

Research on the Learning Performance and Communication Networking of Online Analytical Processing Courses [†]

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Abstract: Most schools do not have a large insurance database or OLAP platform for students' learning, operating, and communication. The university courses investigated in this research were insurance information system courses. Those courses were conducted in a project-based learning approach and mutual communication networking. To facilitate the student's practice, these courses were divided into several groups to create an Excel micro-database and OLAP simulation analysis with pivot analysis charts was executed. In these courses, students needed to overcome the challenge of software operation. After being taught by teachers or classmates, all students were able to complete the designated project reports in those courses. A questionnaire survey result showed that students' course satisfaction was higher than average. The flexibility for students to choose the topic of projects is the key success indicator. Additionally, integrating group and individual communication networking was also important to enhance students' performance.

Keywords: online analytical processing (OLAP); pivot analysis charts; project-based learning; communication networking



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1. Introduction

Most insurance companies have built big data to conduct online multi-dimensional analysis and real-time processing of reports through online analytical processing (OLAP) platforms in Taiwan. OLAP platforms perform customer-related statistical analysis through a simple click-and-drag operation without writing programs, which is convenient.

Most universities do not have insurance databases, policyholder consumption records, and OLAP platforms. The related insurance information system and customer relationship management (CRM) courses need to be learned through a simulation approach. Furthermore, the communication networking of online analytical processing (OLAP) courses is the key success factor for learning performance. Efficient communication networking may be helpful to enhance student's learning performance.

To facilitate students' learning, students create an Excel customer micro-database and operate the pivot analysis table or chart to conduct OLAP multi-dimensional statistical analysis in the course. The meaningful customer analysis results are obtained for marketing campaign planning and are presented to every member of the classes. During the teaching and learning process of database application and pivot analysis courses, students need to overcome learning frustrations and difficulties.

According to the teaching and learning practice in the insurance information system course, this research is carried out to explore the key success indicator to improve learning interests and satisfaction. Furthermore, the shortcomings are reviewed based on the learning process and satisfaction scores for reference.

The research scope and methods for this study are as follows. The research object is the course of insurance information systems. The course adopts project-based learning

and a group cooperation approach. Through the research and analysis during the learning process, the study tries to find the key improvements during the learning process. To understand the learning satisfaction of students, the courses accompany a satisfaction survey to monitor the learning results. The courses are communicated with students through Line software, an e-learning system, and the team's oral communication. It is reconfirmed whether the communication networking between students and teachers are a key success indicator for learning performance.

2. Literature Review

2.1. Project-Based Learning

Hsu and Hsu (2020) investigated student satisfaction and acceptance of the project-based learning course [1]. The results of their study showed that students' satisfaction with the courses was significantly positively correlated. Gary (2015) stated that project-based learning was an approach particularly well-suited to achieve better learning results for computing students [2]. Krajcik and Blumenfeld (2006) stated that project-based learning had the potential to help most students learn science [3]. Solomon (2003) stated that project-based learning comprises students working in groups to solve challenging problems [4].

2.2. OLAP-Related Literature

Kumar, Verma, and Saxena (2012) stated that the OLAP platform had a strong function in the interaction and cross-analysis between data and summary figures [5]. Tardío, Maté, and Trujillo (2020) determined that modern technologies enabled OLAP processing platforms using data pre-aggregation techniques to show multidimensional reports [6]. Chia and Liao (2021) stated that the OLAP platform conducted relevant statistical analyses through the online real-time report and multidimensional customer analyses [7].

3. OLAP Course Design and Conduct

Students' learning ability for customer data analysis and software operation is significantly different depending on the learning process. The process of completing the project requires an understanding of the product, price, and customer profile to establish a customer database. In the research course, students need to operate an Excel customer micro-database and then analyze customer figures through pivot analysis tables and charts. After students completed their customer analysis charts, they need to summarize key company profiles and business findings to develop marketing campaigns using PowerPoint and present them to all members of their respective classes. The details of the research are shown in Figure 1.

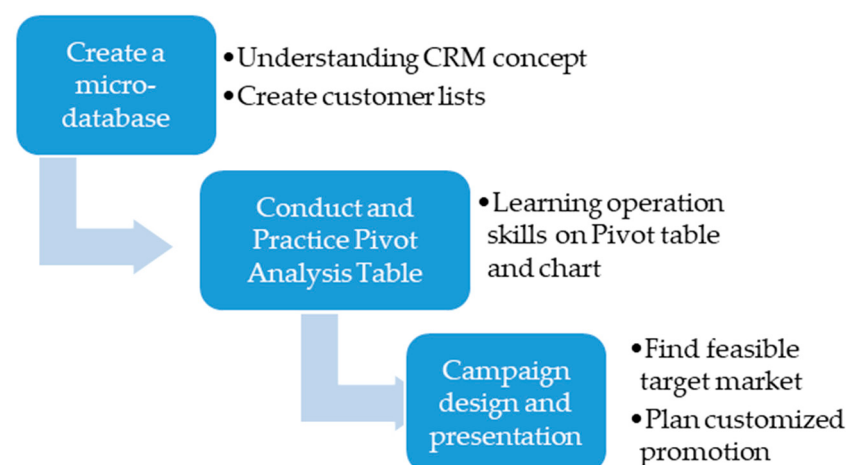


Figure 1. Learning procedure of researched course.

During the learning process, students usually have learning difficulties and frustrations with the establishment of the Excel micro-database. While operating pivot analysis

tables and charts, students usually express countless common and individual learning difficulties. Therefore, the project-based learning course needs to integrate group and individual teaching and demonstration to accurately assist students to complete their projects. In this study, the communication networking between students and teachers is the key success factor for learning performance. The common learning difficulties and individual learning difficulties can be summarized as follows.

3.1. Common Learning Difficulties: Adopting Group Teaching and Demonstration

While students have common learning difficulties, teachers adopt group teaching and demonstration approaches. In general, teachers need to explain common knowledge, demonstrate, and communicate the operation process in advance. Items are described as follows and details are shown in Table 1:

1. To improve students' learning interests, students are allowed to choose companies for projects in which they are interested. Flexibility is needed for students to choose the topic of the project as one of the key success indicators to enhance students' learning interests.
2. Students need to position their company and discuss with team members of their projects. If their company positioning changes, the contents of columns in the customer database are different.
3. Mutual learning among members produces assistance during the learning procedure. Communication networking for classmates and teams is helpful to enhance learning performance.
4. Students can add new customer fields in the customer database for meaningful findings.
5. After the teacher's demonstration on the pivot analysis of table and chart, students need to operate by themselves.

Table 1. Common learning difficulties.

Items	Main Problem Items
Create a micro-database	1. What field name needs to be included?
	2. How many customer lists are needed to be included?
	3. How to quickly create customer lists?
	4. How to classify selected fields by level of range?
	5. How to fill in the value or text in Excel quickly?
How to conduct and practice pivot analysis table or chart	6. How to insert a pivot analysis chart or table?
	7. How to choose, drag, or filter fields?
	8. How to convert accumulated figure in pivot analysis table?
	9. How to execute the range analysis?
	10. Which graph should I choose? Pie chart, bar chart or line chart?

3.2. Individual Learning Difficulties: Adopting Individual Teaching and Demonstration

While students have individual learning difficulties, teachers adopt individual teaching and demonstration approaches. In general, teachers need to explain and communicate specific instructions and demonstrate the operation process for the project. The related items are summarized as follows, as shown in Table 2:

1. Teachers need to guide students to complete the creation of the database by copying, pasting, dragging, and inserting formulas in the Excel software.
2. Teachers explain individual knowledge and demonstration for individual and team members.
3. During the procedure of courses, team cooperation is helpful for students' learning among classmates or teams. Especially while the teacher is busy instructing or

demonstrating to other students, mutual learning and interaction among members and students play an important role in learning improvement. Communication networking among students, teams, and teachers is the key success factor for enhancing learning performance.

Table 2. Individual learning difficulties.

Items	Main Problem Items
How to decide and choose the topic	1. Can teachers suggest topics for other kinds of companies?
Create a micro-database	2. How to operate specific formulas? 3. Can I fill in an accumulative value in customer name lists?
How to conduct and practice pivot analysis table or chart	4. How to set the age range or product range in customer database, pivot analysis table, and chart? 5. Why cannot specific fields be shown in the pivot table? 6. Why did the pivot analysis table disappear? 7. How to complete meaningful findings? 8. How to draw and edit the presented product, channel name, and value in pivot analysis chart?
How to plan promotion campaign	9. Are there any promotion campaign suggestions for my project?

Under project-based learning, students need to cooperate and interact with classmates to learn how to draw and operate the pivot analysis tables and charts, as shown in Figure 2. Furthermore, students need to filter important analysis findings and plan promotion campaigns. In the final step, every member needs to present to other students in the class. After being guided by teachers or learning among classmates, all students complete the designated project reports in those courses. The details of the research are shown in Figure 2.

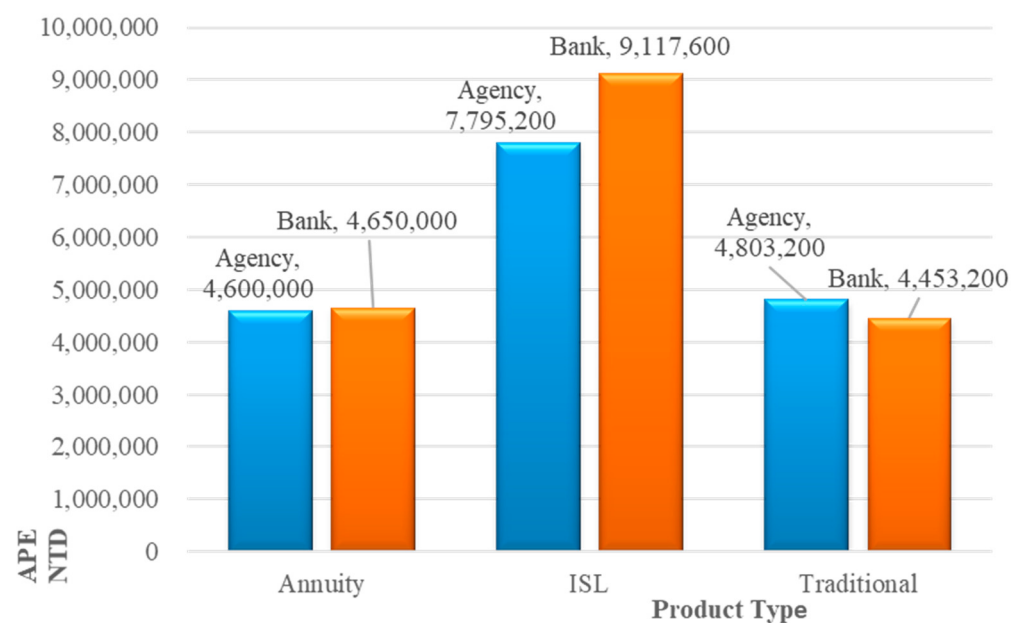


Figure 2. Example of pivot analysis charts for customers.

4. Student Satisfaction Analysis

4.1. Learning Satisfaction

The course investigated in this study offered two classes of insurance information systems, and the number of students was 20 and 14 persons. The students of the courses were university students with jobs. A student learning satisfaction survey was conducted at the end of the semester. The highest score of learning satisfaction was 5 points. The results of student satisfaction scores were higher than college average scores. For example, the average college satisfaction score was 4.45. The scores for A and B courses were 5 and 4.9, which were higher than the college average score. It was found that the course designed and operated by project-based learning and group cooperation approach enhanced students' satisfaction with the learning procedure.

Project-based learning approach allowed students to focus on the operation of the project. A variety of methods to evaluate students' scores is important. In the courses, students were able to communicate through Line software, an e-learning system, and oral communication. The combination of oral and the e-platform were important for the courses. Furthermore, teachers established a scoring system for project tasks and announced it to students in the beginning. Those methods and communications were beneficial to improve the interests and satisfaction of students, as shown in Figure 3.

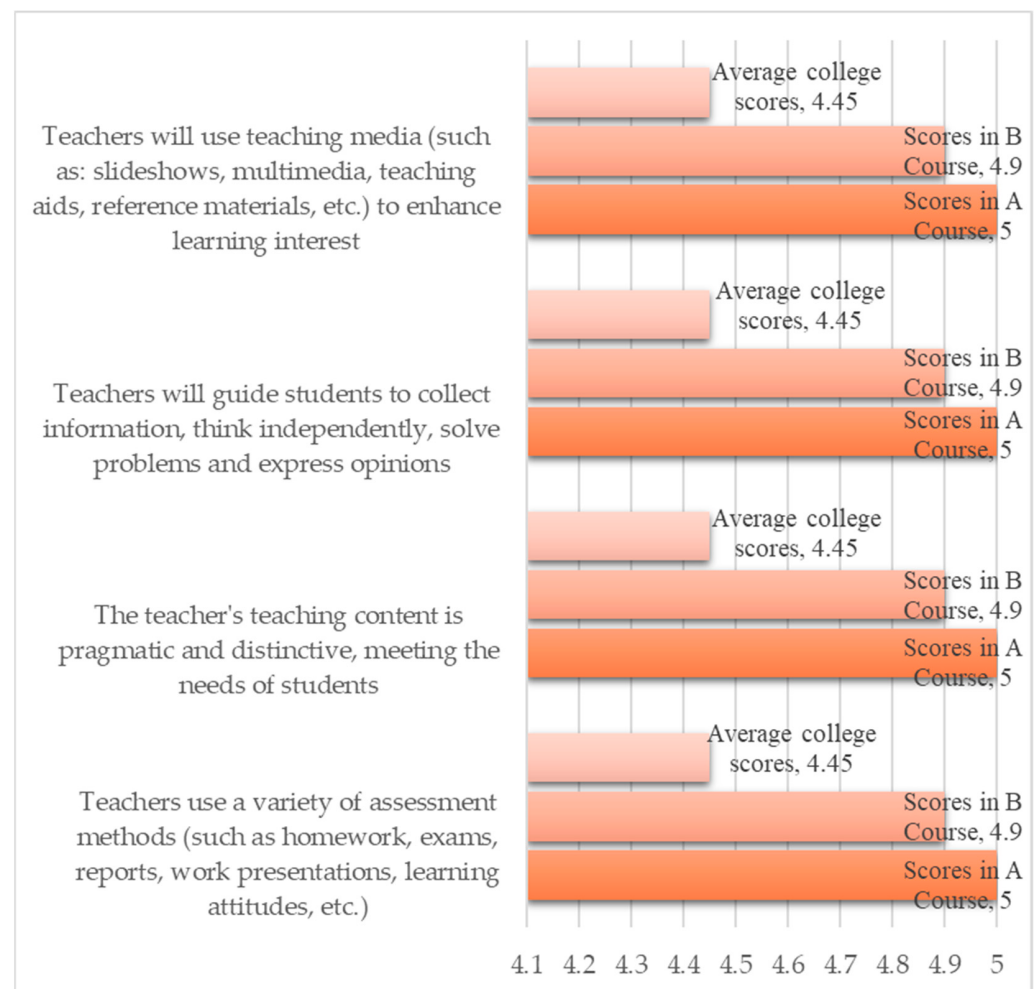


Figure 3. Students' learning satisfaction scores by selected items.

4.2. Shortcomings

After reviewing the learning process, the following shortcomings were identified:

1. When the course enhanced the interaction between teachers and students during the process, the learning performance improved. Especially during the COVID-19 period, many courses were taught by remote video teaching, and so enhancing interaction is critical.
2. Teachers were usually busy helping students during the learning process. The number and composition of persons in every project team needed to be considered because of teachers' time allocation.

5. Conclusions and Recommendations

5.1. Conclusions

The investigated information course adopted the application of big data and the online analytical processing (OLAP) platform based on project-based learning and a group cooperation approach. The course had students in two classes of insurance information system courses. In the insurance information system courses, the flexibility for students to choose the topic of projects is one of the key success indicators to enhance students' interest and satisfaction. For students' different learning abilities, it is also important to integrate group and individual teaching and demonstration.

Communication networking among students, teams, and teachers is also critical for enhancing learning performance. Additionally, it is required that the courses be communicated with students through a variety of methods, such as Line software, an e-learning system, and the team's oral communication.

Students completed their projects and then obtained higher scores in the courses. Project-based learning approach allowed students to focus on the operation of projects. Based on students' satisfaction and learning processes, insurance information system courses designed and operated by project-based learning, group cooperation, and communication approaches were successfully in enhancing students' interest and satisfaction.

5.2. Recommendations

In this study, there was a limitation in the small number of students, which was 20 or 14 in every class. Subject to the number of students, it was not feasible to execute the comparison analysis between project-based learning and the general learning approach. Based on the results, the following is recommended:

1. The number of students in every course needs to be considered because they affect the teacher's time allocation and procedure.
2. The number and composition of students in every team need to be considered. For example, one team is composed of higher-aged and lower-aged students for their cooperation. It is better for communication networking and students' learning.
3. Enhancing the interaction between teacher and students during the process may result in a better learning performance.

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