory management (see figure 3).

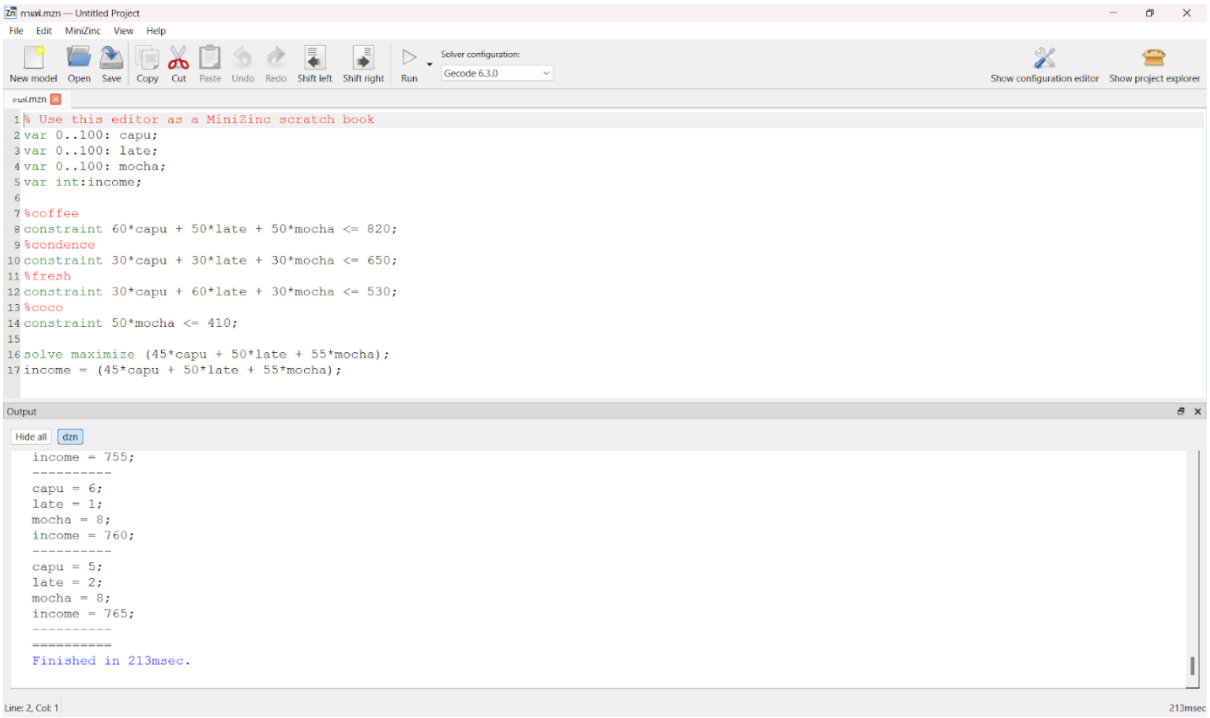


Figure 3 The use of the MiniZinc Tool to solve optimization problems, such as planning ingredient purchases for effective inventory management at a small coffee shop

Artificial Intelligence (IS361) focuses on utilizing various tools for simulation and modeling. It teaches students how to use software like the Orange Tool (Demšar et al., 2013) to simulate AI models and predict outcomes. Additionally, the course incorporates project-based learning, where students undertake projects that apply AI tools to real-world business contexts (see figure 4).

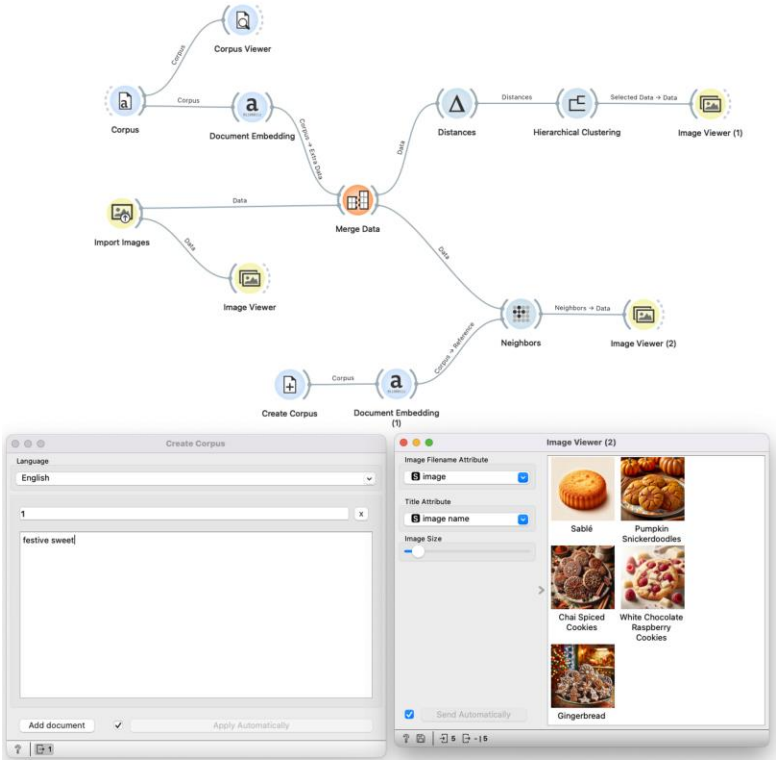


Figure 4 The use of the Orange Tool for simulating AI models and predicting outcomes, demonstrating the application of AI in real-world business projects

Machine Learning in Business (IS785) explores the practical application of machine learning techniques within business settings. It offers an in-depth look at Long Short-Term Memory (LSTM) networks (Hochreiter & Schmidhuber, 1997), a specific type of recurrent neural networks designed to overcome the challenges of gradient vanishing and explosion seen in conventional recurrent networks. LSTMs incorporate unique mechanisms that control the flow and impact of information, enabling the preservation of long-term dependencies. This capability significantly enhances the networks' ability to learn and represent complex patterns, which is exemplified in the course through projects like modeling stock price predictions (see figure 5).

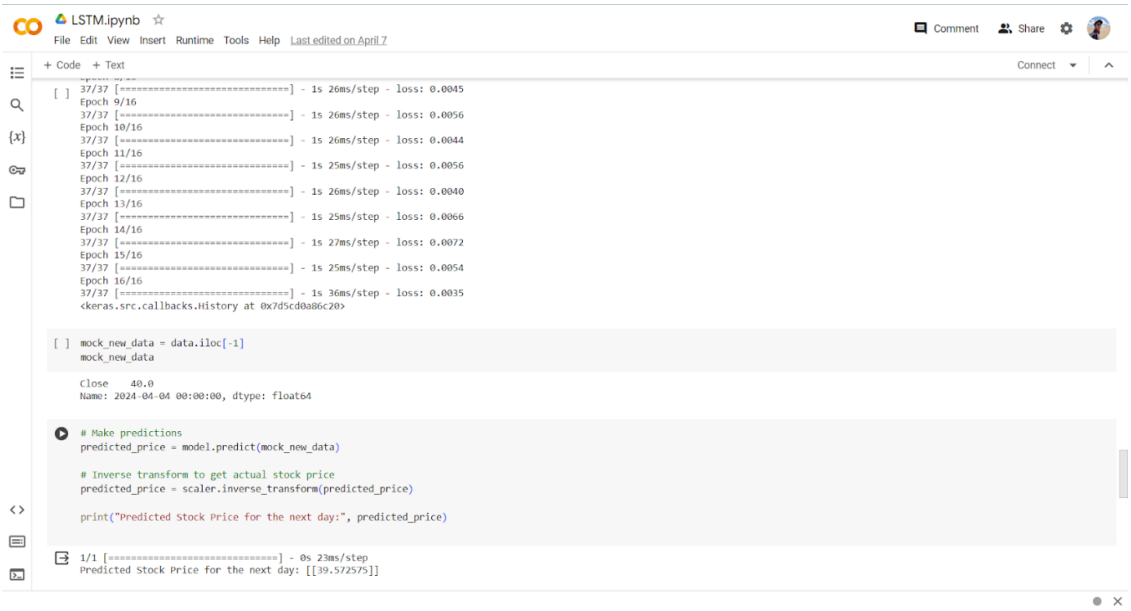


Figure 5 The application of Long Short-Term Memory (LSTM) networks to model stock price predictions

The course explores other decision-making tools including Google OR Tools (Perron & Didier, 2024), a comprehensive suite of operations research software for optimization problems like constraint and linear optimization, as well as flow and graph algorithms. Practical applications demonstrated in the course include using the Google OR Tools library in Python for employee scheduling and vehicle routing problems, illustrating how these tools can optimize workforce management and logistics (see figure 6).

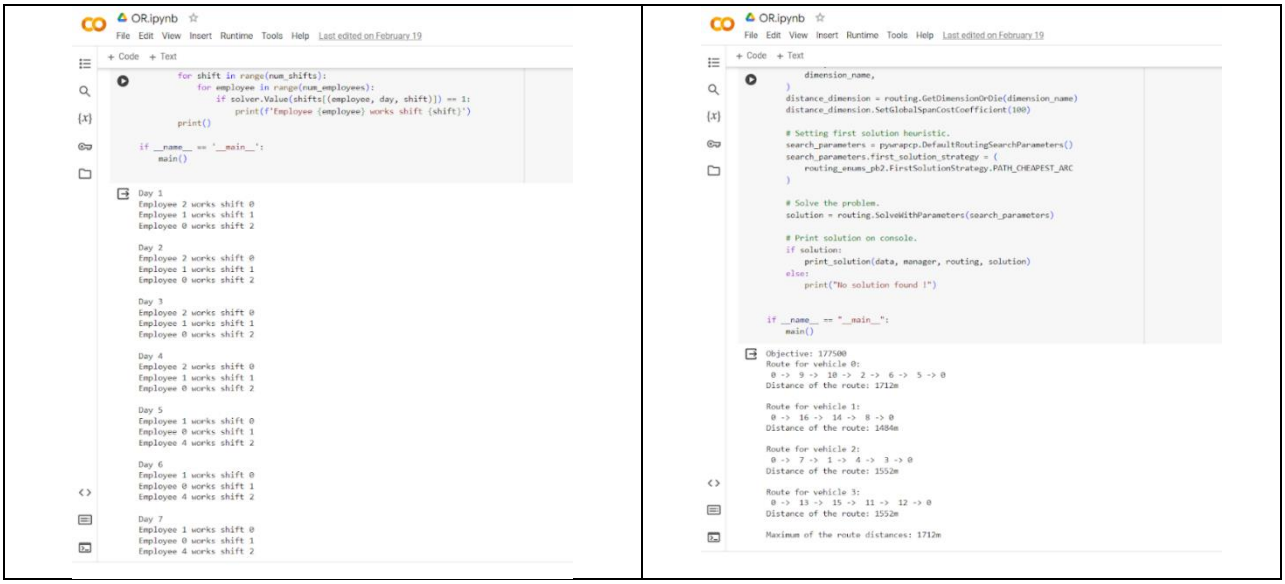


Figure 6 (Left) The use of Google OR Tools in the Python environment for employee scheduling and (Right) The Python-based application of Google OR Tools for solving vehicle routing problems

4. Discussion

The thematic analysis of course syllabi from data-related courses highlights their design to demystify complex concepts for non-technical students through practical, applied learning. The curriculum across these courses emphasizes real-world business problems, utilizing tools and methods directly applicable in business settings. This approach not only boosts student learning but also builds their confidence and competence in data-driven decision-making. The synthesis of these findings provides essential insights into how effectively these courses integrate into business education, ensuring the teaching strategies are relevant to contemporary business practices and accessible to non-tech savvy students, thereby enhancing the overall impact on business education.

4.1 Effectiveness of Teaching Strategies

The courses examined employ a mix of pedagogical approaches that cater effectively to students with varied levels of technical proficiency. The use of practical, hands-on learning experiences alongside traditional lectures helps demystify complex concepts and encourages active learning. For instance, the inclusion of real-world case studies and projects enables students to see the direct application of theoretical knowledge, which is particularly beneficial for those who may struggle with abstract concepts.

Interactive components such as workshops, simulations, and guest lectures from industry professionals further enhance learning by providing diverse perspectives and contextualizing the data skills within actual business settings. These methodologies not only facilitate a deeper understanding but also stimulate student engagement and motivation, crucial for courses perceived as challenging due to their technical nature.

4.2 Relevance to Business Practices

The course content is closely aligned with current business practices, emphasizing skills and tools that are in high demand in the workplace. This alignment ensures that students are not only learning theoretically but are also becoming proficient in the practical applications of data analytics, AI, and machine learning within various business contexts. For example, the focus on popular analytics tools and platforms ensures that students gain marketable skills that enhance their employability and readiness to contribute effectively to their future careers.

Moreover, the integration of ethical considerations, particularly in courses like Machine Learning in Business, prepares students to navigate the complex moral landscapes they might face in data-driven roles, fostering responsible and informed future business leaders.

4.3 Accessibility and Progression

A significant strength of the curriculum is its structured progression and emphasis on accessibility. Starting with foundational topics and gradually introducing more complex theories and applications allows students to build confidence and deepen their understanding incrementally. This scaffolding approach is critical in preventing students from becoming overwhelmed and ensuring that they remain engaged throughout their learning journey.

Additionally, the provision of extensive support systems, such as additional tutoring sessions, online resources, and active faculty engagement, plays a vital role in accommodating students' diverse learning needs. These support mechanisms are particularly advantageous for non-tech savvy students, as they provide the extra help needed to overcome any hurdles related to the technical aspects of the coursework.

4.4 Implications for Curriculum Development

The findings from this study highlight the need for business schools to continue evolving their curricula to integrate data skills more comprehensively across all aspects of business education. There is an opportunity to leverage these insights to further bridge the gap between non-technical and technical education by developing new courses and learning modules that target the development of data literacy from the onset of business education. The success of the courses analyzed also suggests that similar approaches could be adopted in other technical areas of study, potentially transforming how business education is delivered to meet the demands of a rapidly changing business environment. This could involve more interdisciplinary collaborations that blend business knowledge with technical data skills, ensuring that all business graduates are well-equipped to navigate the future data-centric workplace. Overall, the discussion underscores the importance of continuing to adapt educational strategies to meet both the changing technological landscapes and the diverse needs of students, ensuring that all graduates can thrive in a data-driven world. The summary of implications for curriculum development is shown in table 2.

Table 2 Implications for Curriculum Development

Key Area	Insights	Implications for Curriculum Development
Effectiveness of Teaching Strategies	A mix of lectures, practical exercises, and projects effectively demystifies complex data-related subjects and promotes active learning. Interactive components like case studies and guest lectures enrich understanding and engagement.	The curriculum should continue to integrate interactive and practical elements to enhance understanding and retention of complex concepts.
Relevance to Business Practices	Course content is aligned with real-world business needs, emphasizing practical applications of theories. This ensures students are ready to apply their skills in real business contexts.	Update course content regularly to keep pace with industry changes and ensure graduates' skills remain relevant and marketable.
Accessibility and Progression	Courses are designed with a progressive structure that introduces complex topics gradually, ensuring accessibility for all students, particularly those with limited tech backgrounds.	Develop entry-level courses that build foundational skills progressively, preparing students for more advanced topics.
Preparing for a Data-Driven Future	Students are equipped with marketable skills using industry-standard tools and an emphasis on ethical considerations in data handling.	Encourage the development of courses that foster ethical reasoning and decision-making in data-driven scenarios.
Support Systems	Support systems such as tutoring, online resources, and faculty engagement play a crucial role in helping students overcome challenges related to technical material.	Enhance and expand support mechanisms to ensure all students can effectively engage with and master course material.

5. Limitations

This study provides a comprehensive understanding of how data-related courses are integrated into business education for non-tech savvy students, highlighting best practices and potential areas for improvement. However, it acknowledges several limitations that may impact the generalizability of its findings. The focus on a single institution may not represent broader educational trends, and the qualitative nature of the syllabus analysis does not measure actual student competency or assess student and faculty satisfaction with the courses. These limitations suggest that while the study offers valuable insights into course integration and educational strategies, the scope of its conclusions is confined to the context of the institution studied. These limitations could affect the generalizability of the findings and the scope of the conclusions drawn:

1. Scope of Institutions Covered: The study focuses on a single educational institution and analyzes a specific set of courses from this institution's business school. The findings, therefore, may not be representative of broader educational trends across different schools, countries, or educational systems. Different institutions may have varied approaches to curriculum design and different resources available, which can influence the effectiveness of the teaching methodologies identified.

2. Qualitative Analysis Constraints: The methodology employed is primarily qualitative, involving the analysis of course syllabi. While this approach provides deep insights into the planned structure and content of the courses, it does not capture the actual delivery of the courses, the interaction between students and faculty, or the real-time dynamics of the classroom. These factors can significantly impact the effectiveness of the educational strategies discussed.

3. Lack of Direct Student Feedback: This study does not include direct feedback from students or assessments of student outcomes, which are crucial for evaluating the actual impact of the courses on learning. Student perceptions and their academic performance would provide valuable data to assess whether the objectives of making data-related courses accessible to non-tech savvy students are truly being met.

4. Absence of Longitudinal Data: The study does not incorporate longitudinal data to track the long-term effectiveness of these educational strategies. Long-term tracking would help determine whether the skills acquired in these courses are sustained over time and how they influence career trajectories and employability in data-driven business environments.

5. Rapid Technological Changes: The field of data science and machine learning is evolving rapidly. The courses analyzed may soon require updates to their content and methodologies to keep pace with technological advancements. This study captures a snapshot based on current syllabi, which may quickly become outdated as new tools, technologies, and industry practices emerge.

6. Instructor Variability: The effectiveness of course delivery can vary significantly depending on the instructor's proficiency, teaching style, and engagement level. This variability was not captured in the study, which focused on the course design as presented in syllabi without considering individual differences in instruction.

Addressing these limitations in future research could involve expanding the sample size to include multiple institutions, incorporating quantitative measures of student success and satisfaction, and conducting interviews or surveys to gather direct feedback from both students and instructors. Additionally, longitudinal studies could be implemented to track the outcomes of these educational strategies over time, providing a more comprehensive view of their long-term impact.

6. Conclusion

The analysis of course syllabi from data-related business courses designed for non-tech savvy students provides crucial insights into effective educational strategies that enhance curriculum accessibility and student preparedness for data-driven business environments. These strategies focus on applied learning and practical experiences, which are essential in equipping students with the necessary skills to thrive in a data-intensive workplace. The findings suggest that current curricular approaches are effective in making complex concepts accessible and in preparing students to be proficient and competitive. Further research is recommended to explore the longitudinal outcomes of these educational strategies and validate their long-term impact on students' careers, thereby affirming the robustness and sustainability of these teaching methods in business education. The findings from the study suggest several key conclusions:

6.1 Successful Integration of Data Skills

The courses examined demonstrate a successful integration of data-related skills into the business curriculum, catering effectively to non-tech savvy students. The use of applied learning, real-world case studies, and hands-on projects ensures that students not only understand theoretical concepts but are also able to apply these concepts in practical business contexts. This approach not only enhances learning outcomes but also increases the relevance of education to the students' future careers.

6.2 Enhancing Student Engagement and Learning

The methodologies adopted in these courses—particularly the blend of lectures, practical exercises, and collaborative projects—effectively engage students by making learning interactive and practical. This engagement is crucial for subjects that might otherwise be intimidating due to their technical nature. Furthermore, the progressive structure of the courses helps build confidence as students advance from basic concepts to more complex applications, thereby mitigating any initial apprehension and promoting a deeper understanding.

6.3 Preparing Students for a Data-Driven Future

The courses provide students with the skills and knowledge necessary to excel in a data-driven business environment. The focus on current tools and technologies, along with ethical considerations and real-world applications, prepares students not just to participate in, but to lead in the evolving landscape of business where data is a central element. Graduates from these programs are likely to have a competitive advantage in the job market due to their comprehensive understanding of how to leverage data in business decision-making.

6.4 Recommendations for Curriculum Development

Based on the findings, it is recommended that business schools continue to evolve their curriculum to include data skills across all areas of business education. This could involve more integrated courses that start with fundamental data literacy and build up to advanced analytics and machine learning applications. Additionally, updating course content regularly to keep pace with technological advancements will be crucial in maintaining the relevancy and effectiveness of the education provided.

6.5 Future Research Directions

Further research is needed to quantify the impact of these educational strategies on student outcomes. Longitudinal studies could track the career progression of graduates to assess the long-term benefits of such a curriculum. Additionally, expanding the study to include multiple institutions would provide a broader understanding of educational practices and help generalize the findings across different educational settings.

In conclusion, the integration of data-related courses tailored for non-tech savvy students within business education is not only feasible but also highly beneficial. The strategies identified in this study provide a valuable blueprint for business schools aiming to equip their students with essential data competencies, ensuring that they are well-prepared to meet the challenges of a data-centric business world.

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