Student "Micro" Teaching and Learning Experiences

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Abstract

Student teaching experience is considered as the first step and a transitional period during which the student's perspectives undergo a radical change about teaching. Student teaching experience has been utilized as a tool to prepare future educators and it was proven to be successful. In this research, it was used as a "flip-role model" in which the students were assigned small portions of the course content to teach their peers for 15 to 20 minutes. Students were allowed to consider various types of teaching methods to convey the content in an efficient manner. This paper will describe the methods of teaching that were used by "micro-student teachers" and provide reasoning for selecting such teaching methods. Also, the student experiences during preparation prior to the classroom teaching and during and after the teaching exercise were gathered through a survey. A detailed analysis of the results and the effectiveness of this exercise on the students (learning) and the student teachers will be discussed.

Keywords

Student teaching, micro teaching, learning, outcomes.

Introduction

Microteaching has been used as an effective tool for over 50 years in various contexts to train candidate teachers, new teachers and student teachers. It was first introduced in early 1960s at Stanford University to improve verbal and nonverbal aspects of teacher's speech and general performance. It is a technique that is used in teacher education where a teacher candidate teaches a small portion of a lesson to a small group of his classmates and teaching competencies are carried out under strict supervision. After teaching a small group, to begin to teach a whole class is one of the techniques that improves teacher education.[1,2] A microteaching session is an opportunity to adopt new teaching and learning strategies and, through assuming the student role, to get an insight into students' needs and expectations. It is a good time to learn from others and enrich one's own repertoire of teaching methods.

In this study, microteaching and learning activity was used as an interactive knowledge exchange-transfer platform for both the instructor and students. Instructors gain an understanding of what students perceive a method to be an effective tool for teaching while simultaneously mentoring and nurturing student learning through this process. This exercise is expected to be mutually enriching for both the instructor and the "micro teacher". Students understand and assume the role of an instructor and the efforts required to teach a concept. Instructor also has an opportunity to assess the best teaching and learning method for teaching engineering concepts.

Methods and Procedures

CE 4883 Engineered Environmental Systems (EES) is one of the senior design elective courses created to provide an in-depth and interdisciplinary design experience to the senior civil engineering students and those interested in pursuing environmental engineering or water resources engineering concentration within the civil engineering program. Most of the students were seniors. Microteaching exercise was implemented in CE 4883 course to achieve the following objectives: (i) to promote higher levels of thinking; (ii) to enhance student learning experience by teaching their peers; (iii) to enable students to become independent learners; and (iv) to increase the confidence levels on the course content.

In this educational activity, "microteaching" concept was used to encourage students to learn new concepts in engineered environmental systems by teaching their peers and by participating in such teaching and learning activity. Students were asked to consider various teaching approaches that could be more effective than regular classroom teaching. Eight students out of 22 volunteered to participate in this exercise. Students were assigned one of the following topics: water supply, water pollution, post construction storm water pollution control, low impact development (LID), leadership in energy and environmental design (LEED), sediment and erosion control and curve number research.

Microteaching and learning activity can be classified into three important stages[3] (Fig. 1). In the first stage, students go through a rigorous exercise involving higher order thinking followed by planning, preparation, presentation, and evaluation and improvement steps (during preparation) in the second step. The third step is an iterative process in which students go through a repetitive learning exercise by participating more than once.

Fig. 1. Thinking processes, activities involved in "micro-teaching". Step 1 involves exercising different levels of thinking, Step 2 includes preparation, practice and presentation and Step 3 is for students interested in academic careers and is an iterative process[3]

Microteaching requires one to exercise creative, critical, and reflective thinking skills. Creative thinking involves proving new solutions that deviate from routine approaches while critical thinking involves objective analysis and evaluation of an engineering problem and making an engineering judgement based on sound scientific principles[4,5]. Reflective thinking inculcates

higher orders of thinking in students which helps them relate new knowledge to the prior understanding and previous background experiences[6,7]. This process allows students gain a deeper understanding of the subject matter through the concept to be taught to their peers.

Results and Discussion

Student teaching and learning experiences were evaluated through a survey which consisted of more than 25 questions covering various aspects of learning and teaching. These questions also summarize student experiences as a teacher as well as a participant (total responses of 22). Table 1 shows some of the questions, options, and the student responses for each question.

About 55% of the students never participated in a microteaching activity while 27% responded with a one-time participation (which is supposedly this classroom activity) and 18% mentioned participation of more than once in the past. Almost 95% of the students agreed or strongly agreed that they learnt a great deal of the subject matter as a result of this activity. This activity seemed to help students learn the subject matter better than their own study activity (79% responded positively), and classroom lecture by an instructor (16% responded positively). About 5% responded that this activity was not better than the regular classroom lecture by an instructor. Participants as well as micro teachers agreed that this activity was fun and exciting (57%), and challenging and intellectually stimulating (30%). About 13% mentioned that they were either overwhelmed or embarrassed or forced to participate in this activity. About the same percentage of students (57%) responded that the classroom (other participants) was warm and welcoming when they presented their topic, while 25% responded that the classroom was not enthusiastic or energetic. A few described that the classroom was interactive, and inquisitive sometimes.

Higher order thinking

Bloom's taxonomy levels (first and revised) of learning were used to assess the student understanding of this activity. When asked to identify the levels of learning on bloom's taxonomy, > 85% responded that the first four levels of learning (knowledge, comprehension, application, and analysis) were required while 40% indicated that synthesis of some material was required and 40% mentioned that evaluation was also an important step to improve further. When the students were asked to identify the most important level that would apply for this exercise, they chose comprehension, application and analysis with 50%, 30% and 20% responses respectively. For the revised Bloom's taxonomy levels of learning, understand (80%) and analyze (80%) were indicated as important.

About the thinking process required for teaching, majority of responses (60%) indicated creative thinking to be important. Critical thinking and reflective thinking were also identified to be important. Reflective thinking is critical in preparation for this activity since it required one to become well acquainted with the concepts. All the students who participated in this activity and that responded to this question indicated that their confidence level of the subject matter improved as a result of this activity.

Table 1. Survey on student "micro" teaching and learning experiences

I have done Micro-teaching • Once before (6, 27%) • More than once (4, 18%) • Never (12, 55%)	What kind of teaching method you chose: • Writing on the board (4, 12.5%) • PowerPoint lecture (16, 50%) • Questions and answers (6, 19%) • Interactive discussions (6, 19%)
I learnt a great deal of the subject matter as a result of this activity • Agree (14, 78%) • Disagree (1, 5%) • Strongly agree (3, 17%) • Strongly disagree (0, 0%)	Time required to prepare for this activity and difficulty in comparison with regular homework is • Longer (7, 19%) • Shorter (3, 8%) • More challenging (intellectually) (10, 28%) • Easy and fun (3, 8%) • More effective (8, 22%) • Difficult (5, 14%)
Your learning of the subject matter was ----- due to the participation in this activity • Better than normal classroom teaching (by a professor) (3, 16%) • Better than my own study activity (15, 79%) • Worse than the normal classroom learning (1, 5%) • Worse than my own study activity (6, 27%)	What kind of interactive activity you chose: • PowerPoint lecture; Examples and samples (11, 48%) • Writing and drawing on the white board (4, 17%) • Asking questions and mini quiz and discussion points (4, 17%) • Examples and samples (4, 17%)
Your microteaching experience in the classroom can be described as: • Fun and exciting and rewarding (13, 57%) • Overwhelmed and embarrassing (2, 9%) • Challenging and intellectually stimulating (7, 30%) • Forced to do for bonus points (1, 4%)	One will have to exercise the following thinking to prepare for microteaching • Critical thinking (Objective analysis and evaluation of an issue in order to form a judgment) (8, 40%) • Creative thinking (A way of looking at problems or situations from a fresh perspective that suggests unorthodox solutions) (12, 60%) • Reflective thinking (Learners develop higher-order thinking skills by prompting learners to relate new knowledge to prior understanding) (11, 55%)
Was the class for your microteaching session? • Warm and welcoming (9, 56%) • Not energetic or enthusiastic (4, 25%) • Inquisitive and interactive (3, 19%)	My confidence level for the subject matter is • Better after this exercise (13, 100%) • Worse after this exercise (0, 0%) • No impact due to this exercise (0, 0%)
How many hours did you spend for preparation of the session? • 2 hours (3, 25%) • 4 hours (3, 25%) • 8 hours (3, 25%) • 12 or more hours (3, 25%)	My presentation skills as a result of this exercise were • Better (7, 41%) • Slightly better (8, 47%) • No change (2, 12%) • Worse (0, 0%)

Which of the following tasks is difficult with relevance to "micro-teaching" • Making an "A" grade on a quiz (4, 27%) • Preparing to teach a simple concept to the class (7, 46%) • Making an "A" grade in the course (4, 27%)	This activity requires me to work at the following levels (circle all that apply) • Knowledge acquisition (17, 85%) • Comprehension (19, 95%) • Application (17, 85%) • Analysis (19, 95%) • Synthesis (8, 40%) • Evaluation (12, 60%)
One has to go through these main stages (circle all that apply) • Planning (20, 100%) • Practice (19, 95%) • Evaluation (16, 80%) • Reflection (13, 65%) • Decision making for improvements (15, 75%)	This activity requires me to work at the following level (select one most important level) • Knowledge acquisition (0, 0%) • Comprehension (10, 50%) • Application (6, 30%) • Analysis (4, 20%) • Synthesis (0, 0%) • Evaluation (0, 0%)
Were you encouraged to ask questions? • Yes always (11, 50%) • Never (0, 0%) • Sometimes (11, 50%)	This activity requires me to work at the following levels (circle all that apply) • Creating (12, 60%) • Evaluating (10, 50%) • Analyzing (16, 80%) • Applying (13, 65%) • Understanding (16, 80%) • Remembering (12, 60%)
Peer teaching concept instilled an interest in a topic • Yes (10, 45%) • No (2, 10%) • Somewhat (10, 45%)	This activity requires me to work at the following level (select one most important level) • Creating (0, 0%) • Evaluating (2, 10%) • Analyzing (3, 15%) • Applying (5, 25%) • Understanding (8, 40%) • Remembering (1, 5%)

Teaching method

Teaching methods or techniques used by students involved PowerPoint lectures, writing on the board, interactive discussions, questions and answers session (short quizzes). Table 1 shows the percentages of responses for each of these techniques. It is interesting to note that all of the students chose the PowerPoint Lecture method to teach their concept.

Student preparation and planning

An equal percentage of students responded the time to prepare for this activity was anywhere between 2 and 12 hours. Some students mentioned that this task was challenging since it required for them to spend many hours to understand the concept, memorize, and look for real examples and samples to transfer the knowledge in an efficient manner. While one student acknowledged

that this did not require significant preparation. Some students utilized interactive discussion platform where questions (quiz) were asked during the lecture presentation. About 90% of the respondents agreed that microteaching and learning activity has instilled an interest in the subject matter. They also mentioned that they were encouraged to ask questions related to the topics covered in this activity.

The limitations of this work are: (i) students were not given freedom to choose their own topic but they were given the topic and information to be covered for the lecture. They were asked to assess other related information to enhance their understanding on the subject and lecture presentation; and (ii) the survey was conducted for all the students including student teachers and participants. Analysis of results included responses from both the students who participated as micro teachers and those as audience. A better analysis could be performed by segregating the data between the participants and non-participants.

Future work may focus on selecting those students who have a goal of becoming educators (whether at college or school or university level) in their careers and train those students through an iterative process (step 3 in Fig. 1; teach-review-evaluate-improve-teach). In this section, when asked, one of the students (1 out of 22) has indicated that his/her career goal was to become a teacher. Students of this kind may benefit in this process. The only limitation with this approach will be that 1-2 students only benefit from this activity. The students in the classroom may play a critical role in developing future educators by providing feedback and active participation.

Conclusion

Micro teaching was used to enhance the student learning of the engineered environmental systems concepts in a civil engineering senior level design elective course. Overall, the student learning and teaching experiences were enriched by this activity as evidenced by the results. Various types of teaching techniques were utilized by the student teachers. Most of the students chose PowerPoint lecture presentation for teaching, which is an interesting trend. In general, PowerPoint presentation did not seem to be a preferred method for student learning, at least from our experience in the department. This trend was a little surprise. Participants agreed that this activity was helpful in exercising different levels of thinking as well as higher order levels of learning (Bloom's taxonomy). Students' responses indicate that this activity has enriched their learning experience, instilled greater interest in the subject matter and presented an opportunity to improve their presentation and technical skills. It is acknowledged that the results and therefore conclusions derived from this study are limited by number of participants and that the analysis could be improved further in future activities by including a more detailed analysis of the student perceptions and learning experiences as a result of micro teaching.

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