

RESEARCH ARTICLE

Designing a Data Analytics Course for Nursing Professionals: Pedagogical Approach and Learner Feedback

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Abstract

Healthcare organizations increasingly rely on data-driven decision-making, yet many nursing professionals lack formal training in analytical methods. This paper describes the design, delivery, and evaluation of a data analytics course tailored for nurses enrolled in a Master of Science in Nursing (MSN) program at a midwestern U.S. university. The course was structured around five topic modules spanning fourteen weeks: foundations of nursing analytics, data management and visualization, statistical methods for nursing research, predictive modeling and clinical decision support, and ethics and governance. Four software platforms, that is, Microsoft Excel, Tableau, IBM SPSS Statistics, and KNIME Analytics Platform, were integrated into lab exercises to provide learners with practical experience. We surveyed 32 students who were working nurses at a regional medical center in the Chicago metropolitan area, collecting demographic information and perceptions of the topic's relevance, the tool's usefulness, the learning activity's effectiveness, and overall satisfaction. Results indicate that respondents valued data visualization and ethical governance most highly, while predictive modeling and natural language processing received lower relevance scores. Excel and Tableau were perceived as the most useful and easiest tools to use. Hands-on laboratory sessions were rated the most effective instructional activity. We discuss implications for curriculum designers seeking to build analytics literacy among nursing professionals and propose directions for future course iterations.

Keywords — Nursing; Analytics; Curriculum design; Data analytics education; Nursing informatics; Healthcare informatics

1 Introduction

The rapid digitization of healthcare delivery has generated enormous volumes of clinical, operational, and financial data. Electronic health records (EHRs), patient monitoring systems, pharmacy databases, and administrative reporting tools produce data streams that hold considerable promise for improving patient outcomes, reducing costs, and streamlining workflows [1, 2]. At the same time, prior nursing informatics research has emphasized that many nurses need additional preparation to analyze, interpret, and act on healthcare data [3, 4].

Nurses represent the largest segment of the healthcare workforce in the United States and occupy roles that span bedside care, care coordination, quality improvement, infection control, and executive leadership [5]. Despite this breadth of responsibility, graduate nursing curricula have historically emphasized clinical competencies and research methods courses that treat statistics as a discrete methodological step rather than as a continuous analytical capability embedded in daily practice [6]. Recent professional standards, including the 2021 AACN Essentials document, have begun to call for informatics and data literacy across all levels of nursing education [7]. Translating these aspirations into concrete coursework, however, remains an open challenge.

In this paper, we present the results of a study guided by the following questions: (1) What topics and learning objectives should a data analytics course for nursing professionals address? (2) Which software tools are most useful and accessible for nurses with limited technical backgrounds? (3) How do nursing learners perceive the relevance, difficulty, and value of such a course? To address these questions, we designed, delivered, and evaluated a fourteen-week data analytics course within a Master of Science in Nursing (MSN) program at a midwestern U.S. university. The course enrolled 35 practicing nurses from a regional medical center in the Chicago metropolitan area during the Fall 2023 semester. We collected 32 usable post-course surveys to assess perceptions of topic relevance, tool usability, activity effectiveness, difficulty, and overall satisfaction.

This paper makes three contributions. First, it presents a course design framework that maps learning objectives to five topic modules and four software tools. Second, it reports detailed survey results that characterize the target learner population and their perceptions. Third, it derives practical recommendations for educators seeking to integrate analytics training into graduate nursing programs.

2 Related Work

Nursing informatics, as a specialty, has evolved from a narrow focus on documentation systems toward a broader concern with how data are generated, curated, analyzed, and applied to improve care [5]. Stagers et al. [4] proposed a four-level competency model distinguishing beginning nurses, experienced nurses, informatics specialists, and informatics innovators, each requiring progressively deeper knowledge of information management and analytical reasoning. Ronquillo et al. [6] traced the conceptual progression the data-information-knowledge-wisdom framework in the nursing informatics literature, arguing that analytics education must situate technical skills within this broader epistemic framework.

Table 1: Mapping of learning objectives to topic modules and assessments.

LO	Primary Modules	Assessments
LO1	Modules 1, 2	Lab exercises, capstone
LO2	Modules 3, 4	Lab exercises, midterm
LO3	Modules 3, 4, 5	Capstone project
LO4	Module 5, integrated throughout	Reflections, capstone

Brennan and Bakken [3] articulated the case that nursing research and practice would benefit substantially from big-data methods, provided that nurses are equipped with the competencies to engage with large, heterogeneous datasets. Westra et al. [8] reinforced this argument by reviewing exemplar nursing research studies that employed data science techniques, noting that the field remained nascent and that educational infrastructure had not kept pace with research ambitions. Topaz and Pruinelli [9] similarly called for coordinated efforts to prepare the nursing workforce for a data-intensive future.

At the institutional level, the American Association of Colleges of Nursing [7] revised its Essentials document in 2021 to explicitly require informatics and healthcare technology competencies for all graduates of baccalaureate and graduate nursing programs. Health informatics professional guidance also frames informatics as an interdisciplinary competency area that connects healthcare, information science, and computing [10].

A parallel stream of literature examines the design of analytics curricula for healthcare and business audiences. Strome [11] provided a practitioner-oriented overview of healthcare analytics, distinguishing descriptive, predictive, and prescriptive approaches. Bates et al. [1] demonstrated the potential of analytics to identify high-risk patient populations, an application directly relevant to nursing care management. Rajkomar et al. [12] reviewed machine-learning applications in medicine, offering a useful reference for course content on predictive modeling.

In the information systems education literature, Paul and MacDonald [13] surveyed analytics curricula across undergraduate and graduate programs, finding substantial variation in tool selection, topic emphasis, and pedagogical strategies. Parks [14] described a healthcare analytics course in an information systems program that included modules on data visualization, data mining, and ethical use of health data, noting that students favored applied exercises over theoretical lectures. Sapci and Sapci [15] emphasized the importance of hands-on activities for teaching health informatics skills, reporting that experiential learning improved student engagement and self-efficacy. Shmueli et al. [16] provided a widely used textbook treatment of data mining methods that has influenced the design of analytics courses in multiple disciplines.

Research on learner perceptions of analytics tools often draws on the Technology Acceptance Model (TAM), which posits that perceived usefulness and perceived ease of use are primary determinants of technology adoption [17]. This framework has been applied in healthcare settings to examine clinician adoption of EHR systems [2] and in educational settings to evaluate student acceptance of learning technologies. We adopted TAM-inspired constructs in our survey to measure how nursing learners perceived each software tool.

The reliability of analytics in healthcare depends critically on data quality. Weiskopf and Weng [18] proposed a multi-dimensional framework for assessing EHR data quality, identifying completeness, correctness, concordance, plausibility, and currency as key dimensions. Dolezel and McLeod [19] examined diffusion of big-data analytics innovations in healthcare organizations and highlighted data governance as a prerequisite for effective adoption. Katznelson and Gerke [20] argued that ethics education related to artificial intelligence must become a core element of health professions training, a position that informed our inclusion of an ethics module.

3 Course Design

The course was organized around four learning objectives, each aligned with competencies identified in the 2021 AACN Essentials [7] and the nursing informatics literature [4, 5]:

- LO1. Identify, collect, and visualize clinical and operational nursing data.
- LO2. Understand core analytical methods and select appropriate techniques for nursing-relevant questions.
- LO3. Interpret analytics outputs and translate findings into evidence-based nursing practice.
- LO4. Recognize ethical considerations including patient privacy, data governance, and algorithmic fairness.

Table 1 maps each learning objective to the topic modules and assessment components that address it.

3.1 Topic Modules

The course comprised five modules delivered over fourteen weeks. Table 2 summarizes the module structure.

Module 1 (Weeks 1–2): Foundations of Nursing Analytics. This introductory module established a shared vocabulary and conceptual grounding. Students examined the continuum from descriptive reporting (e.g., monthly

Table 2: Topic modules, week allocation, and key content areas.

Module	Title	Weeks	Key Topics
1	Foundations of Nursing Analytics	1–2	Overview of analytics, types of analytics (descriptive, predictive, prescriptive), use cases in nursing practice
2	Data Management and Visualization	3–5	EHR data structures, data quality assessment, dashboard design, data cleaning
3	Statistical Methods for Nursing Research	6–8	Descriptive statistics, ANOVA, correlation, linear and logistic regression
4	Predictive Modeling and Clinical Decision Support	9–12	Classification algorithms, risk scoring models, natural language processing basics, model evaluation
5	Ethics, Governance, and the Future of Nursing Analytics	13–14	Patient privacy (HIPAA), algorithmic fairness, data stewardship, emerging trends

fall-rate dashboards) through predictive analytics (e.g., readmission risk scores) to prescriptive recommendations (e.g., staffing optimization). Case studies drawn from published literature [1, 11] illustrated how analytics had been applied to real healthcare problems. The module concluded with a discussion of nursing-specific data sources and clinical workflows that generate analyzable data.

Module 2 (Weeks 3–5): Data Management and Visualization. Module 2 addressed the practical challenges of working with healthcare data. Students learned to assess data quality using dimensions proposed by Weiskopf and Weng [18], practiced data cleaning in Excel, and created interactive dashboards in Tableau using a de-identified patient dataset. Dashboard assignments required students to select appropriate chart types, apply color conventions for clinical audiences, and annotate visualizations with contextual notes.

Module 3 (Weeks 6–8): Statistical Methods for Nursing Research. This module covered foundational statistical techniques commonly used in nursing research. Topics included descriptive statistics, analysis of variance, correlation analysis, and simple linear regression. Students used IBM SPSS Statistics to analyze a dataset of patient satisfaction scores and staffing ratios, testing hypotheses about the relationship between nurse-to-patient ratios and patient-reported outcomes. The module emphasized interpretation of output rather than manual computation.

Module 4 (Weeks 9–12): Predictive Modeling and Clinical Decision Support. Module 4 introduced supervised learning concepts using the KNIME Analytics Platform. Students built classification models for hospital readmission prediction, experimenting with decision trees, logistic regression, and k -nearest neighbor algorithms. A two-week segment addressed the basics of text analytics and natural language processing (NLP) applied to nursing notes. Throughout, the module drew on Rajkomar et al. [12] and Shmueli et al. [16] to contextualize methods.

Module 5 (Weeks 13–14): Ethics, Governance, and the Future of Nursing Analytics. The final module examined ethical obligations that accompany data use in healthcare. Topics included the Health Insurance Portability and Accountability Act (HIPAA) privacy and security rules, algorithmic bias in clinical prediction models, data governance frameworks, and the nurse's role as a data steward. Readings by Katznelson and Gerke [20] and Dolezel and McLeod [19] grounded the discussion in current scholarly debate.

3.2 Software Tools

Four software tools were selected based on availability, relevance to clinical practice, and pedagogical suitability:

- **Microsoft Excel.** Used throughout the course for data entry, basic statistical calculations, pivot tables, and charting. Excel was chosen because it is universally available in healthcare organizations and familiar to most students.
- **Tableau.** Introduced in Module 2 for interactive visualization and dashboard construction. Tableau Desktop was provided through an academic license. Its drag-and-drop interface was well suited to learners without programming experience.
- **IBM SPSS Statistics.** Used in Module 3 for hypothesis testing, ANOVA, and regression analysis. SPSS was selected because its menu-driven workflow made common statistical procedures accessible without requiring programming.
- **KNIME Analytics Platform.** Introduced in Module 4 for predictive modeling workflows. KNIME's visual workflow paradigm, in which analytical steps are represented as connected nodes, offered an accessible entry point to machine learning for non-programmers.

3.3 Assessment Design

The course used four assessment components. Lab exercises included six hands-on lab assignments, each requiring students to complete an analytical task using one of the four tools. The Mid-term exam consisted of a written examination covering Modules 1–3, including conceptual questions and output interpretation. The Capstone involved a team-based project in which groups of three to four students analyzed a de-identified clinical dataset, produced a dashboard, and delivered a written report with actionable recommendations. In addition, participation and reflections included weekly discussion posts, attendance, and three reflective essays on ethical case scenarios. Figure 1 shows the assessment structure and the corresponding weight (grade).

The capstone project was designed to integrate skills from all five modules. Each team selected a clinical question such as factors associated with patient falls, variations in length of stay by unit, or infection-rate trends, and applied the full analytics workflow from data preparation through visualization, statistical testing, and reporting. Final presentations were delivered to a panel that included a nurse informaticist from the partnering medical center, providing an element of professional authenticity.

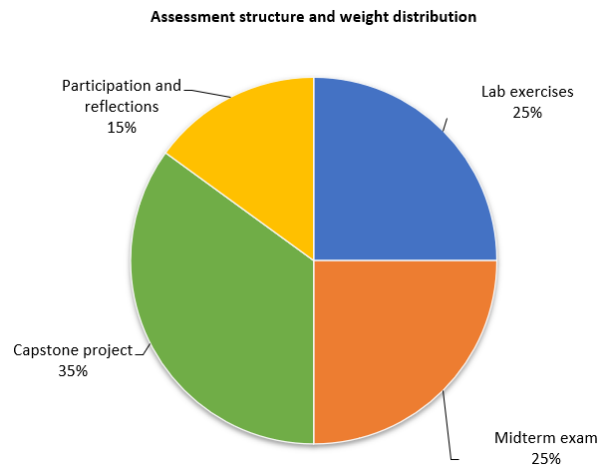


Figure 1: Assessment structure and grade distribution.

4 Evaluation Study

We employed a post-course survey design to collect data on learner backgrounds and perceptions. The survey was administered during the final week of the Fall 2023 semester, after all coursework and examinations had been completed. Participation was voluntary and anonymous; responses were not linked to course grades.

4.1 Participants

The target population consisted of nurses enrolled in the MSN program at the university who were simultaneously employed at a regional medical center in the Chicago metropolitan area. All 35 students enrolled in the course were invited to participate; 32 returned usable surveys, yielding a response rate of 91.4%.

4.2 Survey Instrument

The survey comprised two parts. Part A collected demographic and background information, including gender, age range, highest nursing degree, current professional role, years of tenure at the medical center, and prior exposure to statistics or analytics coursework. Part B measured perceptions across five dimensions:

1. *Topic perceptions.* For each of the eight major topics covered in the course, respondents rated perceived usefulness and perceived relevance on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree).
2. *Tool perceptions.* For each of the four software tools used, respondents rated perceived usefulness, perceived ease of use, and likelihood of future use on the same five-point scale.
3. *Learning activity effectiveness.* Respondents rated the usefulness of seven types of learning activities on a five-point scale.
4. *Difficulty.* Respondents indicated the perceived difficulty of lab exercises, the midterm exam, and the overall course on a five-point scale ranging from “very easy” to “very difficult.”

5. *Learning objective fulfillment and satisfaction.* Respondents rated the extent to which the course fulfilled each of the four learning objectives and provided overall satisfaction and recommendation likelihood scores, each on a five-point scale.

The complete survey instrument is reproduced in Appendix A. Responses were analyzed using descriptive statistics. We computed means and, where appropriate, frequency distributions for each survey item. Given the small sample size ($n = 32$) and the exploratory nature of the study, we did not conduct inferential statistical tests. All analyses were performed in IBM SPSS Statistics (version 29).

5 Results

5.1 Demographics

Figure 2 and Table 3 summarize the demographic characteristics of the 32 respondents. The sample was predominantly female (75.0%). The largest age cohort was 40–49 years (40.6%), followed by 30–39 years (28.1%). Most respondents held a Bachelor of Science in Nursing (BSN) as their highest degree (59.4%). Professional roles were nearly evenly split between clinical positions (37.5%) and administrative or management positions (43.8%), with smaller proportions in education (12.5%) and informatics (6.2%). The majority had been employed at the medical center for one to nine years (62.5%).

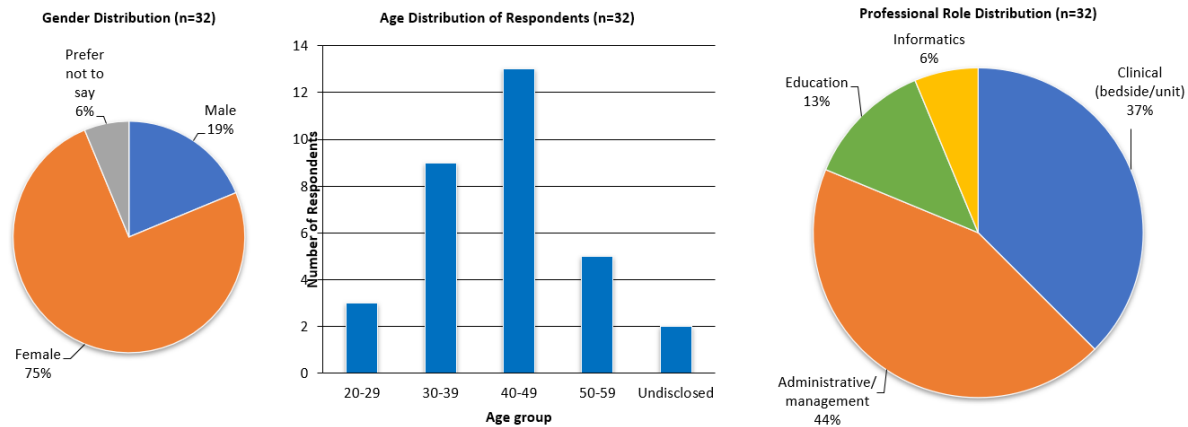


Figure 2: Demographic profile of survey respondents: gender, age, and role.

Table 3: Demographic profile of survey respondents: degree and tenure.

Variable	Category	Count	%
Highest nursing degree	BSN	19	59.4
	MSN	10	31.3
	Doctoral (DNP/PhD)	3	9.4
Tenure at medical center	< 1 year	6	18.8
	1–9 years	20	62.5
	10–15 years	3	9.4
	> 15 years	3	9.4

Table 4 reports respondents’ prior exposure to statistics and analytics. Nearly all respondents (90.6%) had completed at least one introductory statistics course, typically as part of their BSN or early graduate coursework. However, only a small fraction had experience with regression analysis (12.5%), programming languages (6.3%), or formal analytics training (3.1%). These findings confirmed that the learner population possessed foundational numeracy but limited exposure to the methods and tools emphasized in the course.

Table 4: Prior exposure to statistics and analytics ($n = 32$; respondents could select multiple categories).

Prior experience	Count	%
Basic statistics course (undergraduate or graduate)	29	90.6
Regression or multivariate analysis	4	12.5
Programming (R, Python, SQL, etc.)	2	6.3
Formal analytics or data science training	1	3.1

Respondents rated the perceived usefulness and perceived relevance of eight major topics covered in the course. Results are summarized in Figure 3. Data visualization received the highest usefulness rating ($M = 4.41$), followed closely by ethics and governance ($M = 4.38$). At the lower end, NLP and text mining ($M = 3.59$) and predictive modeling ($M = 3.84$) received the lowest scores. Perceived relevance followed a similar ordering, with ethics and governance ($M = 4.34$) and data visualization ($M = 4.28$) at the top.

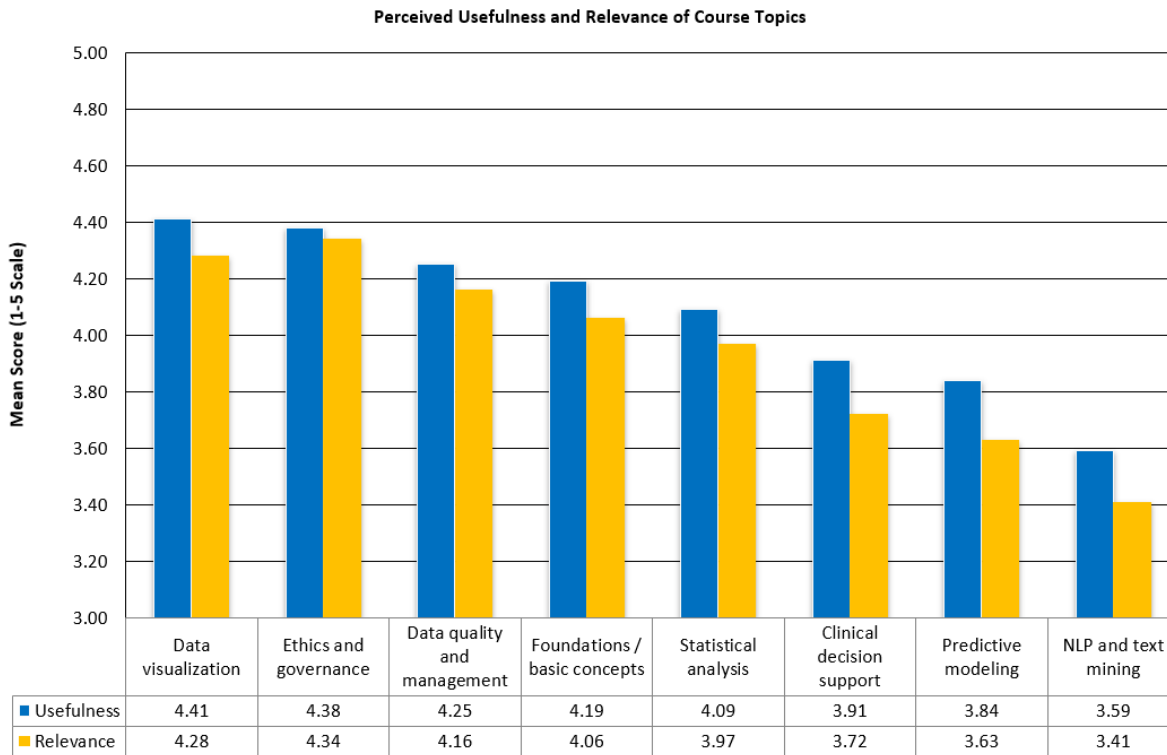


Figure 3: Perceived usefulness and relevance of course topics (mean scores on a 1–5 scale; $n = 32$)

Figure 4 presents mean ratings for the four software tools across three TAM-inspired dimensions: perceived usefulness, perceived ease of use, and likelihood of future use.

Excel was rated most favorably across all three dimensions, with the highest ease-of-use score ($M = 4.59$) and the highest likelihood of future use ($M = 4.53$). Tableau also performed well, particularly on usefulness ($M = 4.22$). SPSS and KNIME received lower ratings, with KNIME earning the lowest future-use score ($M = 2.88$). These patterns align with the expectation that tools requiring less technical learning would be preferred by a population with limited prior analytics training. In fact, Excel and Tableau, which rely on familiar spreadsheet and drag-and-drop interfaces, received higher scores.

Respondents rated the perceived usefulness of seven learning activities. Results appear in Table 5. Hands-on lab sessions received the highest rating ($M = 4.34$), reinforcing the value of experiential learning activities documented in prior work [15]. Case studies ($M = 3.91$) and homework exercises ($M = 3.88$) followed. The midterm exam received the lowest usefulness rating ($M = 3.22$), suggesting that students perceived traditional examinations as less valuable for skill development than applied assignments.

Table 5: Perceived usefulness of learning activities (mean scores on a 1–5 scale; $n = 32$).

Learning activity	Mean
Hands-on labs	4.34
Case studies	3.91
Homework / lab exercises	3.88
Capstone project	3.78
Lectures	3.69
Office hours	3.44
Midterm exam	3.22

Figure 5 reports the distribution of difficulty ratings for lab exercises, the midterm exam, and the overall course. Lab exercises were perceived as manageable by most respondents, with 76% rating them as “very easy,” “easy,” or “fair.” The midterm exam was perceived as more challenging, with 63% of respondents rating it “somewhat

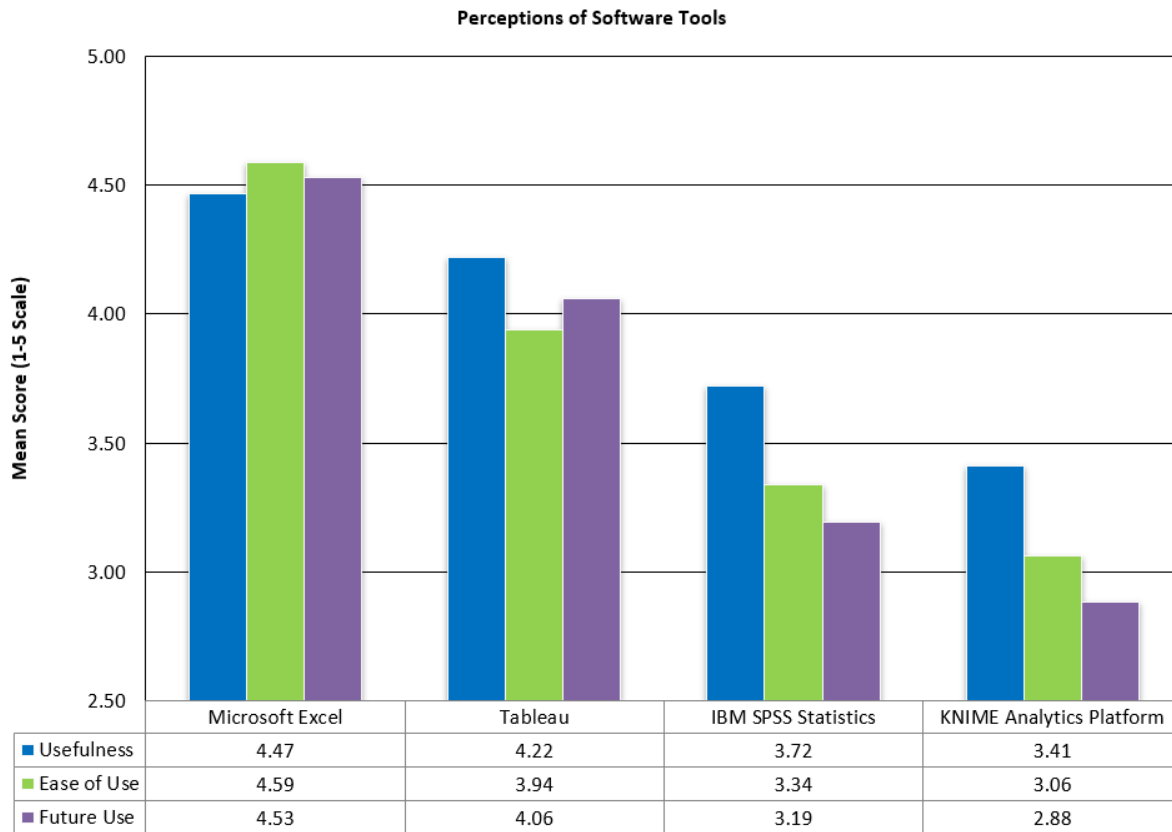


Figure 4: Perceptions of software tools (mean scores on a 1–5 scale)

difficult” or “very difficult.” The overall course fell between these extremes, with 47% rating it “fair” and 47% rating it “somewhat difficult” or “very difficult.”

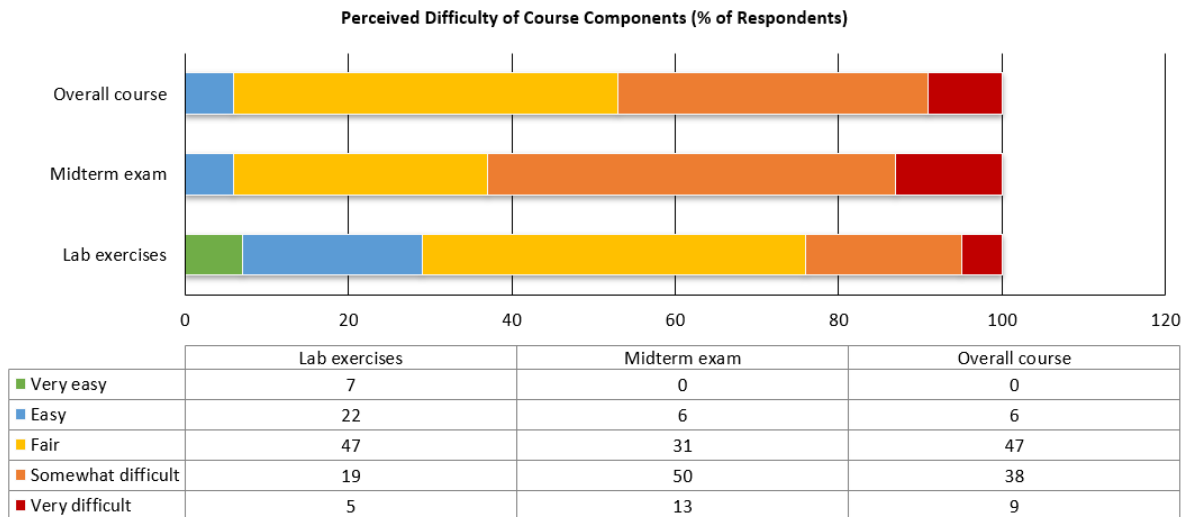


Figure 5: Perceived difficulty of course components (percentage of respondents)

Table 6 presents mean ratings of the extent to which the course fulfilled each learning objective. LO4 (ethics) received the highest fulfillment score ($M = 4.25$), consistent with the high topic relevance ratings for the ethics and governance module. LO2 (method understanding) received the lowest score ($M = 3.97$), indicating that some learners found it difficult to develop confidence in selecting among multiple analytical techniques within a single semester.

Two summary items captured general sentiment. Overall satisfaction with the course received a mean score of 4.06 on the five-point scale. The likelihood of recommending the course to a colleague received a mean

Table 6: Perceived fulfillment of learning objectives (mean scores on a 1–5 scale; $n = 32$).

Learning objective	Mean
LO4: Ethics, privacy, and algorithmic fairness	4.25
LO1: Identify, collect, and visualize nursing data	4.16
LO3: Interpret outputs and translate to practice	4.09
LO2: Understand and select analytical methods	3.97

score of 3.97, as shown in Figure 6. Both values suggest a favorable overall reception, though there is room for improvement, particularly in the more technically demanding segments of the curriculum.

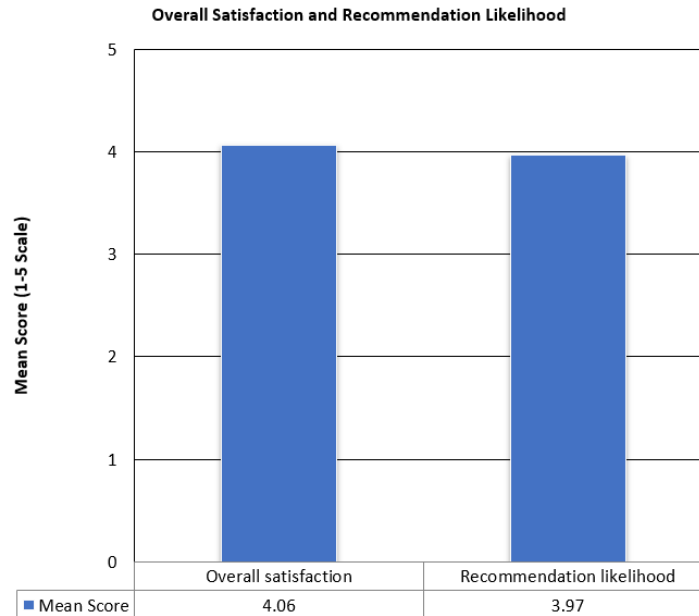


Figure 6: Overall reported satisfaction

6 Discussion

The results reveal several patterns that carry implications for the design of analytics curricula in nursing education. Data visualization and ethics received the highest usefulness and relevance scores across all eight topics. This finding aligns with the professional realities of nursing practice: nurses routinely engage with dashboards and quality reports and are acutely aware of patient privacy obligations. Visualization provides an immediately actionable skill, that is, the ability to construct a clear chart or dashboard translates directly to quality-improvement meetings and unit-level reporting. Ethics and governance, meanwhile, address concerns that nurses encounter daily in their stewardship of sensitive patient data.

Predictive modeling, clinical decision support, and NLP received the lowest scores, though all remained above the scale midpoint ($M > 3.4$). Several factors may contribute to lower perceived relevance. First, nurses in clinical and administrative roles may not envision themselves building predictive models, viewing this as the domain of data scientists or IT departments. Second, the technical complexity of Module 4 may have introduced cognitive overload for learners whose prior experience was limited to basic statistics. Third, NLP applied to nursing notes, while a growing research area [9], may have seemed abstract to professionals accustomed to structured data entry.

Excel's strong performance across usefulness, ease of use, and future-use likelihood reflects its ubiquity in healthcare workplaces and its low learning curve. Tableau also performed well, suggesting that visual analytics platforms can bridge the gap between spreadsheet-based analysis and more sophisticated tools. The lower ratings for SPSS and especially KNIME suggest that these tools, despite their analytical power, impose a learning burden that some nursing professionals find discouraging within a single-semester course.

The high rating of hands-on labs is consistent with findings from Sapci and Sapci [15], who reported that experiential learning enhances engagement among health informatics students. Case studies also performed well, likely because they connect analytical techniques to familiar clinical scenarios. The midterm exam received the lowest activity rating, which may reflect the perception that timed, closed-book assessments are less representative of the analytical work that nurses perform in practice.

Learning objectives are generally well met. All four learning objectives received mean fulfillment scores near or above 4.0, indicating that the course met its primary educational goals. The slightly lower score for LO2 (method selection) suggests a need for more scaffolding around when to apply specific techniques, potentially through additional decision frameworks or flowcharts.

Our findings are broadly consistent with prior studies of healthcare analytics education. Parks [14] reported that students in a healthcare analytics course within an information systems program also favored applied exercises and found machine-learning content challenging. Paul and MacDonald [13] similarly observed that tool selection significantly shapes learner experience and that familiar tools receive higher satisfaction ratings. However, our study differs from prior work in its exclusive focus on nursing professionals and its grounding in the MSN curriculum context, which introduces discipline-specific learning objectives and professional norms.

Several practical lessons emerged from the course delivery:

1. *Scaffold technical tools gradually.* Introducing Excel and Tableau before SPSS and KNIME allowed students to build confidence with progressively complex interfaces. Future iterations should consider additional transitional exercises between Modules 2 and 4.
2. *Ground every technique in a nursing scenario.* Students engaged more actively when analytical methods were presented in the context of a recognizable clinical problem (e.g., predicting pressure-ulcer risk) rather than as abstract mathematical procedures.
3. *Allocate more time to predictive modeling.* Four weeks proved insufficient for students with no prior machine-learning exposure. Extending Module 4 by one or two weeks, or offering optional supplementary workshops, would allow deeper engagement.
4. *Invite clinical guest speakers.* A guest lecture by the medical center's chief nursing informatics officer was among the most positively received class sessions. Incorporating two or three such sessions could reinforce the professional relevance of analytics.
5. *Emphasize interpretation over implementation.* Several students noted in open-ended survey comments that they valued learning to interpret model outputs more than learning to build models. Adjusting the balance toward output interpretation and clinical translation could improve LO3 fulfillment.

Unfortunately, the survey was administered only after the course, precluding a pre-post comparison of attitudes or self-efficacy. Furthermore, all respondents were employed at the same regional medical center, which could introduce workplace culture effects that influence perceptions. Another limitation of this study is represented by the small sample size.

7 Conclusion

This paper presented the design, delivery, and evaluation of a fourteen-week data analytics course for nursing professionals enrolled in an MSN program at a midwestern U.S. university. The course was structured around four learning objectives and five topic modules, utilizing Excel, Tableau, SPSS, and KNIME as software tools. Post-course survey results from 32 working nurses indicated that data visualization and ethics were the most valued topics, that Excel and Tableau were the preferred tools, and that hands-on laboratory sessions were the most effective learning activity. Predictive modeling and NLP topics received positive but comparatively lower ratings, suggesting that these advanced areas require additional pedagogical support when taught to populations with limited technical backgrounds.

The findings offer several actionable recommendations for educators: (1) anchor analytics instruction in discipline-specific use cases, (2) scaffold tool complexity over the semester, (3) prioritize experiential learning over traditional examinations, and (4) dedicate explicit attention to ethics and data governance, which nursing professionals regard as central to their practice.

Future work will extend this study in three directions. First, we plan to administer a pre-post survey instrument to measure changes in self-efficacy and attitudes over the course of the semester. Second, we will compare learning outcomes across cohorts that use different tool combinations (e.g., replacing KNIME with Python-based notebooks). Third, we intend to conduct follow-up interviews six months after course completion to assess whether and how graduates have applied analytics skills in their workplaces.

A Survey Instrument

The survey instrument consisted of two parts, administered online during the final week of the Fall 2023 semester.

Part A: Background Information

1. What is your gender?

- Male / Female / Non-binary / Prefer not to say
2. What is your age range?
 - 20–29 / 30–39 / 40–49 / 50–59 / 60 or older / Prefer not to say
 3. What is your highest completed nursing degree?
 - ADN / BSN / MSN / Doctoral (DNP or PhD) / Other (please specify)
 4. What is your current professional role?
 - Clinical (bedside/unit nursing) / Administrative or management / Education / Informatics / Other (please specify)
 5. How long have you been employed at the medical center?
 - Less than 1 year / 1–9 years / 10–15 years / More than 15 years
 6. Which of the following describe your prior experience with statistics or analytics? (Select all that apply)
 - Basic statistics course (undergraduate or graduate)
 - Regression or multivariate analysis
 - Programming (R, Python, SQL, or similar)
 - Formal analytics or data science training
 - None of the above

Part B: Course Perceptions. For items B1–B4, rate each item on a scale from 1 (strongly disagree) to 5 (strongly agree).

B1. Topic Perceptions

For each topic, please rate:

- (a) This topic was *useful* for my professional development.
- (b) This topic is *relevant* to my current or anticipated job responsibilities.

Topics: (1) Foundations and basic concepts, (2) Data quality and management, (3) Data visualization, (4) Statistical analysis, (5) Predictive modeling, (6) Clinical decision support, (7) NLP and text mining, (8) Ethics and governance.

B2. Tool Perceptions

For each software tool, please rate:

- (a) This tool was *useful* for completing course assignments.
- (b) This tool was *easy to use*.
- (c) I am likely to *use this tool in the future*.

Tools: (1) Microsoft Excel, (2) Tableau, (3) IBM SPSS Statistics, (4) KNIME Analytics Platform.

B3. Learning Activity Effectiveness

Please rate the usefulness of each learning activity for your learning:

Activities: (1) Lectures, (2) Hands-on labs, (3) Homework / lab exercises, (4) Case studies, (5) Capstone project, (6) Midterm exam, (7) Office hours.

B4. Difficulty

Please rate the difficulty of each component on a scale from 1 (very easy) to 5 (very difficult):

Components: (1) Lab exercises, (2) Midterm exam, (3) Overall course.

B5. Learning Objective Fulfillment

Please rate the extent to which the course helped you achieve each of the following objectives (1 = not at all, 5 = to a great extent):

- (a) LO1: Identify, collect, and visualize clinical and operational nursing data.

- (b) LO2: Understand core analytical methods and select appropriate techniques.
- (c) LO3: Interpret analytics outputs and translate findings into evidence-based nursing practice.
- (d) LO4: Recognize ethical considerations including patient privacy and algorithmic fairness.

B6. Overall Satisfaction

- (a) Overall, I am satisfied with this course. (1–5 scale)
- (b) I would recommend this course to a colleague. (1–5 scale)

B7. Open-Ended Questions

- (a) What aspects of the course were most valuable to you?
- (b) What aspects of the course could be improved?
- (c) Do you have any additional comments or suggestions?

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