

# ENHANCING COURSE REALISM: INTEGRATING FEDERAL CRIME DATA SETS IN A DATABASE MANAGEMENT COURSE

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## ABSTRACT

The purpose of this case study was to gain some insight and understanding regarding the use of real federal data sets within a database management course. This case study examined student perceptions of experiencing the use of real federal crime data sets within a database management course. This case study employed a qualitative approach to examining student perceptions of experiencing realistic data sets in a database management course. Students enrolled in the database course were queried using open-ended, standardized questions. Content analysis was used to identify themes. Four themes emerged: increased complexity and rigor; awareness and understanding of database technical concepts; database awareness and understanding; and awareness and understanding regarding societal crime. The use of federal data sets provided the opportunity to interject some amount of realism within the course learning experience thereby possibly producing graduates of greater knowledge and skill. It appeared that incorporating actual federal data sets enhanced course complexity and difficulty while contributing to a stronger student understanding of challenges associated with implementing realistic data sets.

## KEYWORDS

*Computer Science, Course Design, Criminal Justice, Database, Database Management, Higher Education, Learning Style, Teaching Style.*

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## **1 INTRODUCTION**

In the United States, the 1990 Perkins Act defined vocational education as the "organized educational programs offering a sequence of courses which are directly related to the preparation of individuals in paid or unpaid employment in current or emerging occupations requiring other than a baccalaureate or advanced degree" (National Center for Education Statistics, 2020, p. 1). One such occupation involves the vocation of database administration (Foster & Godbole, 2016). Foster and Godbole (2016) indicated that vocational aspects of database administration necessitated knowledge and acumen in the topics of creating, installing, and configuring databases; security; backups and recoveries; tuning; removal; and database management.

Such courses are taught among vocational and certificate programs at higher education institutions (Kamberg, 2018). For instance, Hillsborough Community College, located in Florida, taught a variety of courses pertinent to database concepts as components of its undergraduate certificate program (Hillsborough Community College, 2020). Its curriculum consisted of courses in database design, database administration, and database programming (Hillsborough Community College, 2020). Similarly, Durham Technical Community College in North Carolina taught courses in the field of database programming (Durham Technical Community College, 2020). Courses also were components of programs that led to "Associate degrees, diplomas, and certificates" (Durham Technical Community College, 2020, p. 1). Atlanta Technical College in Georgia offered a vocational certificate program database administration (Atlanta Technical College, 2020). Its curriculum consisted of courses in database management; Oracle databases and administration; and UNIX/Linux operating system (Atlanta Technical College, 2020).

Some people questioned the quality and integrity of vocational studies (Barnett & Ryan, 2005). Concerns also existed regarding "issues in curriculum, assessment, and certification" (Barnett & Ryan, 2005, p. 91). Such notions may be considered from the perspective of database courses. Yue (2013) indicated that a lack of realistic data sets affected the practicality of database course learning environments. Yue (2013) examined the data sets associated with prominent database textbooks. Yue (2013) showed that available textbook databases for supporting database courses were derived from 'toy' projects, were small in scope and size, and were highly simplistic. Yue (2013) also indicated that simplification prepared students neither well nor sufficiently for the complexities of reality among actual workplace settings. Similarly, Jukic and Gray (2008) emphasized that such inferior resources would absolutely fail to adequately prepare students for experiencing the scopes, sizes, and complexities of problems, database issues, and data sets that would be faced when entering a career.

Halawah (2011) pointed out that dynamic educational and learning experiences that had some linkage with the real world, coupled with students being dealt with as achievers and scholars, contributed toward enhanced motivation for learning. Learning experiences should be engaging, and students should be able to relate them to their everyday lives (Caruth, 2016). Additionally, not only should learning experiences have personal relevance, they should also have some influence concerning how students "imagine their future employment" (Heider, 2015, p. 186). Basically, professors should craft learning experiences that provide realism and that may be linked to the real world (Caruth, 2016).

McElreath et al. (2018) showed that the potential of gaining meaningful employment upon the completion of a learning experience catalyzed student motivation. Educational experiences were to be relevant and meaningful for their intended audiences (McElreath et al., 2018). The effectiveness and successfulness of a learning experience were to be demonstrated through skills improvement (McElreath et al., 2018). Proper accrediting of the learning experience should occur to enhance its credibility (McElreath et al., 2018).

Similar notions were reinforced by Arenas (2008) through observations that any educational experience should incorporate facets of “productive work” because it contributed toward the authenticity of the learning experience (p. 377).

Given the chasm between Yue’s (2013) and Jukic and Gray’s (2008) notions regarding the use of unrealistic, simplistic databases among classroom settings and Arenas’s (2008), Caruth’s (2016), Halawah’s (2011), and McElreath et al.’s (2018) calls for learning and educational experiences to reflect and associate with reality, questions emerge: How does someone improve learning assignments and resources among database classes to reflect the complexities of reality? How can assignments be crafted to foster critical analysis and problem-solving thought with respect to a realistic scenario? Thus, the purpose of this case study was to gain some insight and understanding regarding the use of real federal data sets within a database management course.

## **2 THE DATABASE COURSE**

The database course occurred throughout a 16-week semester. The first eight weeks emphasized theoretical concepts whereas the latter eight weeks focused upon completion of the course project assignment. Typically, as prerequisites, students possessed a year of programming experience as well as completion of a systems analysis and design course. The database course occurred annually during the fall semester at an institution that exhibited accreditation from the Accreditation Board for Engineering and Technology (ABET). During the course, students gained familiarity with Structured Query Language (SQL); learned how to integrate and embed SQL within a host language to support database interaction; learned the fundamental principles of requirements acquisition, database design, and development; implemented testing regimens regarding the gleaned requirements; learned how to normalize a database through third normal form (3NF); and exercised critical thinking skills to solve a variety of problems ranging from integration issues to project scheduling.

## **3 THE COURSE ASSIGNMENT**

The primary assignment consisted of requirement development, database design, database testing, and database implementation. On the surface, the practical aspects of the assignment necessitated the creation of a functioning database that allowed users to query and generate reports for American crime over a period of 54 years of data. The database assignment facilitated the querying of crimes representing incidents of violence, murder and non-negligent homicide; legacy rape; revised rape; robbery; aggravated assault; property crime; burglary; larceny; motor vehicle theft; and cybercrime. It also provided an opportunity to incorporate a straightforward process of analysis, design, development, implementation, and evaluation for constructing the database project. Students were divided into groups, charged with devising a project completion plan, and directed to craft a group learning and activities compact for governing group performance and behavior. Students were also tasked with determining a group leader.

## **4 DATA SOURCES**

The course assignment included a two-fold problem involving the lack of database realism in educational settings and the lack of a database resource for housing integrated crime data sets reflecting crime in both physical reality and the virtual domain. Addressing these shortcomings necessitated the use of two existing products: Uniform Crime Reports (UCR) and Internet Crime Complaint Center (IC3) Annual Reports. Published since 1930, the UCR amalgamated data from approximately 17,000 law enforcement organizations throughout the United States each year (McElreath et al., 2013). Published since 2000, the

IC3 Annual Report detailed “Intellectual Property Rights (IPR) matters, Computer Intrusions (hacking), Economic Espionage (Theft of Trade Secrets), Online Extortion, International Money Laundering, Identity Theft, and a growing list of Internet facilitated crimes” (IC3, 2018, p. 1).

## **5 UNIFORM CRIME REPORT (UCR) DATA**

At the time of the assignment, the 2014 year represented the most recent UCR data set. Students obtained both national and state aggregate UCR crime data for the period between 1960 and 2014. Data values represented annual aggregates for the crimes of violence, murder and non-negligent homicide; legacy rape; revised rape; robbery; aggravated assault; property crime; burglary; larceny; and motor vehicle theft. For each individual year, students used both raw aggregate values and a ratio of crime incidents per 100,000 population for each crime category.

## **6 CYBERCRIME DATA**

Students obtained IC3 data sets representing the period between 2001 and 2017. No data sets for cybercrime existed before 2001. Cybercrime categories included various types of fraud; identity theft; harassment; data breach; financial crimes; misrepresentation; malicious software; counterfeiting and copyrights; denial of service; terrorism and hactivism; crimes against minors; ransomware; and gambling. The FBI’s IC3 annual reports were the cybercrime data sources. Data values represented annual aggregates. However, unlike the UCR data, the IC3 annual data values were not available in the ratio terms of quantities of incidents per 100,000 population. Students converted the annual aggregates to the necessary per 100,000 population ratio values for each year using annual data from the U.S. Census Bureau. Both forms of crime data were included within the database assignment.

## **7 DATA INTEGRATION AND STUDENT CHALLENGES**

Both the UCR and the IC3 existed as separate, independent entities. The UCR contained crimes that were reported in physical reality but lacked consideration of crimes that were reported in the virtual domain. It contained annual aggregate data for national crimes and corresponding annual aggregate data for each of the states. Aggregate UCR data was presented as either raw values or as incidents per 100,000 population for each year. Further, the UCR was available via the Internet, and anyone could access its contents. Although the IC3 also existed as an independent entity, it contained only crimes that were reported in the virtual domain. Publicly, the IC3 expressed annual cybercrime reports only within a PDF document – thus, no data set existed that could be queried electronically by the public using multiple variables. Students had to seed data within their assignments by transcribing the PDF data within their databases.

## **8 TECHNICAL CONSTRUCTS**

Students selected Python as their language of choice for assignment completion. The Structured Query Language (SQL) was embedded within Python code as the primary database language. It also necessitated use of the MySQL database platform. Normalization of the database occurred through 3NF. Entity-relationship diagrams were used to model the database system. Relational calculus and algebra were used for query design and optimization. The use of MS Excel was disallowed; instead, students had to construct a database system using MySQL, SQL, and Python.

## **9 LIMITATIONS**

This study was limited in that it addressed only a solitary institution of higher education. The perspectives gleaned represented only a single case study regarding the issue of enhancing course realism through the use of actual data sets. Despite its limitations, this case study may be viewed from the lens of transferability.

Ary, Jacobs, Sorensen, and Razavieh (2010) defined transferability as the “degree to which the findings of a qualitative study can be applied or generalized to other contexts or to other groups,” (p.501). Although this case study examined a solitary institution, it may have transferability for similar institutions offering analogous database courses. Given (2008, p. 886) indicated that judgments concerning transferability may be made based upon considerations of “context, participants, and research design.” Each individual reader may determine whether transferability is appropriate for their respective context and issue (Given, 2008).

## 10 METHODOLOGY

Terry and Braun (2017) stated that qualitative survey tools were useful for obtaining perspectives and views from respondents for the purpose of querying meaning or representation. Terry and Braun (2017) indicated that qualitative surveys typically consisted of an array of open-ended questions that facilitated free, open responses. The method incorporated an anonymous, end-of-semester qualitative survey to gauge student perceptions of the learning experience using real, large-scale data sets. Students enrolled in the database course were queried using open-ended, standardized questions. Although responses were anonymous, they were assigned a control number for data processing purposes. Over the period of 75 minutes, the qualitative surveys were administered during the last course meeting of the semester. Survey questions were designed with respect to ABET outcomes for accreditation and course experience. Derived from ABET tenets (Vanderbilt University, 2020), the course learning outcomes were as follows:

1. “an ability to apply knowledge of mathematics, science, and engineering” (Vanderbilt University, 2020, p. 1).
2. “knowledge of basic sciences, computer science, and engineering sciences necessary to analyze and design software” (Vanderbilt University, 2020, p. 1).
3. “an ability to identify, formulate, and solve engineering problems” (Vanderbilt University, 2020, p. 1).
4. “a knowledge of contemporary issues” (Vanderbilt University, 2020, p. 1).

The corresponding questions were:

1. How do you believe the use of real data enhanced the level of difficulty or challenge during the course? This question related to the outcome of applying knowledge of mathematics, science, and engineering.
2. How do you believe the use of the real data sets enhanced your understanding of system development and database technology? This question related to the outcome of demonstrating knowledge of basic sciences, computer science, and engineering sciences to analyze and design software.
3. How do you believe the use of real data enhanced the learning of database concepts per the course’s goals and objectives? This question related to the outcome of identifying, formulating, and solving engineering problems.
4. How did the real data sets contribute to database course realism? This question related to the outcome of demonstrating a knowledge of contemporary issues.

Data collection occurred via the use of qualitative surveys. The interviewees were provided with a copy of the intended questions before the class session. Each subject was familiarized with the tenets of informed

consent. Implementation of questioning and the conduction of research occurred in conformance with institutional ethics requirements concerning the use of human subjects among research endeavors. Thus, ethical guidelines were integrated throughout the research process invoked herein.

Braun and Clarke (2013) noted that qualitative surveys, when administered by researchers, represented an interview that could occur in written form. Regarding qualitative research endeavors, Given (2008) stated that large sample sizes were inappropriate given the nature of qualitative research. Creswell (2013, p. 157) recommended no more than four to five sources for case studies within a solitary study because it provided “ample opportunity to examine themes.” Creswell (2018) indicated that qualitative interviews involved a sample sufficient to generate saturation among respondents. Although the overall course enrollment consisted of 11 students, a total of eight respondents participated in this study. Thus, the quantity of respondents surpassed Creswell’s (2013) minimum respondent quantity thereby enhancing trustworthiness and credibility within this study.

Seidman (2013) stated that qualitative inquiry involved establishing the credibility of the respondents and gleaning meaning and understanding of the lived experience. Responses were amalgamated and processed via content analysis. Konczal (2000) indicated that content analysis involved processing data into units that could be analyzed and examined for instances of concept frequency. Content analysis involved analyzing student responses to the aforementioned interview questions. Typically, content analysis was applicable for qualitative studies that described some phenomenon and for which literature was limited (Hsieh & Shannon, 2005). In such cases, predefined categories were unused; instead, categories emerged from the data (Kondracki & Wellman, 2002). Such an approach is termed inductive category development (Mayring, 2000). This study employed inductive category development as the basis for content analysis.

Within the annual reports, the IC3 aggregated data items were presented as either raw values or as incidents per 100,00 population only for the years between 2001 and 2011. After the year 2011, the annual reports lacked any reporting of incidents per 100,000 population thereby necessitating students to mathematically generate the appropriate values. In order to calculate the appropriate per 100,000 population ratios, population data was obtained from the U.S. Census Bureau. The annual quantity of cybercrimes reported was then divided by the population quantity and multiplied by the value of 100,000.

Data processing consisted of content analysis per the guidance of Konczal (2000) via the following process: sample selection, category definition, read and code, data analysis, generate inferences, and draw conclusions with respect to observed patterns. Coding was designed to reflect characteristics of realism, understanding, experience, critical thinking, and learning through which themes within the data were discovered. Responses were parsed three separate times for the following purposes: 1) content determination, 2) effect coding, and 3) themes identification. Each instance of a word or phrase reflecting realism, challenge, and education was counted to determine frequencies. Average quantities were derived by dividing the respective frequency counts by the number of respondents. Frequencies were also divided by these tallies to generate values that reflected the percentage of the overall total for each word or phrase within the content array.

Creswell (2013, p. 63) indicated that trustworthiness represented considerations of the “personal biography” of experience. Trustworthiness was addressed by acknowledging the lived experiences of the instructor, teaching assistants, and the students who experienced the database course. The instructional view represented the teaching and guiding of students; the assistant view represented tutorial and technical course

experiences; and the student view represented the completion of the course and its necessary assignments. All three groups had direct experience with the course and its database assignment.

## **11 FINDINGS OF THE FIRST QUESTION**

The first question queried how respondents believed the use of real data enhanced the level of difficulty or challenge during the course. The dominant theme reflected perceptions of increased complexity and rigor of the course resulting from the use of real data sets. For instance, a respondent indicated, “it challenged each student beyond our comfort zones.” Another stated, “The difficulty was enhanced due to the amount of data added.” Experience also emerged among the responses. With respect to both the themes of critical thinking and experience, a respondent noted that difficulty increased in the time allotted for the assignment because “we had to do ancillary ratio calculations, make an ERD, normalize, and make software.” Regarding awareness and understanding, a respondent expressed that “having so much data” increased the difficulty and challenge of programming.

## **12 FINDINGS OF THE SECOND QUESTION**

The second question queried how respondents believed the use of the real data sets enhanced their understanding of system development and database technology. The dominant theme involved awareness and understanding of database technical concepts. For instance, a respondent indicated, “it also showed the difficulties of merging and integrating two different data sets even though both dealt with crime.” Another stated, “I can better understand how to create a database.” Critical thinking emerged as the second theme. As an example, a respondent expressed, “we were concerned with keeping our database structurally sound and accurate so we could debate the given data.” Experience also emerged as a theme. For instance, a response indicated, “it gave us the opportunity to examine different data sets with the same basic information.”

## **13 FINDINGS OF THE THIRD QUESTION**

The third question queried how respondents believed the use of real data enhanced the learning of database concepts per the course’s goals and objectives. The dominant theme reflected database awareness and understanding. For instance, a response indicated, “It helped me understand how data can be used to depict large scale statistics. Also, it helped me understand how you can make large sets and implement them in a variety of ways.” Critical thinking also emerged as a theme. Beyond the database concepts emphasized in the course, a respondent pointed out, “it taught time management and organizational skills.” Regarding the experience theme, a respondent expressed, “we had to do everything talked about in class and that we read about in the book – clean/parse the data, normalize the database, make queries, etc.” Another respondent indicated that the assignment provided a “chance to actually work on such technology.”

## **14 FINDINGS OF THE FOURTH QUESTION**

The fourth question queried how using real data contributed to course realism. The dominant theme reflected awareness and understanding regarding societal crime. For instance, one respondent stated, “it helps us become more aware of actual attacks that occur every day.” Another respondent indicated, “I was better equipped in understanding crime.” Experience also emerged with respect to realism. A respondent mentioned that it provided “real life, hands-on experience of the topics we discussed for many weeks.” Responses were also reflective of critical thinking. For instance, a response stated, “we had to do secondary calculations to make the category ratios.” Another respondent said that data were not “always nice and clean and we sometimes have to fill in the blanks that are missing or find a way to work around them.”

Regarding awareness, a respondent stated, it showed the “types of data and crimes that big agencies deal with.”

## 15 CONCLUSIONS

The outcomes may be considered with respect to the ABET criteria and the corresponding research questions. The first criteria involved applied knowledge of mathematics, computer science, and engineering. Students were required to calculate mathematical ratios to perform baseline comparisons of crime data; used normalization techniques to generate 3NF for the constructed database; applied programming skills to generate database queries; and used software testing for quality assurance purposes. The second criteria involved knowledge of basic, computer, and engineering sciences to analyze and design software. Students designed, developed, tested, and implemented a functioning database thereby demonstrating computer science and software engineering skills. The third criteria involved an ability to identify, formulate, and solve engineering problems. Students integrated two separate data sets and generated equalizing ratios for the data. Students crafted source code and corresponding interfaces to facilitate system interaction. Students designed and implemented test cases and scenarios to ensure that requirements were satisfied. Thus, students demonstrated a knowledge of software engineering skills toward solving a variety of problems. The fourth outcome involved knowledge of contemporary issues. The project contributed toward an understanding of crime and virtual crimes and their respective societal impacts. The course improved coding skills to address realistic, practical problems in computer science and software engineering.

Four themes emerged from the first question: increased complexity/rigor of course, realistic experience, awareness and understanding, and critical thinking. Themes representing the second question included database awareness and understanding, critical thinking, and realistic experience. Themes that emerged from the third question included database awareness and understanding, critical thinking, and realistic experience. Three themes were present among responses to the fourth question: realistic database experience; crime awareness and understanding; and critical thinking.

With respect to didactical phenomenology, Treffers and Goffree (1985) advocated four functions that impacted learning:

1. Concept formation facilitating access to principles and concepts;
2. Model formation generating a foundation for learning necessary rules, operations, and procedures whereby critical thinking and relation to other models may occur;
3. Applicability of concepts within reality; and
4. Practice whereby specific skills are exercised during applied scenarios.

The last two functions identified by Treffers and Goffree (1985) involved applicability and practice. Regarding the database course experience, modeling concepts were applied to generate a database system integrating two real federal crime data sets. Students used a combination of the Python programming language and SQL to build the database in conjunction with the models generated during the design and development processes. Practical application facilitated interactive queries of the database system that produced real outcomes. Through applicability and practice, students started developing skills that may be attractive to potential employers. By using realistic data sets to develop such skills, students may be better able to conceptualize and understand employer expectations of new, entry-level hires.



Gorman et al. (1995) indicated that academic class environments typically compartmentalized learning experiences according to insular views of specific topic areas thereby providing an unrealistic perspective of applying course material. However, when experiencing an experimental, multidisciplinary course that integrated various disciplines, students learned that reality defied compartmentalization (Gorman et al., 1995). Similarly, Ktoudou and Doukanan (2016) signified that multidisciplinary courses were useful for better investigating realistic cases of some phenomena and solving practical problems. Integrating the federal data sets provided a glimpse of reality for students given the multi-disciplinary approach to the course. Through incorporating two different federal data sets, it appeared that students gained insight regarding the realities of data and real-world issues involving both crime and technology. The students seemingly experienced integration issues whereby they realized that real-world data often necessitated parsing, cleaning, and formatting before data use occurred within a database application. It appeared that the use of real data sets also contributed toward a better student understanding of the dimensions and scopes of data sets that affect organizations.

The potential impact of this study may be considered from the perspectives of student recruiting and retention. Within the United States, enrollment decisions were influenced by elite institutional statuses and reputations whereas international students were influenced by their perceptions of specific majors and programs (Davies & Hammack, 2005). Less influence existed regarding perceptions of the overall institution (Davies & Hammack, 2005). Neumann, Hood, and Neumann (2013) indicated that using real data sets contributed toward enhancements in understanding and gaining meaning regarding course topics with respect to practical application. Neumann et al. (2013, p. 65) suggested that using real data sets contributed toward enhancements of "interest, motivation, and engagement." Using realistic data may improve perceptions of rigor and relevance among both domestic and international students regarding their respective colleges' choice processes. Higher education institutions hoping to attract students may consider this case study as useful when crafting and developing vocational credentials, programs, and courses that are relevant and meaningful from realistic perspectives. Through interjecting reality within course assignments and classroom settings, potential students may be lured toward the institutions or its courses.

The potential impacts of this study may also be considered from the perspectives of implications for policy and implications for practice. Given the potential enhancements in student "interest, motivation, and engagement" (Neumann et al., 2013, p. 65), organizational policy may require the use of realistic data sets when available and necessary. Doing so may bolster the efficacy of student learning throughout the class and program experiences. From the perspective of practice, using realistic data may contribute toward bettering student credentials upon graduation whereby they may be viewed with greater attractiveness by potential employers.

Jukic and Gray (2008) and Yue (2013) indicated that unrealistic data sets were commonly used among database courses. Such unrealistic tools insufficiently prepared students for workplace performance (Jukic & Gray, 2008; Yue, 2013). The use of federal data sets provided the opportunity to interject some amount of realism within the course learning experience thereby possibly producing graduates of greater knowledge and skill. This case study incorporated actual federal crime data sets as a means of interjecting realism within the academic setting. However, many other real data sets are publicly available that may suffice as resources for enhancing course realism and academic challenge. For instance, through the Internet site [www.data.gov](http://www.data.gov), faculty may access free and open federal data sets representing a multitude of areas. Examples of the available data set categories include agriculture, climate, consumer, ecosystem, education, energy, finance, health, government, manufacturing, maritime, ocean, public safety, science, and research

data sets. Instructors seeking to enhance the realism of their database courses (or computing courses that require data sets) may find such resources useful for their learning and teaching needs. Thus, future research studies may examine facets of course realism and student challenge from the perspective of using data sets other than crime and cybercrime.

Higher education institutions experienced competition for students (Doss, et al., 2015; Papadimitriou, 2018). Thus, colleges and universities must have some unique selling point to generate competitive advantage and differentiate themselves from other market competitors. Through advertising and marketing the use of real data sets within the course environment, institutions may establish themselves and generate familiarity and notoriety within their respective markets either institutionally or on a per course basis, perhaps. Future studies may examine the various selling points and competitive advantages of higher education institutions, faculty, and courses.

From the instructor's perspective, data sets are useful resources for illustrating different concepts and approaches, analytical methods, and applications toward solving realistic problems (Neumann et al., 2013). Regarding the student viewpoint, data sets are necessary for practicing relevant calculations, gaining experience, and developing reasoning abilities regarding problematic situations (Garfield & Ben-Zvi, 2009). This case study examined only the student perspective of using realistic data sets. Therefore, future research studies may examine the professorial perspective.

Doss et al. (2016) indicated that accreditation was of importance to academic programs and institutions. This case study examined only the perceptions of students representing an internal worldview with respect to the higher education institution. However, external views of the academic setting exist – accrediting bodies. Future studies may examine the perceptions of accrediting personnel regarding the use of real data sets within the vocational education setting.

Actual data sets were deemed as motivational tools that made learning meaningful and relevant while preparing students for reality (Diamond & Sztendur, 2002). Additionally, realistic data sets provided some insight to reality with respect to students who lacked any industry experience (Bradstreet, 1996). Future studies may be considered from such perspectives. After students graduate, enter the workforce, and gain some period of industry experience, future research studies may examine whether course graduates believe that the use of actual data sets truly contributed toward preparing them adequately for entry-level positions.

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