

Exploratory Investigation of Potential Signature Pedagogies in the Information Systems Discipline

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ABSTRACT

This study was an initial investigation on the kinds of signature pedagogies employed in the Information Systems discipline. It attempted to identify the most frequently used instructional strategies to teach in the information systems discipline. This study employed an exploratory study design, through a U.S. national survey. A link to a web-based survey was sent by e-mail to all information systems faculty members who were listed in the Association of Information Systems membership directory on the web, filtered only to those faculty members in the United States. This study managed to secure 695 valid responses obtained from 2,835 eligible participants (24.4% response rate). The data were analyzed with descriptive statistics and factors analysis to group the instructional strategies into similar groups. The results show that lecture-based instructional strategies remain the dominant in the information systems discipline, with over 66% participants identified lecture as the most frequently used strategy when teaching in the classroom. Two out of six groups identified by Exploratory Factor Analysis (EFA) method had higher means in the frequency of use, the project-based strategies and the highly-structured active learning strategies.

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1. INTRODUCTION

There are numerous teaching methods or instructional strategies employed in the higher education level, which allow the employment of a variety of strategies for teaching a certain subject. Customization of strategies, as well as the selection of instructional strategies in a discipline is mostly influenced by the subject matter or the discipline where the subjects are taught. Shulman [1] pointed out the need for “adequate pedagogical content knowledge”, which can be interpreted as the instructor’s knowledge to teach in a specific discipline. The pedagogical content knowledge should allow instructors to teach effectively. Without this pedagogical content knowledge, instructors who only master their discipline structure alone will be sufficient to teach effectively [2].

Align with the notion of understanding the pedagogical content knowledge to teach effectively, it is important that instructors understand what would be the most effective instructional methods that they may employ to teach their students. Shulman introduced his concept of signature pedagogies as “types of teaching that organize the fundamental ways in which future practitioners are educated for their new professions” [3, p. 52]. The signature pedagogies are now understood as the types of instructional strategies that are commonly used in teaching a specific profession. An example would be the use of “teaching by the patient’s bed side” method when teaching medical students. This method is then coupled with the questioning to the students by the instructors [3].

The attempt to identify signature pedagogies in a specific discipline requires a rigorous attempt through a combination of data collections, interviews, and observations. These attempts should be targeted toward the collection of the three dimensions of signature pedagogies in a specific discipline [3]:

1. Surface structure: the concrete, viewable operational acts of the instructors when teaching in the classroom.
2. Deep structure: the assumptions on how to best assist students in understanding the discipline's body of knowledge.
3. Implicit structure: the moral dimension which guide the students in the specific profession.

As this study aimed at collecting the first dimension of signature pedagogies, the surface structure, the efforts were targeted towards collecting what are the most frequently used instructional strategies. The most frequently used instructional strategies are eventually the starting point for continuing studies to identify the other dimensions.

Prior to this study, there were attempts to identify signature pedagogies in various disciplines, but none was in the information systems discipline. The closest discipline to the information systems would be the computer science, but there was no evidence of specific pedagogies that can be signature of the discipline [5]. Similarly, there were limited attempts to identify instructional strategies employed in the information systems discipline. The closest attempt was done by Spradling, et al. [6] who collected the pedagogies employed in teaching social and professional issues in computer science discipline. The study revealed that lectures (77.3%), group discussion (76.5%), readings (66.1%), and case studies (60.2%) were the most frequently used in the discipline of computer science. Another research by Gill and Hu [7] was in line with investigating the information systems discipline, although it focused more on the Information Systems curriculum. There were also few other studies which similarly attempted to identify the most frequently used by undergraduate economic courses in 2005 [8] and in 2010 [9]. The numerous research inspired the attempt to identify the most frequently used instructional strategies in the information systems discipline.

2. RESEARCH METHOD

This exploratory study employed a quantitative research design using the survey method. A web-based online questionnaire was the primary data collection tool. The population surveyed was the information systems faculty member population listed in the Association of Information Systems membership compiled in 2010. An original questionnaire was developed by following the instrument construction process from Crocker and Algina [10], and reviewed by a team of experts. The web-based questionnaire listed 52 instructional strategies that were divided into three categories: 22 in-class activities, 10 online activities, and 20 assignments. The scale used to measure the frequency was a Likert-type scale from Never, Rarely, Occasionally, Frequently/Almost Always, and Always. In addition, demographic and course characteristics were collected. The survey was administered by an online survey tool, which link is provided in the initial e-mail invitation to the survey. There were three reminder e-mails after the initial e-mail to improve the response rate. The study managed to collect 695 valid responses or 24.4% response rate based on 2853 valid potential participants. A descriptive statistic and an exploratory factor analysis were conducted to analyze the results.

3. RESULTS AND DISCUSSIONS

3.1. Participant Profile

The 695 valid responses were composed of the following participants with the majority of male ($n=477$, 68.6%), associate professors (31.7%) or assistant professors (26.9%). The participants' mean age was 48.8 years ($SD=10.8$), and 8.7 years teaching experiences (range=0 to 45). The courses taught were distributed equally across the intermediate/advanced graduate course (39.9%), graduate course (31.2%), and undergraduate course (28.6%). Most courses were delivered face-to-face only (63.7%), and the rest were hybrid (24.3%) and online only (5.5%). Course names were identified by each participant; however, due to large variety of course names and a wide range of variety in the types of course, the course name is merely used as the identifier for the strategies employed, rather than as a variable for the analysis. Finally, only 24.3% of the participants taught with teaching assistants in the course.

3.2. Most frequently used instructional strategies

The results were tabulated and computed with the basic descriptive statistics. The scales of responses were combined into three groups of responses: never/rarely, occasionally, and frequently/almost always/always to present more meaningful interpretation. Table 1 summarized the most frequently used instructional strategies, based on the categories presented in the questionnaire.

The six most frequently used in-class activities identified were lectures (66.7%), interactive lectures (63.1%), cooperative learning/ team-based learning (53.0%), problem-based learning (53.0%), whole group discussion (50.1%), and demonstration (49.4%). From Table 1 it appears that over 75% of the faculty teaching IS courses identified these six strategies as being used in the classroom either occasionally or frequently/almost always/ always.

The three most frequently used online activities identified were self-directed learning (34.9%), online discussions (27.9%), and online collaborative projects (17.8%). These three strategies are shown as the most frequently used among the other 10 online strategies (Table 1). However, the percentage of participants who never/rarely used the three strategies was surprisingly high with over 45% of the participants never/rarely having used these three strategies when teaching information systems courses.

The six most frequently used assignments were case study (49%), analysis and design project (44%), major writing project/term paper (32.8%), student peer assessment (29.9%), application development/programming project (29.5%), and application tutorials (29.3%). The percentage of participants who never/rarely used the six top assignments were also surprisingly high (over 40% of the participants) with the exception of the case study strategy (Table 1).

Table 1. Most Frequently Used Instructional Strategies

| | <i>n</i> | Percentages | | |
|---|----------|---------------|--------------|-----------------------------------|
| | | Never/ Rarely | Occasionally | Frequently/ Almost Always/ Always |
| In-Class Activities | | | | |
| Lectures | 676 | 15.4 | 17.9 | 66.7 |
| Interactive Lectures | 670 | 14.5 | 22.4 | 63.1 |
| Cooperative Learning/ Team-Based Learning | 675 | 19.9 | 27.1 | 53.0 |
| Problem-Based Learning | 674 | 21.7 | 25.4 | 53.0 |
| Whole Group Discussion | 683 | 21.4 | 28.6 | 50.1 |
| Demonstrations | 674 | 21.7 | 28.9 | 49.4 |
| Online Activities | | | | |
| Self-Directed Learning | 664 | 47.0 | 18.1 | 34.9 |
| Online Discussions | 670 | 50.0 | 22.1 | 27.9 |
| Online Collaborative Projects | 659 | 65.3 | 17.0 | 17.8 |
| Assignments | | | | |
| Case Study | 668 | 24.1 | 27.0 | 49.0 |
| Analysis and Design Project | 657 | 42.9 | 13.1 | 44.0 |
| Major Writing Project/ Term Paper | 667 | 52.8 | 14.4 | 32.8 |
| Student Peer Assessment | 662 | 50.5 | 19.6 | 29.9 |
| Applications Development | 664 | 60.5 | 9.9 | 29.5 |
| Applications Tutorial | 656 | 53.2 | 17.5 | 29.3 |

Note. Ranked based on the frequency of participants' "Frequently/Almost Always/Always" responses on the instructional strategies.

In addition to the frequency of use of the instructional strategies, there was an additional question posed to the participants: "... what are the THREE (3) instructional strategies you use most frequently?" This question listed the 52 instructional strategies, and the participants must choose 3 strategies out of the list. The results are shown in the Figure 1, as the perceived most frequently used instructional strategies. Figure 1 shows the number of responses collected for each of the strategies, from the lecturer (315 votes) to major writing project/ term paper (69 votes).

The fact that lectures and interactive lectures appear to be the most frequently used strategies in teaching the information systems discipline was not surprising, and perhaps to be expected. It suggests that over the past thirty years, traditional lectures have been the choice of strategies for most instructors, with little change. Linked to the discussions on the lack of pedagogical content knowledge in the introduction section, this may also portraint the real urgency in educating future information systems faculty members on various pedagogies that can be used to teach different subjects. Viewing back to the past researches, Blackburn, Pellino, Boberg, and O'Connell [11], over thirty years ago identified this similar phenomenon. Between 73%-83% of faculty surveyed identified lecture as their main method for teaching. Other relevant studies [12], [13], [14], and [15] revealed the same results of having lectures among the most frequently used strategies.

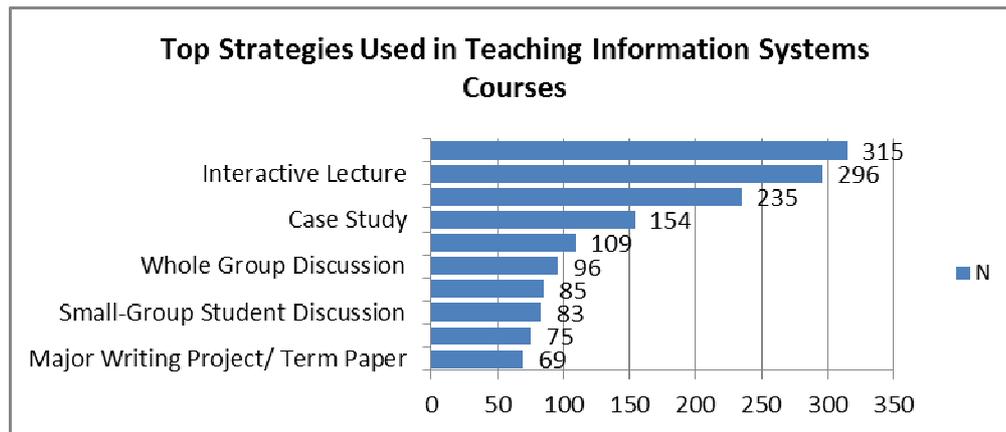


Figure 1. Perceived most frequently used instructional strategies

3.3. Patterns of instructional strategies based on an exploratory factor analysis

One of the goals of this study was also to identify patterns in teaching strategies used in the information systems discipline. To achieve this goal, an exploratory factor analysis was performed on the data set of instructional strategies' frequency of use. Because there were only 446 complete responses, the Mplus software version 6 was used to handle missing data. A parallel analysis with oblique rotation method, geomin, was used. The six extracted factors appeared to be the optimum solutions, with the factors extracted listed in Table 2. Four items (video creation, campus events, student attitude survey, and guest lecture) were eliminated out of 52 instructional strategies due to the assessment that these did not fit any of the factors and their item-to-total statistics were weak. Six subscales were created out of this factor analysis: in-class active learning strategies, highly-structured active learning strategies, online-learning strategies, project-based strategies, writing-based strategies, and portfolio strategies. The Cronbach's Alphas for each of the scale appear to be acceptable, as they are either close to or more than .70.

Table 2. Results of Exploratory Factor Analysis

| Subscale | Number of Items | Cronbach's Alpha | Alpha 95% CI | Range of Corrected Item-to-total Correlation | M | SD |
|--|-----------------|------------------|--------------|--|------|------|
| Project-Based Strategies | 4 | .67 | .62 to .71 | .38 to .52 | 2.09 | 0.99 |
| Highly-Structured Active Learning Strategies | 4 | .67 | .62 to .71 | .33 to .51 | 1.77 | 0.94 |
| Writing-Based Strategies | 6 | .80 | .78 to .83 | .44 to .66 | 1.38 | 0.96 |
| In-class Active Learning Strategies | 18 | .87 | .85 to .88 | .31 to .65 | 1.18 | 0.67 |
| Online-Learning Strategies | 7 | .81 | .79 to .83 | .39 to .66 | 1.02 | 0.97 |
| Portfolio Strategies | 4 | .72 | .68 to .75 | .42 to .64 | 0.51 | 0.73 |

Note.

- Project-Based Strategies are composed of cooperative learning/team-based learning, analysis and design project, problem-based learning, and student peer assessment.
- Highly-Structured Active Learning Strategies are composed of lab activities, application tutorial, demonstrations, and computer-based learning exercise.
- Writing-Based Strategies are composed of literature review, major writing project/term paper, original research proposal, annotated bibliography/webliography, short paper, and student presentations.
- In-class Active Learning Strategies are composed of role play, brainstorming, think/pair/share, debates, games/ simulation, small-group discussion, lecture note comparison/ sharing, interactive lecture, minute paper, in-class informal writing, question and answer, whole group discussion, student peer teaching, background knowledge probe, film/ video critique, concept maps/ Mind maps, Student-generated quiz/ exams, and Case study.
- Online-Learning Strategies are composed of Online discussions, Online lecture, Online collaborative projects, Reflective blogs, Participation in social networking, Self-directed learning, and Online formative quizzes.
- Portfolio Strategies are composed of Online/e-portfolio, Learning portfolio, Personal reflection journal, and Service learning.

Table 2 shows that the composite means of the subscales is the highest for project-based strategies and highly-structured active learning strategies. The results are suggesting that these common strategies across the variety of strategies are used the most in teaching information systems courses. The project-based strategies are composed of cooperative learning/team-based learning, analysis and design project, problem-based learning, and student peer assessment, while the highly-structured active learning strategies are composed of lab activities, application tutorial, demonstrations, and computer-based learning exercise.

Understanding the nature of the information systems profession which requires one to possess rigorous collaboration abilities among diverse team members to complete clients' projects, the results are to be expected.

3.4. Potential Signature Pedagogies

The attempt to identify the most frequently used instructional strategies and patterns of instructional strategies provided us with several strategies that may potentially be the signature pedagogies in the information systems discipline. Table 3 shows the comparisons of the frequency results. Lectures, interactive lectures, and whole group discussions are more of generic strategies used by various disciplines. Thus, these two should not be counted towards potential signature pedagogies. Instead, the cooperative learning/ team-based learning, problem-based learning, demonstrations, lab activities, case study, analysis and design project may potentially be the signature pedagogies. Further, in terms of the patterns identified, the project-based strategies and high-structured active learning strategies are both the potential patterns of teaching in the information systems discipline (Table 2). Further investigations should be performed to confirm this identification of signature pedagogies.

Table 3. Comparing Tabulated Responses and Perceived Most Frequently Used Instructional Strategies

| Six Most Frequently Used Instructional Strategies (based on frequency of responses who answered Frequently/Almost Always/Always) | Six Most Frequently Used Instructional Strategies (as perceived by the participants as their Three Most Frequently Used) |
|--|--|
| 1. Lectures (66.7%) | 1. Lectures (47.2%) |
| 2. Interactive lectures (63.1%) | 2. Interactive lectures (44.3%) |
| 3. Cooperative learning/ Team-based learning (53.0%) | 3. Lab activities (35.2%) |
| 4. Problem-based learning (53.0%) | 4. Case study (23.1%) |
| 5. Whole group discussions (50.1%) | 5. Analysis and design project (16.3%) |
| 6. Demonstrations (49.4%) | 6. Whole group discussions (14.4%) |

Note. Percentages were based on $n=695$

4. CONCLUSION

The study revealed that lectures and interactive lectures are the dominant instructional strategies used by the majority of instructors teaching information systems courses. There were six strategies that may potentially be the signature pedagogies in this discipline: cooperative learning/ team-based learning, problem-based learning, demonstrations, lab activities, case study, analysis and design project. In addition, two major patterns identified as the groups of instructional strategies with higher means of frequency of use, the project-based strategies and highly-structured active learning strategies. Subsequent investigation of signature pedagogies will be required to confirm the preliminary identification. As this study revealed that the information systems discipline still mainly employs lectures and interactive lectures, it suggests a call for action to act on intensifying the use of other active learning strategies in the future. The six potential signature pedagogies that seem to be the top unique strategies can be informed and introduced to more new information system instructors. Although this research has some limitations due to the targeted population being surveyed, at least this can portray the education in information systems discipline.

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