Investigating the Effects of Web-Based IRS on Learning and Teaching in Pre-Service Teacher Courses

運用線上即時回饋系統在師培課程中教學效能之分析

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1. Introduction
Background

• This study aimed to explore the use of online instant response system, ZUVIO, to examine students’ learning experience and teaching quality.
• We used inferential statistics and conducted semi-structured interviews with students to learn about the extent to which ZUVIO influence classroom dynamics, instruction quality and students’ learning process and performance.

Purpose

• The purpose of this research focuses on the learning and teaching effectiveness by using web-based IRS, ZUVIO, in training courses for pre-service teachers.
• The following research questions were proposed:
  1. Can instant response system, ZUVIO, improve students’ learning experience?
  2. Can ZUVIO promote the quality of instruction?
ZUVIO

• ZUVIO is an online teaching and learning platform designed by Xue-Yue Technology in 2013.
• It aims to improve teaching quality, increase students’ learning motivation, and use digital educational system.
• The features of ZUVIO are summarized as:
  1. Course and account management system.
  2. Multimedia question system.
  3. Peer assessment system.
  4. Grading system.
Instant Response Instruction

• The term refers to a software/hardware system that allows instructors to easily get instant feedback from their students, using remote control devices and a portable receiver.

• The most common use instructions are as follows:
  – Assessing student comprehension
  – Voting to engage students in knowledge construction
  – Data gathering
2. Research Method and Design

Participants

• For inferential statistics analysis, 3 pre-service teacher training core courses participated in this study lasting a semester for 18 weeks. In total, 206 Taiwanese college students were pre-service teachers in the Department of Education.

• Five students were randomly selected from each core courses, total 15 students were interviewed after final exam and provided qualitative comments regarding the use of IRS in the instant response learning experience and instruction quality analysis.
Instruments

• In this study, for examining the learning achievement, the student’s t-test was used to compare the two types classes’ mid-term and final exam scores for 2 periods in the semester.
• For examining the quality of instruction, a five-point questionnaire was distributed to measure students’ attitudes toward Instant Response Instruction by using ZUVIO.
  – The questionnaire, the Course Satisfaction Survey, a survey evaluating courses as part of the Institutional Self-evaluation of the University, provides students with an opportunity to evaluate the course they took in the current semester.
  – This Course Satisfaction Survey used in this study included 20 questions and covered four categories: motivation (items 1 to 5), interaction (items 6 to 10), learning outcomes (items 11 to 15), and assessment system (items 16 to 20), each question is counted from 0 to 5 points.
• The interview was designed with an open-ended question to collect qualitative data on the use of the IRS, the series of questions is: “What are the advantages and disadvantages of using the IRS in the classroom?” including 7 advantage questions and 5 disadvantage questions.

Procedure

• Before midterm exam, the first-nine-week class of each course was designed as the control period/group, which was given the traditional teaching instructions.
• The other nine-week class was designed as the experimental one, which had to complete the IRS tasks assigned by the teacher and use assessment, voting, peer-review functions in ZUVIO.
• The same professor taught all 3 core courses, and the students were sophomores and juniors with no ZUVIO learning experience.
Data Collection

• For examining the learning achievement, data was collected from students’ midterm and final exam results.
• For analyzing the overall quality of instruction and learning experience, data was collected from Course Satisfaction Survey, in the end of university semester.
• And the semi-structured interviews were conducted in the end of university semester.

3. Results, Findings and Discussion
Learning Achievement

• The experimental group and the control group differed significantly in the scores (p = .000< .05) with regard to the use of instant response instruction strategy.

<table>
<thead>
<tr>
<th>T-Test Output</th>
<th>One-Sample Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
</tr>
<tr>
<td>MT_score</td>
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</tr>
<tr>
<td>F_score</td>
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One-Sample Test

<table>
<thead>
<tr>
<th>Test Value = 0</th>
<th>95% Confidence Interval of the Difference</th>
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<tbody>
<tr>
<td></td>
<td>df</td>
</tr>
<tr>
<td>MT_score</td>
<td>205</td>
</tr>
<tr>
<td>F_score</td>
<td>205</td>
</tr>
</tbody>
</table>

Overall Instant Response Instruction Quality and Learning Experience

• The Course Satisfaction Survey provides students with an opportunity to show their learning experience or satisfaction in four categories: motivation, interaction, learning outcomes, and assessment system, each question is counted from 0 to 5 points.

• The descriptive statistics output is as following table, it shows students’ high satisfactions on motivation, interaction, learning outcomes, and assessment system, the teaching effectiveness looks very well.

<table>
<thead>
<tr>
<th>Table 2: Course Satisfaction Survey Descriptive Statistics Output</th>
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<tbody>
<tr>
<td>Semester</td>
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<td>1062</td>
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</tbody>
</table>
Personal Learning Experience with IRS

- The qualitative data was collected by using an open-ended question interview. In the students’ responses to the qualitative questions on the advantages and disadvantages of using ZUVIO in the classroom, they listed the following advantages:
  - ZUVIO enhances interactivity in the class, students were more involved, attentive, and participative;
  - students received better and more timely feedback by using ZUVIO;
  - ZUVIO was fun to use in the class, and reduced the distract;
  - students can vote anonymously using ZUVIO;
  - ZUVIO is easy to use;
  - the use of ZUVIO adds technology components to the class;
  - ZUVIO promotes learning; and
  - the use of ZUVIO helps instructors to understand the students’ level of understanding so that they can explain concepts to the students better.

Pros for IRS

- Interactivity is one of the most highly cited benefits of ZUVIO. Students highlighted that the use of the IRS increased their involvement in the class, helped to promote more class participation, allowed them to get immediate feedback, and enabled them to assess their understanding relative to those of the other students.
- Anonymity is one of the advantages provided by ZUVIO. With the IRS, every student has the chance to answer every question without being embarrassed if his or her answer is wrong. The anonymity feature of the IRS increases students’ willingness to participate in the class.
- Fun is another benefit of using the IRS system. As the students stated, “the IRS complements the lectures,” “introduces activities during the lectures,” and “makes the lectures more interesting.”
- The IRS uses BYOD idea as remote control; therefore, the IRS is fairly easy to use and operate. Also, since the design of the courses were technology-integrated, students realized the benefit of using advanced technology, such as the IRS in the class. Students also believed that with the help of the IRS, the instructor was able to explain course materials better. Overall, they felt that the use of the IRS in the class promoted interactivity and learning.
Personal Learning Experience with IRS

• On the other hand, the main disadvantages of ZUVIO that were identified by the students are as follows:
  – sometimes ZUVIO do not function properly due to an unstable internet connection;
  – question types are limited to multiple choice questions and true/false questions;
  – some students do not take voting seriously; and
  – voting using IRS takes up class time.

Cons for IRS

• The above identified disadvantages are concerned with technology, instructional design, and students’ attitudes.
• When wireless network is unstable, students’ responses sometimes could not be detected and received through the internet. The cloud database was not able to receive more than one concurrent response.
• The IRS can only capture quantitative data, thus limiting the responses to multiple-choice or true–false questions.
• Since using the wireless handheld device, the smart phone or the tablet, was fun to the students, some of them did not take it seriously—by clicking multiple times on purpose, by clicking on answers that were obviously incorrect, or by clicking on answers that were out of the range/choices given.
• Students also raised concerns relating to instructional design. For example, the following questions should be considered when designing instruction. How much class time should be allocated to voting? What types of questions are appropriate for use with the IRS? And will the use of the IRS disrupt the pace and flow of the class?
Findings

- Key findings revealed that ZUVIO enriched the quality of teaching and learning in the classroom, with the highest influence reported on all types of assessment, including live and formative assessment, ongoing assessment, and self-assessment, as well as improved learning experience in content delivery, interaction, engagement and motivation.
- Our findings also suggest that the use of web-based IRS in the classroom is likely to minimize distractions, thereby improving the quality of teaching and learning beyond what is provided in conventional classrooms.
- Other factors that contributed to students’ enhanced learning included the creation and integration of appropriate content in ZUVIO, providing students with timely feedback, and game-play strategies.

4. Conclusions and Implications
Pedagogical and Curriculum Issues

- Interactivity has long been considered one of main pedagogical issues in the classroom, especially for large classes and technology-related courses. The results of this study suggest that the IRS is an effective way to improve interactivity in the classroom. The students’ comments also indicate that interactivity promotes learning.
- The success of using the IRS in the classroom also suggests that technology components should be part of the curriculum design for classes related to technology. For example, adoption of a state-of-art technology can improve students’ interests and motivation in learning the course materials.
- Technology should be working. Not only must the technology be easy to use, it must also be useful and working properly. A technology that is not working properly can create frustrations and disrupt the learning process. For example, the internet connection should be checked before the class to ensure that it’s on and stable.
- Instructors need to integrate the IRS seamlessly into the curriculum design. Although the IRS is an effective way for enhancing classroom interactivity, it may disrupt the pace and flow of the lecture if it is not implemented with care. Instructors need to design the questions carefully to complement the lectures.
- When designing the instruction, instructors also need to consider when to introduce the questions, what questions to ask, and how much class time to allocate. Instructors should also be flexible to adjust the pace of lecturing based on the students’ responses gathered using the IRS.

Better Motivation and Attention

- According to the results of the questionnaire, students’ learning motivation has been enhanced.
- Students were willing to apply what they have learned interactively. The student-centered approach guided the students to be more active in the classroom, and the designed curriculum also created an interactive learning atmosphere.
- With the use of ZUVIO online peer assessment, students could work with others on the Internet. Based on the results of the questionnaire, students could listen to their team members’ ideas and try to reach a consensus. They paid more attention to the group presentation because they can grade their classmates.
Implications

• This study has several implications.
  – Using IRS helps students’ learning skills and collaborative skills.
  – Multiple-grading methods increase students’ involvement in the class. Students feel positive when they can grade their peers.
  – Combing ZUVIO’s peer assessment system with the group presentation creates an interactive classroom.
  – The limitations of the study were that only three courses participated in this study. The results would be more valid if there were more participants.
  – Besides, if the study lasted longer, students’ learning motivation and learning behavior could be observed more clearly. In the future, more teaching approaches could be implemented with multimedia to create interactive and student-centered classrooms.

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