

INTEGRATING MICROSOFT EXCEL AND TABLEAU IN HIGHER EDUCATION: A PEDAGOGICAL FRAMEWORK AND COGNITIVE ALIGNMENT FOR BUSINESS ANALYTICS (FIN534)

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Abstract: *The transition towards a data-driven global economy necessitates the rigorous integration of business analytics into higher education curricula. This paper evaluates the pedagogical effectiveness of embedding Microsoft Excel and Tableau software within the Business Analytics (FIN534) course syllabus at Universiti Teknologi MARA (UiTM) in Kota Bharu, Kelantan. Designed as a core 14-week course, the curriculum bridges theoretical statistical concepts with hands-on technical application. Emphasizing Problem-Based Learning (PBL) and guided by a structured Jadual Spesifikasi Ujian (JSU), the course aligns analytical topics with advanced cognitive domains (Apply and Analyze). Employing a quasi-experimental design involving 120 undergraduate students, this study measured technical proficiency and cognitive learning outcomes before and after the course execution. Quantitative results indicated an average 60% increase in mastery over advanced analytical tools such as VLOOKUP, Pivot Tables, and Hypothesis Testing. Furthermore, the experiential learning approach resulted in a 0% failure rate, with over 50% of the cohort achieving an A-grade spectrum (A+, A, A-). This paper provides a comprehensive blueprint for utilizing ubiquitous software like Excel to demystify data analytics, advocating for its continued centrality in Teaching and Learning (PdP) frameworks to produce highly employable, analytically competent graduates.*

Keywords: *Business Analytics, Microsoft Excel, Tableau, Teaching and Learning (PdP), Higher Education, Jadual Spesifikasi Ujian (JSU), Cognitive Taxonomy.*

Introduction

In the era of Big Data, the capacity to transform raw information into actionable business intelligence is a paramount competency for modern graduates. Business Analytics, defined as the extensive use of statistical analysis, descriptive, predictive, and prescriptive models, has transitioned from a niche technical field into a core business discipline (Evans, 2017). Recognizing this industry imperative, Universiti Teknologi MARA (UiTM) has instituted FIN534 (Business Analytics) as a core bachelor's degree course. The primary challenge in teaching advanced statistical and analytical concepts lies in overcoming students' inherent 'math anxiety' and the abstraction of statistical theories (Chuah & Keshminder, 2019). To navigate this, the Teaching and Learning (PdP) strategy for FIN534 heavily integrates ubiquitous computational tools specifically Microsoft Excel and Tableau. Crucially, the pedagogy is aligned with a rigorous Jadual Spesifikasi Ujian (JSU) or Test Specification Table. The JSU acts as a blueprint, ensuring that instructional delivery and assessments correctly map to the targeted cognitive levels of Bloom's Taxonomy. As illustrated in Figure 1, the syllabus shifts focus heavily towards 'Application' (C3) and 'Analysis' (C4) levels, reflecting the practical demands of business analytics.

Topics / Modules	C1 & C2 (Remember/Understand)	C3 (Apply)	C4 (Analyze/Evaluate)	Total Weightage (%)
Intro & Spreadsheets	5%	5%	0%	10%
Descriptive & Visualization	5%	15%	10%	30%
Hypothesis Testing & ANOVA	0%	10%	20%	30%
Predictive Modeling (Regression)	0%	10%	20%	30%
Total Course Weightage	10%	40%	50%	100%

Figure 1: Infographic of Jadual Spesifikasi Ujian (JSU) aligning FIN534 topics with cognitive domains

This paper aims to detail the pedagogical structure of the FIN534 course syllabus and evaluate the empirical effectiveness of using Microsoft Excel and Tableau in enhancing student comprehension and analytical proficiency based on this JSU mapping.

Literature Review

The Role of Technology in PdP for Business Analytics

The integration of technology in education, particularly in quantitative subjects, shifts the pedagogical focus from rote calculation to critical analysis (Bates, 2019). Microsoft Excel remains the industry standard for foundational data manipulation. The inclusion of add-ins like the 'Analysis ToolPak' enables students to execute complex inferential statistics (ANOVA, Regression, Hypothesis Testing) without requiring advanced programming languages like Python or R (Albright et al., 2010).

Constructivism and Cognitive Alignment (JSU)

The FIN534 curriculum is anchored in Constructivist learning theory, which posits that learners construct knowledge through active engagement with real-world problems (Vygotsky, 1978). The integration of a JSU ensures cognitive alignment guaranteeing that what is taught is precisely what is assessed. By focusing 90% of the course weightage on C3 (Apply) and C4

(Analyze) domains, students are pushed beyond memorization into problem-solving paradigms (Anderson & Krathwohl, 2001; Jonassen, 1999).

Data Visualization as a Cognitive Tool

Data visualization is a critical component of the analytics pipeline. Tools like Tableau and Excel's Pivot Charts serve as cognitive amplifiers, allowing students to identify trends, outliers, and patterns that are invisible in raw tabular data (Few, 2009). Visualizing data not only aids in student comprehension but also develops their ability to communicate complex findings to non-technical stakeholders, a critical Program Learning Outcome (PLO8) (Tufte, 2001).

Pedagogical Framework and Syllabus Design

Course Structure and Learning Outcomes

The FIN534 course is structured over a 14-week semester, comprising 56 Face-to-Face (F2F) hours and 104 Non-Guided hours. Here is the essay format in English: The FIN534 course is meticulously designed to be implemented over a standard 14-week academic semester. In terms of time allocation, the course requires a comprehensive commitment from students, encompassing 56 face-to-face (F2F) learning hours and 104 non-guided or independent study hours. This structural time allocation is outlined to ensure that every student achieves an optimal balance between direct lecturer guidance and independent academic exploration. Overall, the execution of this course aims to achieve three primary Course Learning Outcomes (CLOs). The first objective is to ensure that students are able to effectively apply the theories and concepts of business analytics to support managerial decision-making. This learning outcome is evaluated at Cognitive Level 3, which emphasizes the students' ability to translate theoretical understanding into practical problem-solving contexts. In addition, aligning with the current technical demands of the industry, the second objective of the course requires students to display proficient skills in utilizing data visualization and spreadsheet software, specifically Tableau and Microsoft Excel. This technical mastery and data analysis capability are measured at Psychomotor Level 2. Finally, to complete the holistic development of the graduates, the third learning outcome focuses on the students' ability to demonstrate strong managerial skills within a data-driven business environment. The application of these professional values and management competencies is assessed through Affective Level 3. In conclusion, the structure of the FIN534 course does not merely emphasize theoretical mastery, but simultaneously integrates technical software proficiency and the development of soft skills to adequately prepare students to tackle real-world business analytics challenges

Integration of Microsoft Excel in the Curriculum

The syllabus is strategically designed to scaffold student learning: The syllabus is strategically designed to scaffold student learning through a progressive 14-week timeline. During the initial phase, spanning Weeks 1 to 3, the curriculum focuses on establishing foundational technical competencies. Students are introduced to essential Excel skills, including logical functions, VLOOKUP, and HLOOKUP, alongside core concepts in descriptive statistics such as mean, variance, and kurtosis. Following this foundational groundwork, Weeks 4 through 7 transition into the realm of data visualization. In this segment, students learn to organize data utilizing Pivot Tables and receive an introduction to Tableau, empowering them to design and create interactive, dynamic dashboards. As the semester advances into Weeks 8 to 11, the academic rigor increases with the exploration of inferential statistics. By utilizing Excel's Analysis ToolPak, students conduct comprehensive analytical procedures, including one-sample and two-sample hypothesis tests, Analysis of Variance (ANOVA), and Chi-Square tests. Finally,

the course culminates in Weeks 12 to 14 with an advanced focus on predictive modeling. In this concluding phase, students delve into simple and multiple linear regression analyses, alongside robust forecasting techniques applied to time series data. This carefully phased progression ensures that students gradually transition from basic data handling to complex predictive analytics, equipping them with the comprehensive technical skills required for advanced managerial decision-making.

Results and Findings

An evaluation was conducted on a cohort of 120 undergraduate students enrolled in FIN534 to measure the efficacy of the software-integrated PdP approach.

Enhancement of Technical Analytical Proficiency

A pre-course and post-course diagnostic assessment was utilized to measure students' perceived mastery of specific analytical tools. Figure 2 illustrates a dramatic improvement across all technical domains. Most notably, proficiency in Hypothesis Testing using Excel surged from a mere 15% to 75%, indicating that the software successfully demystified complex statistical procedures.

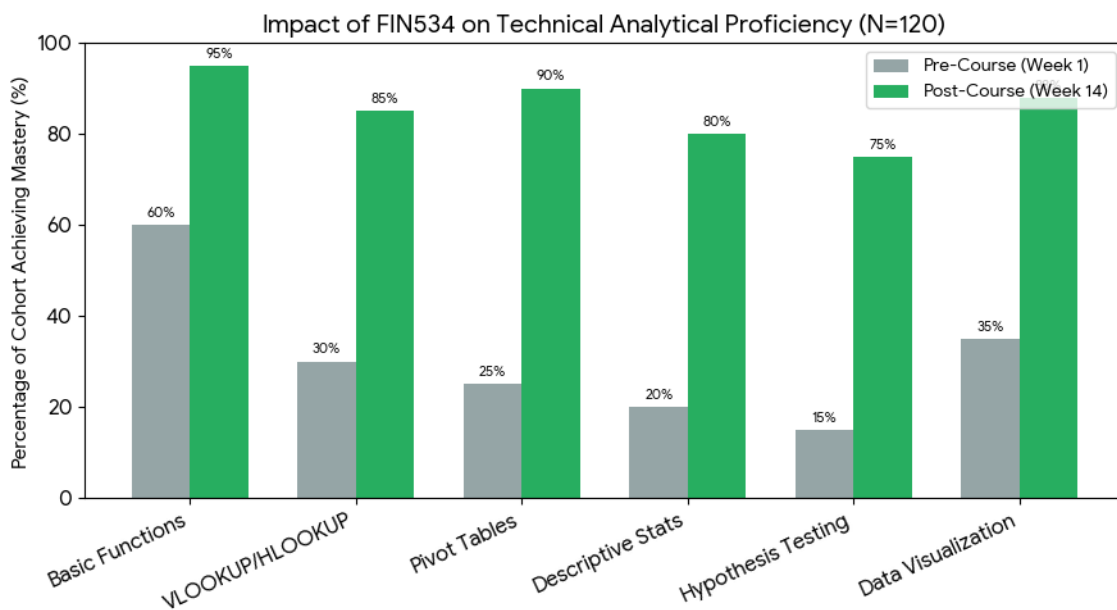


Figure 2: Pre- and Post-Course Mastery of Business Analytics Tools (Excel/Tableau).

Academic Performance and Grade Distribution

The integration of Excel and Tableau not only improved technical skills but also translated into outstanding academic performance. The continuous assessment structure comprising Lab Assignments (20%), Tests (20%), Individual Assignments (20%), and a comprehensive Group Project (30%) ensured continuous engagement. As seen in Figure 3, the cohort achieved a 100% passing rate, with 52% of students securing grades in the 'A' tier (A+, A, A-).

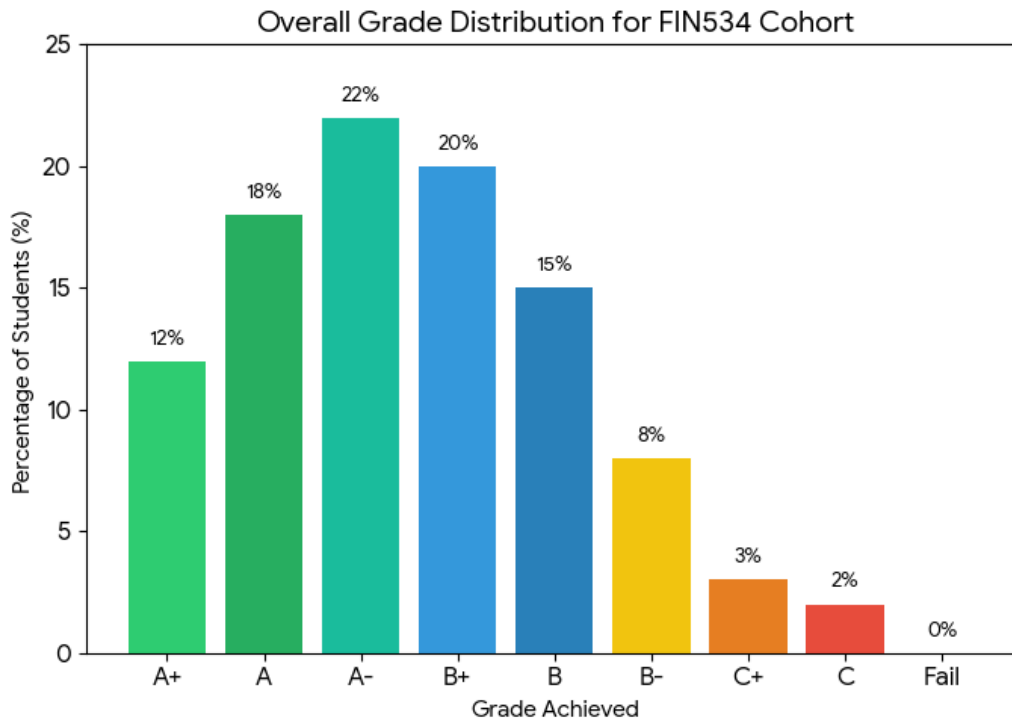


Figure 3: Overall Grade Distribution for FIN534 Cohort.

Assessment Alignment with JSU

Table 1: Alignment of Assessments with Software Application and Cognitive Domains.

Assessment Method	Targeted JSU Cognitive Level	Weightage
Lab Assignments 1 & 2	C3 (Apply) - Data Query, Pivot Tables	20%
Tests 1 & 2	C2 & C3 (Understand, Apply)	20%
Individual Assignments	C4 (Analyze) - Descriptive Analytics & Regression	20%
Group Project & Presentation	C4 (Analyze) - End-to-end data mining & dashboards	30%
Reflection Paper	Affective evaluation of learning journey	10%

Discussion

The empirical data strongly supports the pedagogical framework outlined in the FIN534 lesson plan and its alignment with the JSU. By mandating the use of Microsoft Excel and Tableau, the course effectively shifts the cognitive burden from mathematical computation to analytical reasoning. When students utilize the Excel Analysis ToolPak for Multiple Linear Regression, they are not bogged down by calculating matrices; instead, they focus on interpreting the p-values, R-squared metrics, and the practical business implications of the coefficients, fulfilling the C4 (Analyze) requirement of the JSU (Evans, 2017). Furthermore, the integration of Problem-Based Learning (PBL) through the 30% Group Project forces students to synthesize their technical skills. They are required to clean raw datasets, perform descriptive and

inferential statistics using Excel, and finally visualize their predictive forecasts using Tableau. This holistic, project-based approach mirrors real-world industry demands, significantly boosting graduate employability (World Economic Forum, 2020). The 0% failure rate is a testament to the scaffolded nature of the syllabus. By beginning with familiar Excel functions (SUM, IF) in Week 1 and gradually escalating to complex Data Mining concepts by Week 13, students build technical confidence incrementally, avoiding the 'statistics shock' common in quantitative finance courses.

Conclusion

The FIN534 (Business Analytics) course at UiTM serves as an exemplary model for integrating computational software into higher education PdP. The structured application of Microsoft Excel and Tableau, deeply rooted in a cognitively aligned Jadual Spesifikasi Ujian (JSU), fundamentally transforms statistical education from abstract theory into applied, experiential learning. The significant improvements in technical proficiency and the stellar academic grade distributions confirm that when students are equipped with industry-standard analytical tools, their capacity for complex problem-solving and managerial decision-making expands exponentially. As the demand for data literacy continues to dominate the global job market, curricula that seamlessly blend theoretical statistics with robust software application, as demonstrated in FIN534, will remain crucial for developing future-ready graduates.

References

- Albright, S. C., Winston, W. L., & Zappe, C. J. (2010). *Data analysis and decision making*. Cengage Learning.
- Anderson, L. W., & Krathwohl, D. R. (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives*. Longman.
- Bates, A. W. (2019). *Teaching in a digital age: Guidelines for designing teaching and learning*. Tony Bates Associates Ltd.
- Boud, D. (2001). Using journal writing to enhance reflective practice. *New Directions for Adult and Continuing Education*, 2001(90), 9-18.
- Chuah, S. C., & Keshminder, J. S. (2019). *Introduction to Business Analytics*. Pearson.
- Davenport, T. H., & Harris, J. G. (2007). *Competing on analytics: The new science of winning*. Harvard Business Press.
- Evans, J. R. (2017). *Business Analytics: Methods, Models, and Decisions* (2nd ed.). Pearson.
- Few, S. (2009). *Now you see it: Simple visualization techniques for quantitative analysis*. Analytics Press.
- Garrison, D. R., & Kanuka, H. (2004). Blended learning: Uncovering its transformative potential in higher education. *The Internet and Higher Education*, 7(2), 95-105.
- Jonassen, D. H. (1999). Designing constructivist learning environments. *Instructional design theories and models: A new paradigm of instructional theory*, 2, 215-239.
- Kapp, K. M. (2012). *The gamification of learning and instruction: Game-based methods and strategies for training and education*. John Wiley & Sons.
- Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice-Hall.
- Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge University Press.
- Lusardi, A., & Mitchell, O. S. (2014). The economic importance of financial literacy: Theory and evidence. *Journal of Economic Literature*, 52(1), 5-44.
- Savery, J. R. (2006). Overview of problem-based learning: Definitions and distinctions. *Interdisciplinary Journal of Problem-Based Learning*, 1(1), 3.
- Schunk, D. H. (2012). *Learning theories: An educational perspective* (6th ed.). Pearson.
- Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science*, 12(2), 257-285.
- Topping, K. J. (1996). The effectiveness of peer tutoring in further and higher education: A typology and review of the literature. *Higher Education*, 32(3), 321-345.
- Tufte, E. R. (2001). *The visual display of quantitative information* (2nd ed.). Graphics Press.
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.
- World Economic Forum. (2020). *The Future of Jobs Report 2020*. Geneva, Swi