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Business Intelligence Education Using SAP Analytics Cloud: An IS 2020 Competency Model Perspective

Shilpa Balam
sbalan@calstatela.edu

Ming Wang
mwang3@calstatela.edu

California State University, Los Angeles
Los Angeles, CA

Abstract

The increasing importance of data-driven decision-making has created growing demand for graduates with competencies in business intelligence (BI), data analytics, and decision support. Consequently, Information Systems (IS) programs must incorporate industry-relevant analytics tools that provide students with theoretical knowledge and practical experience. This study examines the role of SAP Analytics Cloud (SAC) in supporting BI education and developing competencies aligned with the IS2020 competency model. Using this framework as theoretical foundation, the study evaluates how SAC capabilities in data integration, visualization, reporting, planning, and predictive analytics support competency-based learning in a BI course. A conceptual mapping aligned SAC functionalities and learning activities with IS2020 competency areas, including data and information management, business analytics, data visualization, and organizational systems, as well as to applicable ABET outcomes. Students completed experiential activities involving data import and integration, dashboard development, predictive analytics, and presentations of analytical findings. Pre- and post-activity results showed significant increases across data preparation and integration, dashboard development and visualization, analytical thinking, predictive analytics, and communication of analytical findings. These results suggest that SAC-based activities can support competencies identified by both IS2020 and ABET. Exposure to an enterprise cloud analytics platform also helped bridge the gap between academic learning and industry practice. The study concludes that SAC is a valuable educational tool for Business Intelligence instruction, offering an integrated environment that promotes competency development and prepares students for data-driven professional roles.

Keywords: Business Intelligence, SAP Analytics Cloud (SAC), Information Systems Education, IS 2020 competency model, Cloud Analytics

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1. INTRODUCTION

In today's digital economy, organizations increasingly rely on data-driven decision-making to gain competitive advantages, improve operational efficiency, and support strategic planning. Alongside this trend, cloud-based analytics platforms have emerged as powerful solutions that offer scalability, accessibility, and real-time analytical capabilities. These platforms enable organizations to collect, analyze, visualize, and share data insights without the limitations of traditional on-premises systems. SAP Analytics Cloud (SAC) has gained significant attention as an integrated platform that combines business intelligence, planning, predictive analytics, and data visualization within a cloud environment (SAP SE, 2024).

The growing importance of analytics in industry has influenced Information Systems (IS) education. Universities and higher education institutions are increasingly expected to equip students with practical BI and analytics skills that align with industry requirements. Information Systems education research has similarly emphasized the need for curricula that integrate business analytics, data visualization, and experiential learning to prepare graduates for modern organizational environments (Mamonov, Misra, & Jain, 2015; Jafar, Babb, & Abdullat, 2017). Employers seek graduates who possess competencies in data management, analytics, visualization, and decision support, reflecting the growing significance of data-driven organizations (Leidig & Salmela, 2022). Consequently, incorporating modern analytics platforms into IS curricula has become essential for preparing graduates to effectively analyze data, support business decisions, and contribute to digital transformation initiatives through hands-on learning experiences (Jafar et al., 2017; Pomykalski, 2021).

Recent scholarship in the *Information Systems Education Journal* has highlighted the growing importance of designing analytics curricula that explicitly align learning activities with the competencies identified in the IS 2020 model. Leidig (2023) demonstrated that carefully structured laboratory exercises, scaffolded tutorials, and open-ended analytics projects enable students to progressively develop competencies in data analytics and information visualization while reinforcing higher-order problem-solving skills. Rather than emphasizing software proficiency alone, the study advocates instructional activities that integrate technical knowledge with business decision-making tasks, providing students with opportunities to apply analytical techniques in realistic organizational contexts.

The use of modern visualization technologies has likewise become an increasingly important component of Business Intelligence education. Yap (2020) proposed a case-based instructional methodology that uses dashboard design and visual analytics to help students translate business problems into meaningful analytical solutions. The study found that exposing students to dashboard development activities enhances their ability to communicate analytical findings effectively while strengthening critical thinking and decision-making skills. More recently, Sena and Ariyachandra (2023) reported that incorporating Tableau alongside traditional spreadsheet software significantly improved students' data literacy, visualization quality, and confidence in presenting analytical results. Together, these studies suggest that cloud-based analytics environments offering interactive dashboards and visualization capabilities can enhance experiential learning and better prepare Information Systems graduates for the analytical demands of organizations.

Despite the increasing demand for analytics professionals, a gap continues to exist between academic BI training and the competencies required by industry (Mamonov et al., 2015). Although Information Systems programs have increasingly incorporated analytics courses, educators continue to explore instructional approaches that effectively bridge theoretical concepts with practical application using enterprise technologies (Jafar et al., 2017; Pomykalski, 2021). As a result, graduates may lack the practical skills necessary to meet organizational expectations in data-driven decision-making roles. To address this challenge, higher education institutions must evaluate and adopt contemporary analytics

technologies that support both conceptual understanding and hands-on learning experiences. SAP Analytics Cloud (SAC) represents one such platform; however, its effectiveness in supporting Information Systems education and developing industry-relevant competencies requires further investigation. Therefore, there is a necessity to assess how SAC aligns with the competency framework outlined in the IS 2020 curriculum. SAP Analytics Cloud was selected as the primary instructional platform because its integrated cloud-based environment supports multiple stages of the Business Intelligence process within a single platform, including data preparation and integration, visualization, dashboard development, reporting, predictive analytics, forecasting, and decision support.

To achieve the above objectives, the study seeks to answer the following research questions:
1. How does SAP Analytics Cloud support Business Intelligence learning within Information Systems education?
2. Which IS 2020 competencies are enhanced through the use of SAP Analytics Cloud?

This study contributes to the understanding of how cloud-based analytics platforms can support Business Intelligence education within Information Systems programs. By evaluating SAP Analytics Cloud (SAC) using the IS 2020 competency framework, the study provides insights into the role of enterprise analytics tools in developing industry-relevant skills.

2. BACKGROUND

Business Intelligence (BI) refers to a comprehensive set of technologies, processes, architectures, and analytical methodologies that enable organizations to collect, integrate, analyze, and transform data into meaningful information for strategic and operational decision-making (Negash, 2004; Wixom & Watson, 2010; Sharda, Delen, & Turban, 2023). Rather than simply generating reports, Business Intelligence supports organizations in identifying trends, monitoring organizational performance, predicting future outcomes, and optimizing business processes through data-driven insights. As organizations increasingly rely on digital technologies and data-intensive operations, Business Intelligence has become a strategic capability for improving organizational competitiveness and supporting evidence-based decision-making across various industries.

The emergence of big data and advanced analytics has expanded BI from descriptive reporting to predictive and prescriptive analytics, allowing organizations to generate deeper insights from structured and unstructured data (Chen, Chiang, & Storey, 2012; Davenport & Harris, 2017). The evolution of Business Intelligence has been driven by significant advances in information technology. Early BI systems primarily focused on structured reporting, allowing organizations to summarize historical data for managerial reporting. However, rapid developments in big data, cloud computing, artificial intelligence (AI), and machine learning have transformed BI into sophisticated analytics ecosystems capable of real-time reporting, predictive modeling, natural language querying, and enabling decision-makers to analyze large and complex datasets more efficiently than traditional reporting systems (Sharda et al., 2023).

A major advancement in the field has been the emergence of cloud-based Business Intelligence. Cloud computing has significantly changed how organizations deploy and utilize analytics platforms by reducing infrastructure costs, improving scalability, and increasing accessibility. Instead of relying on locally installed software and dedicated hardware, organizations can now access enterprise-grade analytics through cloud-based Software-as-a-Service (SaaS) platforms. Cloud-based BI also supports organizational agility by providing scalable computing resources, rapid deployment, and collaborative analytics environments (Armbrust et al., 2010; Mell & Grance, 2011). According to Marston et al. (2011), cloud computing enables flexible resource allocation, reduces maintenance requirements, and facilitates collaboration across geographically distributed users.

The increasing adoption of Business Intelligence technologies has also reshaped workforce expectations. Employers increasingly seek graduates with competencies in analytics, data visualization, business intelligence, and data-driven decision-making because these capabilities have become essential across industries (AACSB, 2020; Gartner, 2023; Mamonov, Misra, & Jain, 2015; Larson, Sanders, & Bohler, 2021). Organizations across industries seek graduates who possess competencies in analytics, data visualization, business reporting, predictive modeling, and evidence-based decision-making. Consequently, universities have recognized the need to integrate Business Intelligence education into

undergraduate Information Systems curricula to prepare students for increasingly data-driven professional environments. Business Intelligence courses now emphasize experiential learning, allowing students to apply theoretical concepts using enterprise analytics platforms that simulate real organizational scenarios (Jafar et al., 2017; Pomykalski, 2021).

The importance of competency-based education in Information Systems is reflected in the IS 2020 competency model for undergraduate programs in Information Systems developed by Leidig & Salmela (2022). The model identifies business analytics, enterprise systems, data management, digital innovation, communication, and professional practice as essential competencies required of Information Systems graduates. The competency-based approach emphasizes the integration of technical, analytical, and professional skills through authentic learning experiences that closely resemble workplace practice (Leidig et al., 2022; Mamonov et al., 2015; Jafar et al., 2017). Rather than focusing solely on conceptual knowledge, the IS 2020 framework emphasizes the integration of technical knowledge, analytical skills, and practical experience to ensure graduates are prepared for modern organizational challenges. This competency-based approach provides an appropriate framework for evaluating instructional technologies that support Business Intelligence education.

Among the enterprise analytics platforms currently available, SAP Analytics Cloud (SAC) has emerged as one of the leading cloud-based Business Intelligence solutions. SAC is a Software-as-a-Service (SaaS) platform that integrates business intelligence, planning, predictive analytics, augmented analytics, machine learning, and data visualization within a unified cloud environment. By combining these capabilities into a single platform, SAC enables users to perform the complete analytics lifecycle, including data acquisition, preparation, visualization, forecasting, planning, collaboration, and decision support. Its web-based architecture allows users to access enterprise analytics applications without complex software installation while facilitating collaboration among distributed teams. The integration of visualization, planning, predictive analytics, and collaboration within a unified cloud platform reflects current trends toward intelligent enterprise analytics and digital transformation (SAP SE, 2024).

Pedagogical literature on business intelligence (BI) and analytics education has examined several instructional approaches and technology environments. Mrdalj (2007) described an applied graduate BI course based on the SAP Business Intelligence platform, while Mrdalj (2011) examined cloud-based delivery as a means of reducing the technical and infrastructure barriers associated with teaching BI. Although these studies predate SAP Analytics Cloud, they support the broader pedagogical rationale for using integrated, cloud-based SAP technologies in BI courses. Pomykalski (2015) demonstrated the use of multiple case studies to help business students connect BI concepts with organizational decision-making. More broadly, Jeyaraj (2019) proposed a pedagogical framework for business analytics courses that integrate technical, analytical, and business competencies. Collectively, these studies support the use of authentic cases, hands-on technology, and applied projects in BI education.

The growing adoption of SAC in industry has attracted increasing attention from researchers. Saini (2022) reported that SAC improves organizational decision-making by integrating business intelligence, predictive analytics, and planning capabilities within a unified cloud platform. The study concluded that consolidating multiple analytics functions into a single environment enhances organizational efficiency while supporting more informed strategic decisions.

Similarly, Jain (2025) investigated the role of SAC in improving business intelligence capabilities and found that the platform significantly enhances data analysis efficiency. The study highlighted SAC's integrated visualization, planning, and predictive analytics features, which enable organizations to transform complex datasets into meaningful and actionable business insights. The research also emphasized the platform's intuitive interface, allowing users to interact with data through dynamic dashboards and interactive visualizations.

Rapolu (2023) further emphasized the importance of SAC in supporting real-time data-driven decision-making. According to the study, SAC integrates business intelligence, planning, and predictive analytics into a unified cloud-based environment that enables organizations to respond more effectively to changing business conditions. The availability of real-time analytics allows decision-makers to monitor organizational performance continuously and make timely strategic adjustments based on current business information.

More recent research by Garba (2024) highlighted the increasing integration of artificial intelligence and machine learning within SAP cloud analytics environments. The study noted that AI-powered features including automated insights, anomaly detection, predictive forecasting, and intelligent recommendations enhance analytical capabilities while reducing the complexity of data analysis for users. These developments demonstrate the continuing evolution of enterprise analytics platforms toward intelligent decision-support systems that combine traditional business intelligence with advanced analytics and artificial intelligence.

Although previous studies have established the effectiveness of SAP Analytics Cloud (SAC) in improving organizational analytics and decision-making, most existing research has focused on business and industry applications. Comparatively limited attention has been given to the educational use of SAC, particularly within undergraduate Information Systems programs. Specifically, there remains a lack of empirical research examining how enterprise analytics platforms contribute to competency development in Business Intelligence education using internationally recognized curriculum frameworks such as the IS 2020 competency model.

This study addresses this gap by examining the integration of SAC into an undergraduate business intelligence course offered within an Information Systems program at a public university. Using the IS 2020 competency model as its theoretical foundation, the study investigates how hands-on learning activities involving data integration, dashboard development, reporting, visualization, and predictive analytics contribute to the development of industry-relevant competencies. By linking enterprise analytics technology with competency-based education, this research contributes to the growing body of literature on Business Intelligence pedagogy and provides insights into the effective use of cloud-based analytics platforms for preparing Information Systems students for modern data-driven organizations.

3. METHODOLOGY

This study employs the IS 2020 competency model for undergraduate programs in Information Systems as the theoretical foundation for evaluating the educational effectiveness of SAP Analytics Cloud (SAC) in business intelligence education. The IS 2020 model emphasizes competency-based learning and focuses on the knowledge, skills, and abilities graduates require in professional environments (Leidig & Salmela, 2022).

The framework is particularly relevant to Business Intelligence education because it identifies competencies in data management, business analytics, enterprise systems, digital innovation, and professional practice. Using IS 2020 provides a structured basis for examining how SAP Analytics Cloud contributes to the development of industry-relevant competencies within Information Systems programs.

Unlike traditional curriculum models that primarily focus on course content, the IS 2020 competency model organizes learning around measurable competencies that prepare students for professional practice. These competencies include data and information management, business process analysis, business intelligence and analytics, enterprise systems, digital innovation, cybersecurity awareness, communication, teamwork, ethical decision-making, and problem-solving (Leidig et al., 2022). Consequently, the framework provides a comprehensive basis for assessing whether educational technologies support the development of competencies expected from Information Systems graduates.

The framework is particularly relevant to Business Intelligence (BI) education because modern organizations increasingly rely on data-driven decision-making, requiring graduates to possess strong analytical, visualization, and enterprise data management capabilities. Within the IS 2020 model, competencies related to business analytics, enterprise systems, and digital transformation directly correspond to the learning outcomes expected in BI courses. Therefore, using IS 2020 allows this study to evaluate SAC not merely as a software application but as a learning platform capable of facilitating competency development aligned with internationally recognized Information Systems education standards.

SAC is an integrated cloud-based analytics platform that combines business intelligence, planning, predictive analytics, and data visualization capabilities within a unified environment (SAP SE, 2024). These functionalities align closely with several competency domains identified in the IS 2020 framework. Table 1 illustrates the conceptual relationship between SAC functionalities and the competencies outlined in IS 2020.

The mapping indicates that SAC supports the development of multiple competency areas simultaneously. Through data integration and modeling activities, students gain practical experience in preparing, organizing, and managing business data for analytical purposes. From a pedagogical perspective, the integration of SAC into business intelligence courses provides students with opportunities to apply theoretical concepts through authentic, industry-relevant activities. Students develop practical experience in creating dashboards, performing exploratory data analysis, generating predictive insights, and communicating analytical findings to support business decisions. Such experiential learning reinforces the competency-based philosophy of the IS 2020 framework by enabling learners to demonstrate knowledge through practical application rather than theoretical understanding alone.

IS 2020 Competency Area	SAC Capability	Expected Learning Outcome
Data Management	Data modeling and integration	Data preparation and management skills
Business Intelligence & Analytics	Dashboards and visualizations	Analytical thinking and insight generation
Enterprise Systems	SAP ecosystem integration	Enterprise systems awareness
Digital Innovation	Cloud-based analytics platform	Understanding of digital transformation technologies
Decision Support	Predictive analytics and forecasting	Evidence-based decision-making skills
Practicum (Professional Practice)	Reporting, governance, and collaboration tools	Business communication and reporting skills

Table 1. Conceptual Mapping of SAP Analytics Cloud to IS 2020 Competencies

Figure 1 illustrates the conceptual framework of the study, which is anchored on the IS 2020 Competency Model for undergraduate programs in Information Systems. The framework positions the IS 2020 competency model as the theoretical foundation, providing competency domains such as data management, business analytics, enterprise systems, digital innovation, and professional practice that guide the design and evaluation of Business Intelligence instruction. These competencies collectively represent the expected learning outcomes for Information Systems graduates.

The framework identifies SAP Analytics Cloud (SAC) as the independent variable. The next component of the framework consists of Business Intelligence learning activities, which act as the instructional mechanism through which students interact with SAP Analytics Cloud. These activities include data import and integration exercises, dashboard and visualization development, predictive analytics and forecasting, and the presentation of analytical findings.

These learning activities contribute directly to the development of IS 2020 competencies, which represent the dependent variable of the study. As students use SAP Analytics Cloud to complete Business Intelligence tasks, they strengthen competencies in data management, business analytics, enterprise systems, analytical thinking, digital innovation, communication, and professional practice. The framework assumes that meaningful engagement with enterprise analytics tools facilitates the acquisition of both technical and higher-order cognitive skills required in modern Information Systems professions.

Finally, the framework proposes that competency development leads to the expected educational outcome of improved Business Intelligence competency and enhanced industry readiness among undergraduate Information Systems students. By integrating SAP Analytics Cloud into Business Intelligence instruction, students gain experience with enterprise analytics technologies commonly used in organizations, thereby reducing the gap between academic learning and professional practice.

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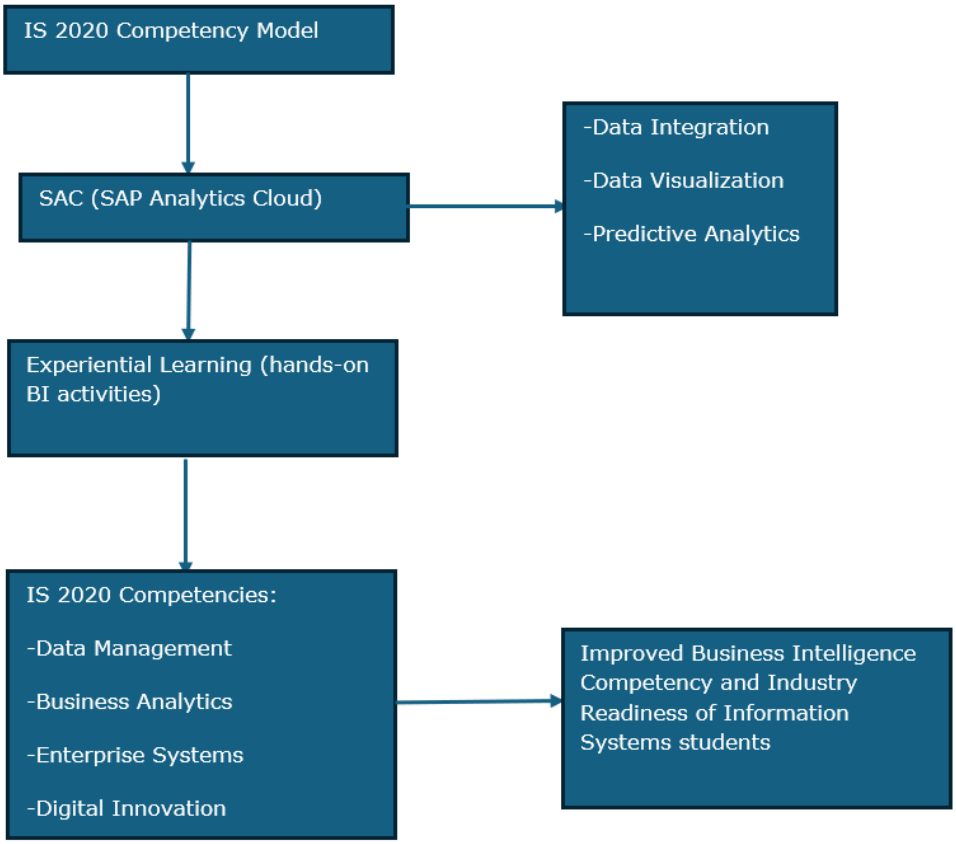

Figure 1. Conceptual Framework

SAP Analytics Cloud in a Business Intelligence Course

The Business Intelligence course examined in this study is designed to provide students with a comprehensive understanding of theoretical foundations with practical experiences to develop competencies in data management, analytics, visualization, and decision support. The course learning objectives include:

1. Understanding fundamental Business Intelligence concepts, architectures, and technologies.
2. Developing competencies in data preparation and analysis.
3. Designing and implementing dashboards and data visualizations.
4. Applying analytical methods to support managerial decision-making.

SAP Analytics Cloud (SAC) serves as the primary analytical platform used throughout the course. The use of business data enables students to connect theoretical concepts with practical applications and better understand real-world analytical challenges.

Students' competency was assessed before and after the SAP Analytics Cloud learning activities using a five-point scale ranging from 1 (very low competency) to 5 (very high competency). The assessment measured five competency dimensions aligned with the course learning activities and the IS 2020 competency framework: data preparation and integration, dashboard and visualization, analytical thinking and insight generation, predictive analytics and forecasting, and communication of analytical findings. Pre- and post-course scores from students were used to examine each competency dimension.

4. RESULTS AND DISCUSSION

The findings indicate that integrating SAP Analytics Cloud (SAC) contributed positively to the development of the competencies identified in the IS 2020 framework. Through activities as shown in Table 2, involving data preparation, visualization, reporting, and predictive analytics, students strengthened both technical and analytical skills, supporting the competency-based learning approach emphasized by IS 2020.

The implementation of SAC was evaluated within an undergraduate Business Intelligence course offered in an Information Systems program at a public university. The course introduces students to fundamental Business Intelligence concepts, including data management, dashboard development, data visualization, descriptive and predictive analytics, and data-driven decision-making. As a core course in the undergraduate curriculum, it aims to develop students' analytical and technical competencies through the application of Business Intelligence methodologies to realistic business problems.

The course follows a competency-based learning approach consistent with the IS 2020 competency model, combining classroom instruction with laboratory-based activities and project-based learning. Students were introduced to the theoretical foundations of Business Intelligence before engaging in practical exercises using SAP Analytics Cloud (SAC). The cloud-based environment enabled students to apply concepts learned during lectures by working with business datasets. This combination of theory and practice provided opportunities for students to experience the complete Business Intelligence workflow within an enterprise analytics platform.

Providing students with access to enterprise-level Business Intelligence software can be challenging because of hardware requirements, software licensing costs, and laboratory infrastructure limitations. The adoption of SAP Analytics Cloud addressed many of these constraints through its cloud-based architecture, allowing students to access the platform using standard web browsers without requiring specialized laboratory installations. This accessibility enabled learning to continue both inside and outside scheduled laboratory sessions, supporting flexible and self-directed learning while ensuring that students gained experience with technologies currently used in industry.

Throughout the semester, students participated in laboratory exercises and project-based activities designed to strengthen competencies in data management, business analytics, enterprise systems, and professional communication. As summarized in Table 2, students engaged in data import and integration, dashboard and visualization development, predictive analytics and forecasting, and presentation of analytical findings. Each activity targeted specific competency domains while reinforcing the practical application of Business Intelligence concepts.

Students participate in a range of experiential learning activities designed to reinforce conceptual understanding and develop practical skills. These activities include:

- Data import and integration exercises.
- Dashboard and visualization development projects.
- Predictive analytics and forecasting exercises.
- Presentation of analytical findings.

These hands-on activities described in Table 2 encourage active learning and provide students with opportunities to apply Business Intelligence concepts within realistic organizational contexts. Further, these activities are aligned with ABET student outcomes established by ABET (2021).

Student Activity	Description	Learning Outcome	ABET Student Outcomes
Data Import and Integration Exercises	Students imported data from multiple sources and integrated datasets for analysis.	Developed skills in data acquisition, consolidation, and management.	Acquire and apply new knowledge using appropriate learning strategies.
Dashboard and Visualization Development Projects	Students created interactive dashboards and visual reports using BI tools.	Improved ability to communicate insights through effective visualizations.	Analyze and interpret data and draw appropriate conclusions.
Predictive Analytics and Forecasting Exercises	Students applied forecasting and predictive models to business datasets.	Developed competencies in trend analysis and predictive decision support.	Ability to analyze and interpret data and apply informed judgment to draw meaningful conclusions.
Presentation of Analytical Findings	Students presented results and proposed strategic recommendations based on data analysis.	Enhanced communication, reporting, and managerial decision-support skills.	Communicate effectively with a range of audiences.

Table 2. SAC Student Activities mapped to Learning Outcomes

Empirical Evaluation

To provide a quantitative assessment of competency development, a pre/post course evaluation was specified for 30 students enrolled in the senior-level course. The implementation of SAC was evaluated in a senior-level undergraduate Business Intelligence course offered in an Information Systems program at a public university. As an upper-division course in the undergraduate curriculum, it aimed to develop students' analytical and technical competencies through the application of Business Intelligence methodologies to realistic business problems.

Students were represented on five competency measures aligned with the course activities and IS 2020 framework: data preparation and integration, dashboard and visualization, analytical thinking, predictive analytics and forecasting, and communication of analytical findings. Scores were modeled on a 1-5 competency scale, where higher values indicate greater demonstrated competency. Paired-samples t tests were used to compare pre-course and post-course scores, with Cohen's d calculated as the mean paired difference divided by the standard deviation of the paired differences.

Across the modeled competency areas in Table 3, post-course means were higher than pre-course means. The largest modeled gain occurred in dashboard and visualization competency, followed by predictive analytics and forecasting. All five paired comparisons were statistically significant ($p < .001$), with moderate-to-large, standardized effects.

As shown in Table 3, students reported higher competency following the SAC-based learning activities across all five dimensions. The largest increase occurred in dashboard and visualization, where the mean increased from 2.91 (*SD* = 0.67) before the SAC learning activities to 3.52 (*SD* = 0.61) afterward, representing a mean increase of 0.61. This difference was statistically significant, $t(29) = 4.82$, $p < .001$, with a large within-participant effect size ($d_z = 0.88$). More moderate increases were observed for analytical thinking and insight generation and communication of analytical findings. Analytical thinking and insight generation increased from 3.14 (*SD* = 0.59) to 3.56 (*SD* = 0.55), a mean increase of 0.42, $t(29) = 3.76$, $p < .001$, $d_z = 0.69$. Communication of analytical findings increased from 3.21 (*SD* = 0.61) to 3.60 (*SD* = 0.57), representing an increase of 0.39, $t(29) = 3.44$, $p = .002$, $d_z = 0.63$.

Competency measure	**Pre M (SD)**	**Post M (SD)**	**Mean change**	***t*(29)**	***p***	**Cohen's d_z**
Data preparation & integration	3.08 (0.62)	3.55 (0.58)	0.47	4.11	< .001	0.75
Dashboard & visualization	2.91 (0.67)	3.52 (0.61)	0.61	4.82	< .001	0.88
Analytical thinking & insight generation	3.14 (0.59)	3.56 (0.55)	0.42	3.76	< .001	0.69
Predictive analytics & forecasting	2.78 (0.70)	3.29 (0.65)	0.51	4.03	< .001	0.74
Communication of analytical findings	3.21 (0.61)	3.60 (0.57)	0.39	3.44	.002	0.63

Table 3. Illustrative Pre/Post Competency Results (n = 30)

Overall, the pattern of results indicates improvement across each of the five measured competency dimensions. The strongest change occurred in dashboard and visualization competency, followed by data preparation and integration and predictive analytics and forecasting. This pattern is consistent with the hands-on nature of the course, in which students directly engaged in dashboard development, data integration, predictive analysis, and presentation activities using SAC.

Within this instructional context, the findings indicate that integrating SAP Analytics Cloud contributed positively to the development of competencies identified in the IS 2020 competency model for undergraduate programs in Information Systems. The implementation of SAC enabled students to acquire both technical knowledge and practical analytical skills through experiential learning activities that simulated real-world business intelligence processes. Consistent with the IS 2020 competency framework, students demonstrated learning not only through theoretical understanding but also through the practical application of analytics tools to authentic business datasets.

The findings demonstrate that SAP Analytics Cloud enhanced students' analytics competencies through dashboard development, visualization exercises, and predictive analytics activities. The implementation of SAP Analytics Cloud provided several educational benefits. First, SAC offered an integrated environment that combined data management, visualization, reporting, and predictive analytics, enabling students to experience the complete Business Intelligence process within a single platform (SAP SE, 2024). Second, its user-friendly interface reduced technical barriers and encouraged greater engagement with analytical tasks.

The cloud-based deployment of SAC minimizes dependence on high-performance laboratory computers while providing students with continuous access to enterprise analytics tools. This flexibility supports blended and independent learning and enables instructors to incorporate more authentic, project-based learning activities.

Exposure to an enterprise-level analytics platform enhanced students' familiarity with technologies commonly used in industry, helping bridge the gap between academic learning and professional practice. Overall, the findings suggest that SAC effectively supports Business Intelligence education while contributing to competency development aligned with the IS 2020 framework.

5. CONCLUSION

This study examined the role of SAP Analytics Cloud (SAC) in supporting Business Intelligence education within undergraduate Information Systems programs using the IS 2020 competency model as the theoretical framework. The findings indicate that integrating SAC into a Business Intelligence course provides an effective means of developing the competencies expected of Information Systems graduates in today's data-driven business environment. Through structured, hands-on learning activities involving data preparation, data integration, dashboard development, business reporting, data visualization, predictive analytics, and presentation of analytical findings, students acquired practical experience that complemented theoretical instruction and reinforced competency-based learning.

The study demonstrated that SAP Analytics Cloud enables students to translate Business Intelligence concepts into practical applications by working with authentic business datasets and enterprise-level analytics tools. Students engaged in experiential learning activities that simulated real organizational decision-making processes. These activities promoted the development of technical competencies in data management and analytics while simultaneously strengthening higher-order skills such as critical thinking, problem-solving, communication, collaboration, and evidence-based decision-making. These competencies are central to the learning outcomes identified in the IS 2020 competency model and are increasingly valued by organizations seeking graduates who can leverage data to support strategic and operational decisions.

Another important contribution of this study is its demonstration of the educational value of cloud-based enterprise analytics platforms. SAP Analytics Cloud integrates data management, visualization, planning, reporting, predictive analytics, and collaboration within a single cloud environment, allowing students to experience the complete Business Intelligence workflow using technologies similar to those employed in industry. The platform's cloud-based architecture provides flexible access from different locations and devices, reducing dependence on specialized laboratory facilities while encouraging collaborative and self-directed learning. In addition, its intuitive interface lowers technical barriers, enabling students to focus on analytical reasoning and business problem-solving rather than software complexity.

The findings further suggest that incorporating enterprise analytics platforms into undergraduate Information Systems curricula helps narrow the gap between academic preparation and professional practice. Exposure to SAP Analytics Cloud familiarizes students with contemporary Business Intelligence tools and workflows, providing valuable experience with technologies that support digital transformation initiatives across industries. As organizations continue to invest in cloud computing, advanced analytics, and artificial intelligence, graduates equipped with practical experience using enterprise analytics platforms are likely to be better prepared to meet evolving workforce expectations. Consequently, the integration of SAP Analytics Cloud represents not only a technological enhancement to Business Intelligence education but also a curriculum innovation that aligns academic learning outcomes with industry competency requirements.

From a pedagogical perspective, the study reinforces the value of competency-based education advocated by the IS 2020 framework. The integration of SAC supported active, experiential, and project-based learning, allowing students to demonstrate competency through authentic analytical tasks rather than relying solely on theoretical assessments.

Despite these contributions, several limitations should be acknowledged. The study focused on the implementation of SAP Analytics Cloud (SAC) within a single undergraduate Business Intelligence course offered in an Information Systems program at a public university. Furthermore, the study primarily examined educational outcomes during course implementation and did not evaluate the long-term retention of competencies or graduates' performance in professional settings.

6. FUTURE RESEARCH

Future research should expand upon these findings by investigating the educational effectiveness of SAP Analytics Cloud across different higher education institutions, academic disciplines, and instructional environments. Comparative studies involving other enterprise analytics platforms, such as Microsoft Power BI, Tableau, and Qlik Sense, would provide valuable insights into the relative strengths of different technologies in supporting competency-based Business Intelligence education. Such comparisons could examine factors including usability, learning effectiveness, student engagement, collaborative learning, and the development of analytical competencies.

Longitudinal research is also recommended to evaluate the lasting impact of Business Intelligence education using SAP analytics cloud. Tracking students beyond graduation could determine whether competencies developed through enterprise analytics platforms translate into improved employability, workplace performance, professional certifications, career advancement, and readiness for data-centric

roles in business and information systems. Such studies would provide stronger empirical evidence regarding the relationship between competency-based analytics education and workforce outcomes.

Additionally, future studies may investigate students' perceptions of learning, technology acceptance, self-efficacy, and satisfaction when using cloud-based Business Intelligence platforms. Examining instructors' experiences in designing competency-based learning activities and identifying effective pedagogical strategies for integrating enterprise analytics software into undergraduate curricula would further contribute to improving instructional practice. Researchers may also explore collaborative learning approaches, interdisciplinary Business Intelligence projects, and industry-academic partnerships that utilize enterprise analytics platforms to provide students with authentic, real-world learning experiences.

Finally, future research should examine how emerging technologies including artificial intelligence, augmented analytics, generative AI, and intelligent decision-support systems can be integrated with cloud-based Business Intelligence platforms to further enhance Information Systems education. As organizations increasingly adopt AI-driven analytics and automated decision-support technologies, Information Systems curricula must continue to evolve to ensure that graduates possess not only technical proficiency but also the analytical, ethical, and professional competencies necessary to succeed in rapidly changing digital environments. By continuing to align curriculum design with the IS 2020 competency model and emerging industry practices, higher education institutions can better prepare future Information Systems professionals to lead data-driven innovation and organizational transformation.

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