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# Examining Micro-Level (SQL) Curriculum-Oriented and Promotional IS Enrollment Strategies

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**ABSTRACT**

Maintaining enrollments in information systems programs capable of meeting industry demands is an ongoing challenge. While significant research has been conducted examining macro-level strategies (e.g., promoting MIS activities), very few studies have examined micro- level strategies (e.g., promoting Structured Query Language). The purpose of this study is to empirically examine both curriculum-oriented and promotional interventions by introducing SQL into foundation information systems curricula. Based on the Theory of Reasoned Action (TRA), 180 students completed a survey to measure attitude, behavior norms, and plans to enroll in a database class in the future. Additionally, both the hands-on SQL instruction and the promotional SQL intervention played a moderating role on the impact attitude had on plans to take a database course. These results add to our pedagogical understanding of enrollment decisions as well as provide practical solutions educators may use to keep pace with enrollment demands.

**KEYWORDS**

Information Systems (IS) education; structured query language (SQL); course enrollments; database management; theory of reasoned action; TRA

## Background and purpose

Maintaining adequate Information Systems (IS) enrollments continues to be a constant challenge for academic departments responsible for training future data scientists and systems specialists with major shortages predicted through 2018 [42]. Database management, and particularly Structured Query Language (SQL) and big data analysis, continues to be cited among the highest technology skills in demand by industry [14, 19, 26, 37]. Currently, 40% of those hiring for industry positions indicate big data and analytics as primary hiring objectives [27]. Relational database management and SQL continue to be in demand, particularly because of the emergence of big data and analytics. Both big data and SQL continue to have bright futures and are not considered competitors [30] and SQL continues to be that standard data access method for big data [44].

Prior research has identified several strategies to address IS enrollments including curriculum-oriented, modifications to course offerings, marketing and promotion, and visibility of IS within the university [24]. The introductory IS course is considered an incredible resource for attracting IS enrollments and strategically determining the content of the course is critical [22, 24, 40]. Unfortunately, schools often focus on low-level computer concepts such as identifying the components of a computer [22]. The introductory IS course provides an opportunity to expose students to intriguing topics (such as big data, analytics, and SQL) as they immerse themselves into the learning experience [3]. There is some agreement that an "overhaul of the introductory, entry-level core information systems course may increase interest in the field" [23].

Granger et al. [23] identified four specific enrollments strategies available to help boost IS enrollments (e.g., curriculum-oriented, modifications to course offerings, marketing and promotion, and visibility of IS within the university approaches). Although prior studies have found that promotion strategies are effective to increase perceptions of MIS programs [35], very few studies have examined the impact of micro-level (i.e., a single database course) promotion strategies. Additionally, would a modification to the introductory IS course generate additional interest in student's taking a database course?

Specific coverage of SQL in foundation IS courses is currently not part of the IS 2010 curriculum guidelines [45]. Further, although IS foundation textbooks include a chapter on database, they generally do not include specific hands-on training focused on SQL [45]. Akbulut and Looney [3] found students were more inclined to pursue an IS degree based on the perceived value of the technology taught in the foundation IS course. Given that 97% of IS programs offer a course in database management [8] and database is often considered the next class after students complete the IS introductory course, we propose that a more in-depth exposure to database and SQL specifically in the introductory class would (a) provide a bridge between the introductory class and the next logical class, (b) more importantly increase the perceived value of the technology covered in the class, and (c) serve as an appropriate entry point toward a career as a data scientist. Our proposal is based on the assumption that increasing enrollments in database course lead to increased enrollments in MIS as a major or minor field of study.

The Theory of Reasoned Action (TRA) and related Theory of Planned Behavior (TPB) have been used in research to predict intentions based on attitudes, subjective norms, and behavioral control [2, 6, 13] and have been used in previous

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research to examine enrollment intentions. For instance, Downey et al. [15] used TPB to examine student's attitude toward the choice of a major and found interest in the field, job availability, and job security as common influences across all majors. Another research has examined influences on strategies such as instrumental assistance to increase enrollments [4]. Similar to the limitations of promotional strategies to increase IS enrollments, research using the TRA are generally limited to macro-level examinations (i.e., promoting the entire MIS program) and have not been used to examine the impact of micro-level strategies (i.e., promoting SQL in an introductory MIS course). While we expect TRA, as an established theory, to explain a portion of the variance surrounding the decision of students to turn to MIS as a major, our goal is to understand, given the impact of TRA, what direct and moderating impact micro-level strategies may have on student's decision to enroll in a database course.

Investigating IS enrollment strategies focused on promoting using a micro-level approach (i.e., introducing SQL in an introductory IS course) as opposed to an entire program is a potential blue ocean strategy of uncharted waters in terms of recruiting and its impacts can be empirically tested. As such, the objectives of this study are as follows:

(1) Confirm the impact of attitude and subjective norms on intention to enroll in a database class.
(2) Examine the direct impact of micro-level strategies on intention to enroll in a database class.
(3) Examine the moderating role of micro-level strategies on attitude and subjective norms.

This research differs from much of the IS Enrollment research in two important ways. First, most IS Enrollment research that use TRA or TPB focus on identifying important impact factors and rarely consider intervention strategies that could be implemented by IS Programs interested in increasing enrollments. Second, prior studies that investigate moderating variables tend to focus on macro-level strategies (i.e., promoting MIS). This study examines micro-level moderating variables related to TRA. Both distinctions provide a unique lens to examine IS Enrollment challenges and opportunities.

## Literature review

### IS enrollments

Prior research on IS enrollments has provided clarification on strategies, approaches, and impact factors to improve student recruiting and retention. Better understanding factors that influence students to choose a major have the potential to reverse a downward trend in IS enrollments [15]. "An increase in students seeking [IS] degrees can only help strengthen academic programs and ensure the continued maturation of the computing disciplines" [3].

Granger et al. introduced four major strategies to address IS enrollments including curriculum-oriented, modifications to course offerings, marketing and promotion, and visibility of IS within the university [24]. In this review, we specifically examine two of these major strategies: promotional strategies and curriculum changes in the IS introductory course, along with prior research on impact factors of students when deciding a major. This approach will help to provide a better understanding of the mechanisms by which students make decisions regarding selecting a major [3]. We attempt to illustrate the value intervention strategies provide for academic programs at higher education institutions [4].

### Promotional strategies

Research related to promotional strategies is promising [12, 28]. There is evidence to suggest that students on campus do not have strong attachments to any particular major to meet IS enrollment expansion goals [23], so promotional strategies may prove particularly important. Further, research has also shown that undergraduate business students are not as knowledgeable about information systems as a major when compared to other key business areas such as accounting and marketing [9], though this is not universally accepted [10]. Regardless, it is clear that guidance, education, and MIS promotion by faculty provide exposure to students which can have a profound impact on students' decisions regarding choosing a major [4].

Li et al. [35] surveyed 249 students to examine the impact of a promotional strategy implemented as part of the study. Findings from the study indicate that a promotional strategy can improve student perceptions of MIS programs [35]. In this study, the promotional strategy was focused on a macro-level overall IS program.

Similarly, Akbulut et al. used Social Cognitive Theory to survey 400 students to examine the impact of implementing an instrumental assistance strategy on computer self-efficacy, outcome expectations, interest, and choice goals [4]. Results found "a particular micro-level intervention strategy that higher education institutions can utilize to increase student enrollments" [4].

Finally, research by Ferratt et al. [19] conducted a qualitative analysis using an extension of the Theory of Planned Behavior to better understand student motivations to major in MIS. This research resulted in the creation of four specific intervention categories:

(1) Raise awareness about an MIS major as compared to other majors.
(2) Describe features of MIS degree and career opportunities.
(3) Examine student preferences and fit within MIS.
(4) Overcome lack of understanding of MIS and lack of interest.

These intervention categories provide a foundation for identifying and leveraging opportunities to increase IS enrollments based on specific student motivations. This provides a custom intervention strategy depending on the profiles being addressed.

### Curriculum changes/focus on introductory class

Similar to other programs like accounting and finance, the Introductory IS course is a critical nexus for increasing interest and attracting IS enrollments [23, 24, 40]. Unfortunately, given the importance of this class, schools often focus on low-

level computer concepts and rote knowledge [21]. There have been requests to overhaul introductory IS courses; however, very little has changed in most IS curriculum and related textbooks [23].

Prior research has been conducted to improve introductory IS courses [3, 47, 48]. Looney and Akbulut found that "Assigning effective teachers to introductory IS courses represents one intervention strategy that has been broadly advocated to help reverse the sharp decline of students majoring in IS" [41, p. 781]. Similar research includes assigning effective teachers, but also encourages recruiting guest speakers and exposing students to innovative technology as well to overcome the challenge of students failing to see the relevance of information systems [48]. Adding high demand content (e.g., SAP) to the introductory IS course has also been implemented to improve the quality of the overall student experience [31].

Another research has addressed course characteristics to find the appropriate balance between comprehensive coverage and in-depth treatment [28]. As a result of Keillor et al.'s research, they created a conceptual framework based on course characteristics including attraction, evaluation, retention, and meeting expectations. Treatment of exposing students to the work–life activities of information systems professionals resulted in positive change in student perceptions.

### Impact factors

The bulk of IS enrollment research focuses on what impact factors are related to a student's choice of majors. An earlier study by Adams, Pryor, and Adams [1] found genuine interest in the field to the most important determinant among students determining a major. Table 1 provides additional determinants identified as part of the review and illustrates genuine interest is still considered a major determinant.

Interest in the field was by far the most common impact factor identified by prior research [1, 7, 9, 15, 32, 35, 49]. Regardless of other impact factors, it appears the element that remains most important is genuine interest in a field. Unfortunately, research also shows "undergraduate business students are not as knowledgeable about information systems as a major when compared to other key business areas such as accounting and marketing" [9], though not all research agrees with this finding [10]. Given the lack of students' knowledge about the MIS major, it follows that IS programs need to be proactive regarding promoting and educating students about the value of an IS degree, in order to pique the interest of students.

### Database and introductory IS in the IS model curriculum

For years, information system educators have identified and maintained IS curriculum models to provide both consistency and flexibility in the field. Prior research indicates 97% of IS programs offer a course in database management, following the Introductory MIS [8]. Both courses are consistent with the IS2010 model curriculum recommendations [45]. Figure 1 illustrates the growth of both classes among AACSB IS programs from 1996 to 2013 [8, 34, 36, 39]. Given these two courses represent the most commonly offered courses, there is certainly potential to use the IS Foundations course to promote the next logical course, database management (i.e., 2010.1–2010.2).

**Table 1.** Reasons students select a major.

| Researchers | Impact factors |
|---|---|
| Li, Zhang, & Zheng [35] | Career related (security, salary, growth)<br>Personal interest (subject matter)<br>Social (influence of friends and family, reputation) |
| Brooks, Korzaan, & Ceccucci [9] | Interest, major attributes, and job characteristics |
| Granitz, Chen, & Kohli [25] | Family and perceived monetary outcomes |
| Kumar & Kumar [33] | Social image, job availability, and aptitude |
| Butterfield & Crews [11] | Timing of major selection, work experience, external influencers (i.e., parents and friends) |
| Ferratt, Hall, Prasad, & Wynn Jr. [17] | Interest (in technical issues), job prospects, and potential income |
| Kuechler et al. [32] | Interest in the field, salaries, security, and advice of others |
| Downey et al. [15] | Interest (love of technology), job security, gratifying work, income, using state-of-the-art equipment, variety, freedom, easy of entry, flexibility |
| Beggs et al. [7] | Interest, compensation, instructors, parents, and friends |
| Walstrom & Schambach [46] | Career factors and personal interest |
| Zhang [49] | Interest in field, availability of jobs, difficulty of curriculum, and influence of family and teachers |
| Adams, Pryor, & Adams [1] | Genuine interest, job opportunities, earnings, similar to parents occupation, recommendations by friends and relatives, advisors, high status, ease of earning a degree, ability to maintain GPA, faculty reputation, parental pressure, and interest in the field |

### Theory of reasoned action

The TRA has been used in research to predict intentions based on attitudes and subjective norms [2, 13]. Table 2 provides a summary of IS curriculum studies using TRA.

Considering the widespread acceptance of TRA (See Figure 2) used in information systems research, and its specific applicability to examining behavioral intentions such as taking a database course, we adopt TRA as the guiding theoretical foundation used in this study [17].

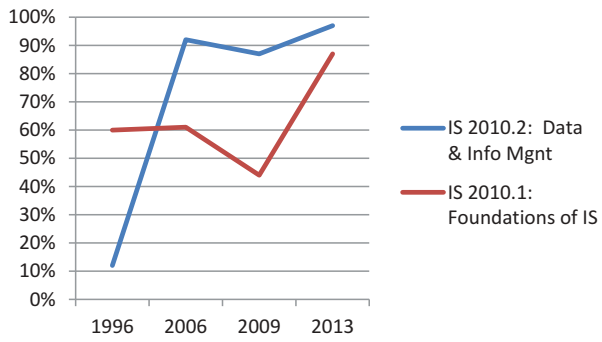


**Figure 1.** Growth Data & Info Management and Foundations of IS from 1996 to 2013.

**Table 2.** IS curriculum studies using TRA framework.

| Authors/Year | Framework | Findings |
|---|---|---|
| Kumar & Kumar [33] | Theory of Reasoned Action | Social image, job availability, and aptitude significant factors to select a major. In addition, family, counselors, and professors have an impact as well. Differences were found among gender, decided/undecided status of students. |
| Downey, McGaughey, & Roach [15] | Theory of Reasoned Action | Interest in the field, job availability, and job security common across both MIS and non-MIS majors. Other impacts include aptitude, social and personal image, workload, and influence of family, friends, and other students or professors. |
| Kuechler, McLeod, & Simkin [32] | Theory of Reasoned Action | Genuine interest most salient factor. Did not find the promise of good salaries, job security, the advice of others, or image to be significant factor. |
| Zhang [49] | Theory of Reasoned Action | Interest in the field, availability of jobs, difficulty of curriculum, and influence of family and teachers. |

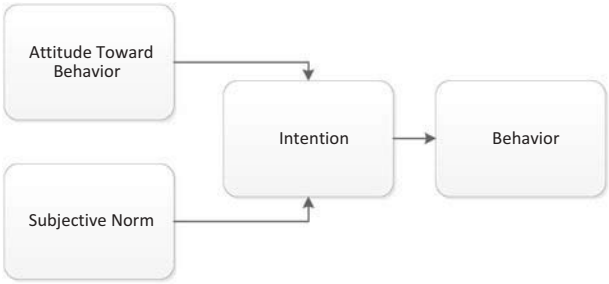


**Figure 2.** Theory of reasoned action.

### Model development

Our research model (Figure 3) begins with the TRA as a foundation. As identified above, TRA has consistently been shown to explain behavior intentions in terms of an individual's attitude and subjective norms. Given the accumulated research relating to TRA, we discuss each construct and its relationship to our outcome variable briefly. Attitude represents an individual's affective response toward a behavior—that is whether the individual has positive or negative feelings toward the behavior. Attitude includes a person's salient beliefs and an assessment of the consequences of performing the behavior. When an individual's attitude toward an activity is positive, s/he is more likely to engage in that activity. Subjective norms relate to how an individual thinks referent others may view the behavior. Referent others may include friends, family, instructors, and employers. Individuals will choose behavior that is believed to be normative by influential referents. Based on TRA, we posit:

H1: Higher positive attitudes will lead to higher intentions to enroll in a database class.

H2: Higher subjective norms will lead to higher intentions to enroll in a database class.

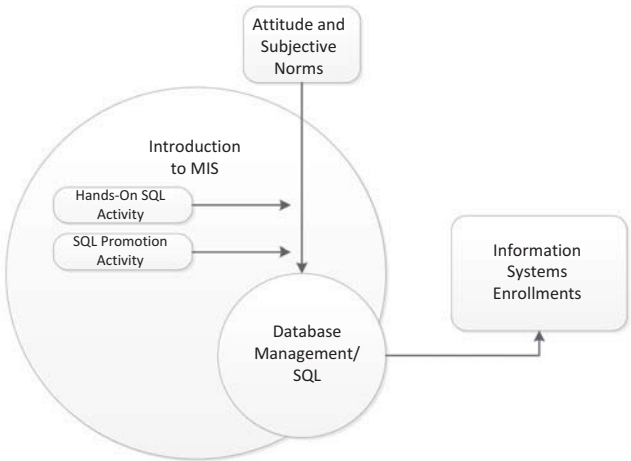


**Figure 3.** Extension to Theory of Reasoned Action with SQL intervention moderator.

Promotional strategies have been proposed as a means to interest students in the MIS major [23]. This study is unique in that instead of promoting the MIS major in general, the intervention and promotion strategy was focused on a specific area of the MIS curriculum, namely database and SQL. The focus on SQL was chosen for three reasons: First, a database class with a focus on SQL is typically the first course students who choose to major in MIS would take. Thus students can foresee taking a direct and immediate behavioral action (signing up for the database class) as a result of the intervention. Second, SQL is intuitive, and likely not to come across as intimidating or too technical. Third, SQL is an easily recognizable skill and one that is known to be in high demand by employers.

We choose two types of promotional interventions—the first, an SQL promotional activity (SPA) which aims to educate students about SQL and its importance in the business environment. Presenting practical advice and skills to students has been found to increase the level of understanding and the ability to apply knowledge. Our second intervention strategy was designed to actively engage students with a hands-on SQL activity (HSA). We expect that promoting the benefits of learning database and SQL will lead to higher levels of enrollment in a database course. Alternatively, we propose that when students experience SQL personally, the hands-on engagement activity will also convince students to enroll in a database course. Thus we propose:

H3: Participating in an SQL Promotional Activity (SPA) will lead to higher intentions to enroll in a database class.

H4: Participating in hands-on SQL activities (HSA) will lead to higher intentions to enroll in a database class.

Furthermore, we posit that intervention strategies will not only increase student's intent in signing up for a database class, but will also influence their salient beliefs about MIS, and the database class more specifically. The intervention strategies will moderate attitude and subjective norms and thus we expect attitude and subjective norms to have a stronger impact toward taking a database class.

H5a: The effect of attitude toward intention to enroll in a database course will be stronger for those who participated in the SPA.

H5b: The effect of behavior norms toward intention to enroll in a database course will be stronger for those who participated in the SQL Promotional Activity (SPA).

H6a: The effect of attitude toward intention to enroll in a database course will be stronger for those who participated in the HSA.

H6b: The effect of behavior norms toward intention to enroll in a database course will be stronger for those who participated in the HSA.

## Methodology

The study was conducted with 180 students enrolled in an undergraduate introductory MIS course required of all students majoring in business. The students predominantly identified themselves as business students; only 7 identified themselves as MIS majors. Most participants were male (73.9%), with females accounting for 22.8%. A small percentage (3.3%) did not reveal their gender. Freshman (19.4%) and sophomores (42.8%) accounted for a majority of the respondents with juniors (23.9%) and seniors (or older) accounting for a 10.6%. A small percentage (3.3%) did not reveal their year in school.

Our research design involved first introducing the intervention to the students during which approximately one-third of the students were exposed to the SPA, one-third were exposed to the HSA, and the remaining one-third were used as a control group and not exposed to any intervention. About a week after the interventions were introduced, a survey was administered to all students. The survey, adapted based on prior TRA enrollment research by Randall [43], was designed to collect (1) attitudes related to taking a database/SQL course; (2) normative beliefs related to SQL; (3) intentions to take a database/SQL course; and (4) demographic information. Surveys which were incomplete or invalid were discarded, leaving 145 usable survey results. The survey questions were based on previous research by Randall [43] and modified minimally to suit the study's context.

### SQL promotional activity

The SPA focuses on an overview of SQL, market demands for SQL, and student benefits of learning SQL regardless of major. The promotion activity begins by discussing a popular auto commercial where an individual is trying to determine the perfect car to purchase. As she decides on ideal car color, make, and model, cars begin to disappear eventually resulting in one perfect car remaining at the end of the commercial. After this commercial, the faculty member then opens SQL Server and walks through code using a Cars dataset that contains 9250 rows of cars. As the SQL code is typed, the number of rows reduces until only one car (row) remains, just like the commercial (See Table 3).

**Table 3.** Promotional code activity using cars data.

```
SELECT *
FROM CarData
WHERE Make = 'Ford' and Model = 'Explorer' and Color = 'AggieBlue';
9000 Vehicles → 434 Vehicles
434 Vehicles → 14 Vehicles
14 Vehicles → 1 Vehicle
```

The second part of the promotional activity involves showing sites (e.g., Computer Weekly & ZDNet) that indicate SQL is the number one software skill on the market [14, 19, 37].

The final portion of promotional activity includes several quotes by students who have dramatically benefitted by taking a database class. The first talks about a student who switched to MIS and credits the 2100 promotional activity for learning about databases. "I know I wouldn't have taken it … and would have missed out on what will now be the rest of my life."

A second story described a student who was turned down for an internship in finance at a major organization. The company told him he would benefit from learning Excel Macros and SQL. The student did both and was later hired by the same organization full time. Similar stories were used, including one where it was too late for an economics student who was graduating and needed SQL on his resume.

The presentation concludes by showing both national and local career outlooks for database managers. Students were provided with several resources to access after the presentation concluded to learn more about database management as a career.

### Hands-on SQL activity

The HSA consisted of three 50-minute sessions of hands-on instruction on SQL foundations. The first session demonstration introduced SQL using SQL Server 2014. Students logged into the database and followed along as the instructor covered basic single table design topics including SELECT, FROM, and WHERE clauses, on tables that were already present and populated. The second session progressed to slightly greater complexity, including the use of AND and OR, wildcard characters, dates, and the ORDER BY clause as well as brief coverage of an INNER JOIN. The final 50 minutes consisted of a hands-on lab where students completed a graded assignment wherein they solved basic coding problems in SQL Server 2014. Throughout the three sessions, students were periodically reminded of the high demand for SQL skill in industry, and the desirable practicality of such skill regardless of major.

### Attitude

Attitude is formed by assessing the consequences of a behavior, and then an evaluation of the expected consequences. Attitude is typically measured as one's feelings toward a behavior along dichotomous descriptions such as good/bad, worthwhile/worthless, etc. Following Randall [43], the attitude scores across all attitude items for each student were summed. The Appendix lists the items used to measure attitude.

### Subjective norms

Subjective norms are typically assessed through a series of questions that focus on what specific audiences (e.g., people most important to the student, family, friends, and future employers) think about the behavior under study (e.g., enrolling in a database course). The survey included questions related to the students' perceptions of doing what most people who are important to them think they should do weighted by how strongly the student valued each opinion. A combined score for each student was obtained by multiplying the student's evaluation of what each referent thought about the behavior by how much the student valued the respective referent. These products across all referents were then summed [43]. The Appendix lists the items used to measure subjective norms.

### Behavioral Intention

Behavioral intentions were measured by asking the students to report their intention in taking a database class in the upcoming semester. Three items were used (see the Appendix) and combined for each student.

The research model tested is shown in Figure 4.

## Results

A hierarchical multiple regression analysis was performed to test each hypothesis. The dependent variable was student intention to take a database management course with independent variables consisting of attitude, subjective norms, and intervention strategy. Gender and year in school were used as controls.

Our data were reviewed for meeting the standard assumptions for multiple regression, with the results summarized in Table 4. Independence in outcome variables was assured by collecting survey results from separate individuals. Care was taken such that no student was able to submit more than one survey. The Durbin–Watson test verifies the independence of errors, with values close to 2 (range is 0–4), indicating that the errors are uncorrelated [18]. The Durbin–Watson score for our data was 2.16, signifying independence of errors. Normality of the data is represented by examining the skewness and kurtosis scores. Skewness scores within the bounds of −1 to +1 are considered normally distributed [41], while scores outside the bounds of −3 to +3 are regarded as highly skewed [29]. Attitude did indicate some negative skewness (i.e., a higher number of scores is above the mean), but not sufficiently so to warrant removing the construct from the model. The Cronbach's alpha for all constructs exceeded .70, thus demonstrating reliability [21]. Convergent validity is demonstrated when the average variance extracted (AVE) is above 0.5 [20].[1] Discriminant validity verifies that the constructs are distinct from each other, and is demonstrated when the square root of the AVE for a construct exceeds its correlations with any other construct [20]. All the constructs in our sample demonstrated discriminant validity. In addition, multicollinearity can be an issue when two constructs are highly correlated. Our data do not present any correlations above .70, and a test of the VIF indicators were all below 3.0 indicating that multicollinearity is not a concern. Table 4 presents the means and demonstrates the normality, reliability, convergent, and discriminant validity of the data.

Three analyses were performed on the sample. The first analysis contained the entire sample, and tested TRA as the foundation of the model. The second analysis compared the SPA intervention with no intervention, and the third analysis compared the HSA intervention with no intervention.

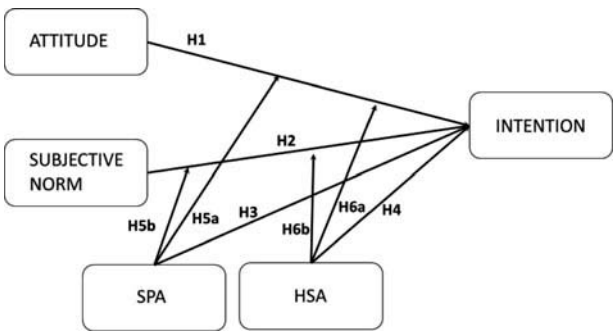


Figure 4. Research model.

### Model 1: Base TRA

The first analysis included the entire sample with Attitude and Subjective Norms as independent variables, and Intention to Enroll as the dependent variable. Controls for Gender and Year were also included. This model explained 49.9% of the variance in behavioral intentions ($F_{4,\ 140} = 34.913$, $p < .001$). The regression results are presented in Table 5.

### Models 2 and 3: Effect of interventions

To test the impact of the intervention on students' decisions to enroll in a database class, we draw on two items most pertinent to our research question. Because a focus in both interventions was toward the benefits of learning SQL for the

Table 4. Means and correlation between constructs.

| | Mean | Standard deviation | Skewness | Kurtosis | Cronbach's alpha | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|---|---|---|
| Gender (1) | 0.752 | 0.434 | −1.178 | −0.622 | – | – | | | | |
| Year (2) | 2.269 | 0.959 | 0.728 | 0.823 | – | −0.005 | – | | | |
| Attitude (3) | 3.945 | 1.403 | −1.491 | 1.518 | 0.771 | 0.034 | −0.035 | **0.684** | | |
| Subjective norms (4) | 96.951 | 38.034 | 0.144 | −0.157 | 0.835 | −0.008 | −0.056 | 0.413 | **0.732** | |
| Intention to enroll (5) | 11.386 | 4.569 | 0.120 | −0.452 | 0.915 | 0.091 | 0.057 | 0.656 | 0.484 | **0.894** |

*Note:* The square root of the AVE for each construct is shown in bold along the diagonal.

[1]All but one construct met this condition. The AVE for Attitude was 0.468, which is slightly below the recommended cutoff of 0.50. Due to the previously tested and validated scale, we opted to keep the construct and all items in our models.

**Table 5.** Hierarchical multiple regression results for the three analyses.

| | | Model 2: SPA intervention | | Model 3: HSA intervention | |
|---|---|---|---|---|---|
| | Model 1: Base TRA[+] | Intervention direct effect | With moderation | Intervention direct effect | With moderation |
| Gender | .075 (ns) | −.076 (ns) | −.053 (ns) | −.367 (ns) | −.297 (ns) |
| Year | .091 (ns) | .007 (ns) | −.007 (ns) | −.006 (ns) | −.046 (ns) |
| Attitude | .548*** | 1.464*** | 1.544*** | 2.022*** | 1.976*** |
| Subjective norms | .263*** | .287** | .294** | .137 (ns) | .126 (ns) |
| Intervention | | .367* | −.118 (ns) | −.008 (ns) | .080 (ns) |
| Attitude × intervention | | | .560[+] | | .956*** |
| Subject norms × intervention | | | .031 (ns) | | −.124 (ns) |
| $R^2$ | .499 | .390 | .416 | .40 | .484 |

*Notes:* $p < 0.05$; ** $p < 0.01$; *** $p < 0.00$; [+]Standardized coefficients reported.

job market, we expect the referent of the employer to be a particularly important component of the subjective norms. Also, decisions by undergraduates in terms of majors and classes to take are often swayed by how interesting students think the class will be [5]. Thus we expect undergraduate's attitude toward enrolling in a database class to be strongly driven by the perception of the class to be dull versus interesting. Using these items, we tested the base TRA model, adding the impact of the intervention as both a direct effect and as a moderator to Attitude (dull/interesting) and subjective norms (employer as referent).

The second analysis was conducted to determine the impact of the SPA intervention on students' intention to enroll in a database class. The analysis was performed on those students who either received the SPA intervention or no intervention at all. A hierarchical multiple regression was used with subsequent variables entered in each step beginning with the controls (step 1), followed by the direct impact of attitude and subjective norms (step 2). In step 3, the categorical predictor SPA was entered. SPA represents whether the student received the intervention. The variable was coded −1 to represent no intervention and +1 to represent the SPA intervention. The results showed that the SPA intervention was significant. Finally, two interaction terms were created (SPA × Attitude and SPA × Subjective Norm), and entered during step 4 and step 5. Adding the SPA intervention did not significantly moderate the relationship between subjective norms and the behavioral intention outcome; the SPA intervention did significantly moderate the relationship between attitude and behavioral intention. Table 5 shows the output from Model 2 after step 3 (Intervention direct effect) and after step 5 (With moderation).

The third analysis was similarly conducted to determine the impact of the HSA intervention on students' intention to enroll in a database class. The analysis was performed on those students who either received the HSA intervention or no intervention at all. A hierarchical multiple regression was used following the same procedure above to test the SPA intervention. The HSA intervention did not have a significant direct impact on the behavioral intentions. However, effects can sometimes be confounding, and therefore we next tested in step 4 and step 5 the moderating role of the HSA intervention on the TRA model. We found that there was a significant moderating effect on the relationship between attitude and behavioral intentions, but not between subjective norms and behavioral intentions. Table 5 shows the output from Model 3 after step 3 (Intervention direct effect) and after step 5 (With moderation).

The moderating effects are especially important as it indicates that interventions can influence students' attitude, which in the base TRA model was the most significant influencer on students' intent to enroll in a database class. Figures 5 and 6 show the moderating effects of the two interventions graphically.

Table 6 presents a summary of the hypothesis testing.

## Discussion

Our results confirm the foundational theory of reasoned action which proposes that behavior is influenced by both attitude and subjective norms. Our study seeks to extend these results by testing how an intervention might impact a student's behavior, and whether the intervention itself might have an effect on student attitude or subjective norms.

The findings indicate that the SPA intervention improved student's attitudes toward taking a database course. Figure 5

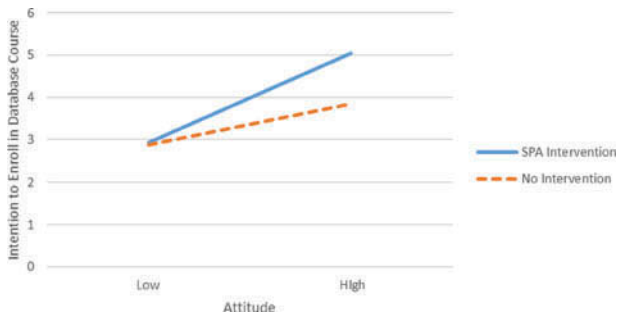


**Figure 5.** Moderating role of SPA intervention.

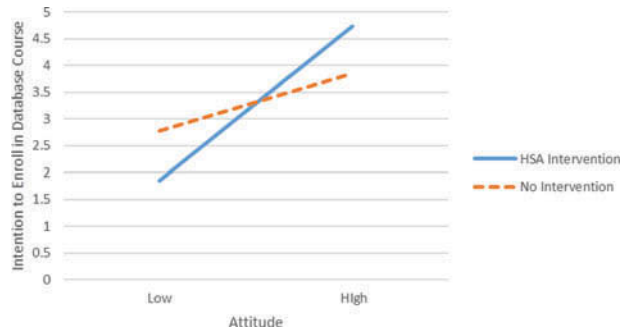


**Figure 6.** Moderating role of HSA intervention.

**Table 6.** Results of hypothesis testing.

| | | |
|---|---|---|
| H1 | Higher positive attitudes will lead to higher intentions to enroll in a database class. | Supported |
| H2 | Higher subjective norms will lead to higher intentions to enroll in a database class. | Supported |
| H3 | Participating in an SQL Promotional Activity (SPA) will lead to higher intentions to enroll in a database class. | Supported |
| H4 | Participating in a hands-on SQL activities (HSA) will lead to higher intentions to enroll in a database class. | Not supported |
| H5a | Participating in an SQL Promotional Activity (SPA) will lead to improved attitudes toward enrolling in a database management course. | Supported |
| H5b | Participating in an SPA will lead to higher behavior norms related to enrolling in a database management course. | Not supported |
| H6a | Participating in an HSA will lead to improved attitudes toward enrolling in a database management course. | Supported |
| H6b | Participating in an HSA will lead to higher behavior norms related to enrolling in a database management course. | Not supported |

illustrates virtually no downside to this approach. The intervention did not appear to lower any student's attitude toward enrolling in a database class, and only had a significant and positive impact for most students.

Thus, as an attempt to increase database enrollments, the SPA intervention seems to be appropriate given students might be more inclined to register for a database class than they had been previously to the intervention. This would provide a student an additional IS experience, learning SQL, and potentially solidify a student deciding to major or minor in IS. In addition, the SPA intervention had an impact on students over a large range of majors. As a result, students from a wide variety of majors may decide to take a database course based on the SPA intervention. For instance, a student might not be interested in a macro-level IS presentation to major in IS, but would potentially be very interested in complementing an existing major (e.g., accounting, finance, marketing) with database and SQL.

In contrast, the HSA's intervention had a different impact (compare Figures 5 and 6) regarding a student's attitude toward taking a database course. The HSA intervention was more polarizing, in that the intervention either increased student's attitude or led to a decrease in attitude. Some students experienced frustration from not understanding the content which then lowered their attitudes when compared to no interaction. Conversely, it appears some students enjoyed the hands-on SQL which had a positive impact on attitude toward enrolling in a database class. Thus, the HSA intervention acted as a polarizer, influencing positive attitudes to be more positive, and negative attitudes to be more negative. As an attempt to impact enrollments this intervention may not affect the quantity as much as the quality of students enrolling in the database class. That is, the HSA intervention may encourage students who are best suited to the course to enroll, while at the same time discouraging those not suited for the major.

The findings also indicate that while both intervention strategies moderated the relationship between attitude and intention to enroll in an SQL course, the relationship between subjective norms and intention to enroll was not influenced by either intervention strategy. Our findings as well as prior research has found that intention is influenced more by attitude than by subjective norms [16], which make these findings especially noteworthy. Given the important role of attitude, the idea that an intervention can moderate a student's attitude is encouraging. As IS programs continue to identify strategies to maintain and increase enrollments to meet market demands, both SPA and HSA may be appropriate interventions depending on enrollment and program goals.

### Limitations and future research directions

Each intervention in this study was conducted by one person. While multiple presenters might have introduced a certain level of *noise* due to differences in presentation style, etc., a single presenter also introduces concerns about generalizability. Students' perceptions (and responses) might have been different, for example, if the SQL had been taught by a different instructor. Further, the sample size used for data analysis is sufficiently large but it is only from one school. This allows the possibility of a biased sample.

Understanding the dynamics of these interventions could benefit by future research in several areas. Replication of the interventions in introductory courses across a broader array of schools and by a wider range of presenters could enhance the generalizability of these findings. In addition, strategies could be developed to improve upon the basic intervention strategies presented here. Future research might search for ways to improve upon the HSA intervention to perhaps lessen its polarizing impact.

Prior research by Li et al. [35] examined promoting MIS programs in an introductory IS course with results showing increased positive perceptions toward majoring in MIS. The current study focused on a specific area of MIS (e.g., SQL) and with results showing both a positive perception (e.g., attitude) toward taking a database class and intentions to enroll in a database class. The distinction between the two studies is significant because it examined an MIS topic as opposed to the larger decision of majoring in MIS. In addition, the study is distinct because it shows attitudes may be influenced by an intervention such as promoting SQL. Future research on the impact of students enrolling in an SQL course and deciding to major in MIS is warranted as it would represent the nexus between the current study and the Li et al. research.

As promoting healthy enrollment is a continuous concern in academic Information Systems departments, the topic is likely to motivate future studies in a variety of approaches and forms. For example, of the four strategies identified by Granger et al. [23], our study examined only two. The other two, indeed all four, could certainly be tried, singly or in combination with one another. Additionally, following Akbulut and Looney [3], other intriguing concepts from the advanced courses (e.g., big data analysis) could be introduced in the overview course, and the outcomes studied. The field of Information Systems is a dynamic and professionally rewarding arena, and students deserve to be informed of the opportunities it presents.

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## Appendix: Constructs for MIS 2100

**Table A1.** Theory of planned behavior survey questions (2100).

| | |
|---|---|
| Attitude | Taking a database course next term would be (circle one for each row below):<br>good/bad<br>foolish/wise<br>worthwhile/worthless<br>irrelevant/relevant<br>interesting/dull |
| Control | If I wanted to, I could take the database course next term.<br>It would be mostly up to me whether or not I take the database course next term. |
| Intention | How likely is it that you will take the database course offered next term?<br>I intend to take the course in database offered next term.<br>I very much would like to take the database course offered next term. |
| Subjective Norms | First, most people who are important to me would probably think that I should take a database course.<br>Generally speaking, I want to do what most people who are important to me think I should do.<br>Instructors at my University think I should take a database class next spring.<br>My friends think I should take a database class next spring.<br>My spouse/girlfriend/boyfriend thinks I should take a database class next spring.<br>My potential future employer thinks I should take a database class next spring.<br>Generally speaking, I want to do what my instructors think I should do.<br>Generally speaking, I want to do what my friends think I should do.<br>Generally speaking, I want to do what my spouse/girlfriend/boyfriend thinks I should do.<br>Generally speaking, I want to do what my potential future employer thinks I should do. |

**Table A2.** "Impact" survey questions (2100).

| | |
|---|---|
| Impact of 2100 Presentation | Do you remember someone presenting in 2100 (or other class) about database other than your instructor? (yes/no)<br>If yes, what was the impact on deciding to take a database class next semester? Answer each of the following as approximate potential course titles for this class based on your understanding of the class topics. |
| Impact of 2100 Hands-on SQL | Did you study SQL in MIS 2100? (yes/no)<br>If yes, what was the impact on deciding to take a database class next spring? |
| Impact of Prior SQL Experience | Other than a class, have you written SQL code before? (yes/no)<br>If yes, what was the impact on deciding to take a database class next spring? |
| Impact of 2100 Class | What was the impact of MIS 2100 on your decision to take a database class next semester? |
| Impact of friends | What was the impact of your friends on your decision to take a database class next semester? |
| Impact of 2100 Instructor | What was the impact of your MIS instructor in taking a database class next semester? |
| Impact of Market Demands | What was the impact of your knowledge of future market demands (e.g., future employer) in taking a database class next semester? |

**Table A3.** Other survey questions (2100).

| | |
|---|---|
| 3330 Required | Is a database class required for you? (yes/no) |
| Major | What is your major? _____ |
| Minor | Do you have a minor?<br>If yes, what is it? _____ |
| Gender | What is your gender? (male/female) |
| Year in School | What year are you in school? (freshman, sophomore, junior, senior) |