ACTIVE LEARNING APPROACHES FOR ELECTRONICS ENGINEERING SUBJECTS

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ABSTRACT

ACTIVE APPROACHES FOR ELECTRONICS ENGINEERING SUBJECT
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Active learning is importance among Electronic Engineering student to enhance their generic skill. Diversity training also is essential in today's ever-changing multicultural world (Junkette, 2005). According to the U.S. Census, by 2050, the minority population will represent approximately 54% of the nation's overall population. Studying how teachers of diversity topics present the material is essential to determining the best possible way to teach intercultural communication competency. Intercultural communication competency has four dimensions: cognition, affect, behavior, and experience/exposure (Grunzweig & Rinehart, 1998). Time, age of students or participants, and the level of sensitivity of diversity topics create a unique dilemma in understanding. Previous research and observations determined that active learning was a key component in diversity training environments, both in a classroom and in a professional setting. Active learning uses different activities and interactive teaching styles to involve students more in the learning process (Prentless, 2006). To further examine the topic, previous student focus groups from a UTeM University as well as qualitative one-on-one interviews with the professors, participants of a local diversity training workshop, and the workshop trainers were all used to analyze the use of active learning in diversity college courses and professional trainings. The study indicated that both university professors and professional trainers reported using the same active learning techniques in their teachings. Secondly, students of both university professors and the diversity trainers reported that they enjoyed the use of active learning methods, particularly activities and team teaching. The students of both groups in this study felt that they understood the topics and would be able to apply the knowledge in a real life cross cultural interaction. The results of this study imply that active learning should continue to be a part of teaching diversity topics.

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CHAPTER 1

INTRODUCTION

Diversity training is essential in today's ever-changing multicultural world (Junkette, 2005). According to the U.S. Census, by 2050, the minority population will represent approximately 54% of the nation's overall population. In addition to the changing demographics within U.S. borders, the world is also becoming more fluid internationally. Improved technology such as air travel and the Internet have made international relations much easier and more frequent. For these reasons, diversity training is especially important in today's schools and workplaces. Diversity training is necessary in order for individuals to interact with others who are different from them in a positive and productive way.

In 2008, the Chicago Community Trust's Fellowship in Arts & Cultural Management partnered with Business Development Directives and Graciela Kenig and Associates to launch a two-year diversity initiative throughout Chicago public museums. This is a proactive approach to the important topic of diversity. Given the size, length, and resources put behind this project it is evident that diversity training awareness is a very important topic for business.

Beyond big business plans in major metropolitan cities, diversity issues can occur anywhere. Whitewater, Wisconsin, is an example of a small town struggle with diversity. Whitewater is a small Midwestern town of approximately, 13,437 people. It is

predominantly Caucasian with about 92% of the population reported as White (2000 Census). At the end of the school year in 2009, threatening racist graffiti was discovered plastered on a door of a bathroom stall of Whitewater High School. In a town with such a homogonous racial/ethnic make up, diversity training may not seem relevant, but it is very relevant and necessary- especially given a racist incident at the high school. The high school took action and developed a task force and hired diversity consultants to help the school and community work through these problems. These two examples differ in size and location, but the goal of effectively educating people to accept diversity is the same. It is perhaps especially important to support diversity education in locations such as Whitewater, where racial, ethnic, gender, and sexual orientation is less diverse so that limited exposure does not lead to excessive stereotyping and prejudices. Diversity training takes place in varied environments. University classrooms and professional training sessions are two common places in which individuals learn about diversity. In my personal observations of these two environments, I have noticed similar patterns in content and style. However, I have also noticed distinct differences in goals and student motivation. Thus, I was curious to compare and contrast these two environments. I wanted to study the similarities and difference of what educators and students in both settings felt were effective techniques for teaching diversity and cultural awareness. I also wanted to specifically explore how locale impacts diversity training. As mentioned earlier, small towns and less diverse regions may have a particular need for diversity training. Diversity educators and students in such areas may also face special Thus, I wanted to contextualize my research within a small town and less diverse regions.

To accomplish this goal, my study examines diversity training in a university setting and in a professional setting, using in-depth qualitative interviews and focus groups to examine what active learning strategies professors, professional trainers, and students in both these settings feel are most effective at helping students learn about diversity.

CHAPTER 2

LITERATURE REVIEW

Diversity is an expansive term that includes everything from race, age, status, background, education, sexual preference, physical status, lifestyle, religion and geographic region (Ivanevich & Gilbert, 2000). The ultimate goal of diversity training is intercultural competency. Intercultural competency is the ability to recognize differences and respond effectively and appropriately in a cross-cultural situation (Wright, 2008).

Intercultural Communication Competency

Intercultural communication competence has four dimensions: cognition, affect, behavior, and experience/exposure (Grunzweig & Rinehart, 1998). Cognition is having knowledge of a culture. To have a successful intercultural communication, an individual must first know something about the culture with which they are interacting. Affect is the motivation and willingness to communicate with others. To have a successful communication interaction in an intercultural setting, a person must be motivated to communicate and be open-minded. Behavior is the skill and awareness to demonstrate the appropriate verbal and non-verbal behavior in the situation. To demonstrate ICC, one must engage in effective and appropriate communication behavior. The final component of ICC is experience or exposure. While a person can have knowledge, motivation, and a strong communication skill set, if individuals are not given the opportunity to actually experience intercultural communication and practice what they learned, they will never be able to achieve full intercultural communication competency. Helping people improve their intercultural communication competency is the primary goal of diversity training. 5

Diversity Training in Education and Professional Settings

Diversity training in both academic and professional settings is very similar in its structure and goals. In both environments, diversity classes are typically focused on topics such as relationship with self, relationship with others, and the relationship with the environment (Armour et al., 2004). However, while the content may be similar, the structure of the learning environments can be different.

Workplaces often provide diversity training sessions, workshops, or seminars. The workplace diversity sessions may be provided by a human resources department at the place of business or a professional diversity consultant may be called in to educate employees on diversity issues with the goal of creating cultural competence (Wentling & Rivas, 1999). In the professional setting, there is not a set amount of time for diversity training. A study reviewing the effectiveness of diversity training in the Midwest found that training ranged from one to eight hours and could be completed in one day or in a few short sessions over several days (Hite, 2006).

Benefits of diversity training

The benefits of both educational and professional diversity training are numerous and include: better intercultural communication, higher morale, greater trust, increase in understanding, and deeper appreciation for differences (Wentling et all, 1999). Diversity training helps people understand their own strengths and weaknesses, reduces differential treatment, and builds skills necessary to work in a diverse environment. Diversity training is helpful in all settings because almost everyone interacts each day with someone who is different from them in age, sex, education level, religion, or other areas (Wentling et al, 1999).

Diversity training has particular relevance in school settings, where teachers not only need to teach a diverse student body, but also teach their students to deal with diverse others. Diversity awareness and skills are also important beyond the classroom. It is necessary in business settings for employees to interact with co-workers and clients from diverse backgrounds (Wentling et al., 1999). Many Fortune 500 companies understand how important such knowledge is. In Fortune 500 companies, 72% in the service sector and 80% in the manufacturing sector have some kind of diversity training

in place (Wentling et al., 1999). The Chicago example listed before displays how big companies are taking a proactive stance regarding diversity.

Challenges in diversity training

There are challenges in providing diversity training. It is very important in both educational and professional settings to have support from higher administration or upper management (Wentling et al., 1999). If there is a lack of interest from employers, employees, faculty or students, then the training will not be successful. If upper management does not take diversity training seriously, that poor attitude can be seen by subordinates -- creating an unfriendly environment for diversity training.

Another challenge to diversity training is poor execution. A poorly conducted training has the potential to do more harm than good. For example, the session leaders might talk down to or degrade the attendees or make them feel guilty, which could create distrust or produce other negative outcomes.

Another challenge is that leaders may encounter unwilling participants (Watson, 2008). People who are not open to diversity to begin with may shut down emotionally, severely hindering any possibility for progress (Hite, 2006). Unfortunately, one bad experience with diversity training can negate the possibility for a positive change, especially in an individual who is skeptical of diversity training (Kiselica, 1999).

Active Learning

Active learning uses different activities and interactive teaching styles to involve students more in the learning process (Prentless, 2006). For example, an instructor could show a video clip about a diversity topic, have the students break into small groups to discuss the clip, and then bring the discussion back to the entire class. Another example is, an instructor involving students in a game to help students to understand a concept. This could be a game where students were not allowed to talk to each other but had to accomplish a task to help to demonstrate non- verbal communication or language barriers. Active learning engages a deeper understanding of the topic because the learner must apply knowledge to an activity (Prentless, 2006).

Active Learning Techniques

Active learning can include a wide range of activities and techniques. Specific active learning techniques include think in pair exercises (where students answer questions with a partner) role playing scenarios, peer review, discussion with a partner or a small group, games, quizzes and tests, journals, concept mapping, case studies, role playing, and debate (McKinny, 2008). Active learning techniques also include the use of video clips and team teaching. Most of the research on active learning in relation to diversity training focuses on the techniques of discussion, group work, and team teaching.

Discussion

Discussion is a favored active learning technique. It is easy to incorporate into educational and professional training, making it a popular choice among diversity instructors. Discussion is also is something students are familiar with and feel comfortable doing, because students are used to professor-directed questions and small group work with classmates (Dugan & Letterman, 2008). Its relate to the material by helping them to apply course topics to their own life experiences, and link them with new knowledge applicable to the real world (Goldburg & Finkelstin, 2002). Studies emphasize the benefits of discussion (Ellis et. al., 2004). Discussion helps students build confidence about class topics and understand the topics on a deeper level. In a lecture only setting, it is easy for students to gloss over the material, and not everyone may fully understand the key concepts (Ellis et al., 2004). Discussion helps relate to the material by helping them to apply course topics to their own life experiences, and link them with new knowledge applicable to the real world (Goldburg & Finkelstin, 2002). Studies emphasize the benefits of discussion (Ellis et. al., 2004). Discussion helps students build confidence about class topics and understand the topics on a deeper level. In a lecture only setting, it is easy for students to gloss over the material, and not everyone may fully understand the key concepts (Ellis et al., 2004). Discussion helps relate to the material by helping them to apply course topics to their own life experiences, and link them with new knowledge applicable to the real world (Goldburg & Finkelstin, 2002).

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Discussion as an active learning technique can have some downsides. A problem with discussion is that students can be unsure about the expectations and topics can wander if the discussion is not set up properly (Ellis et al., 2004).

Team teaching

Among the three active learning techniques discussed here, team teaching has the most current literature examining its pros and cons. Team teaching consists of a group of two or more instructors involved in planning, delivering, and evaluating a class or learning group (Levy et al. , 2006). Team teaching can create an enriching and supportive environment for both staff and students. Studies show that students are more likely to have an understanding of what is required in a team teaching environment and respond positively (Levy et al., 2006). Team teaching is usually interactive, and can keep students'

attention. Many studies credit team teaching with increasing students' engagement and retention (Yellowley & Parmer, 2005).

Team teaching has been linked to higher student achievement levels, greater retention rates, improved interpersonal skills, and improved skills of analysis and judgment (Dugan & Letterman, 2008). Students of team teaching classes report feeling more at ease, finding it easier to talk in class, and feeling more comfortable with the material (Carpeter et al., 2007). They also report enjoy being able to go to either instructor with questions. Students also benefit from the diverse backgrounds of their instructors and like receiving multiple viewpoints on a subject (Vogler & Long, 2003). Team teaching also helps model teamwork, which workplaces value (Lage & Snavely, 1999).

Beyond the benefits for students, team teaching also benefits faculty. Teachers can draw from each other and help each other out when problems arise (Bowles, 1994).

Team teaching is not without its problems. First, both teachers and students need to be present and involved to be effective (Hatcher & Hinton, 1996). Additionally, students may worry that they have to please two instructors. Students may have some initial apprehension about the new team teaching style, because it is a new environment and both students and instructors need to adjust (Hatcher & Hinton, 1996).

Group work

Group work is another active learning strategy, which refers to any activity that students engage in as a small group including, discussion, projects, role-playing scenarios, and games. Group work is a good way to apply knowledge and is enjoyable for the students (Carpenter et al., 2007). Group work allows students to apply key project or role-playing scenario allows students to see how the information can be applied to real life situations. Group work engages students on multiple levels. It encourages students to become more involved in their own learning process. It can be easy to passively listen to a lecture, but it requires deeper understanding and more involvement to use concepts in a group activity (Carpenter et al., 2007).

Group work does have some negative aspects. If students do not understand an activity or choose not to involve themselves, group work will not be successful. For group work to be most effective, all individuals involved need to take an active role.

Summary of Active Learning

In sum, despite some drawbacks, active learning has been shown to create a more in-depth understanding of material through a variety of different methods including team teaching, group work, and discussion. Diversity topics can be difficult to teach and understand. Thus, using active learning teaching in diversity education can be beneficial. Active learning can help overcome some of the difficulties of diversity training. For example, using active learning techniques can help students to grasp concepts such as racism and discrimination that may not be explained as well in a reading or lecture style. Diversity topics are sensitive, and active learning techniques such as in-depth discussion can help students relate to the topics on a more personal level. Finally, the key goal of diversity training is to improve intercultural communication competency. Research on ICC from previous studies by Roux, Grunzweig, and Yamazaki clearly demonstrates that experience is an essential component of ICC. Thus, by providing students with apparatus for hands on learning, active learning techniques such as discussion, group work, and team teaching should aid students in gaining ICC. These methods can help create a better understanding of the material by involving the learner in the material.

Based on the research, it seems logical to propose that the use of active learning techniques in diversity training would be beneficial and that both educators and students would report positive outcomes of active learning in diversity settings. However, the use of active learning techniques in diversity training has not been studied in depth, so such connection still needs support.

Academic research on active learning is not specifically focused on diversity training courses but rather looks at the impact of active learning in general for a variety of education topics. Based on the connections established in the literature review, I would like to explore the link between active learning and diversity education. I would like to examine if and how diversity educators view active learning techniques and what they feel they provide. What active learning techniques have instructors found to be the most effective? If the instructors feel they are beneficial, do the students as well? Do cross-cultural workshops and classrooms use the same teaching techniques? Are they effective

in each setting? In addition, I wanted to examine if trainers in educational and professional setting use the same teaching techniques, and if so, are they effective in each setting. Finally, because I feel diversity education is especially important in non-diverse contexts, I want to specifically examine diversity training programs in small towns and or regions with limited diversity so that findings about what is effective in those settings can be passed on to others who train in such context.

The research questions being examined in this study are:

RQ1: How do academic professional use active learning techniques in their teaching? What do they view as the strengths and weaknesses of these techniques?

RQ2: How do professional diversity trainers use active learning techniques in their teaching? What do they see as the strengths and weaknesses?

RQ1: How do participants in academic diversity education settings view active learning?

RQ2: How do participants in professional diversity education settings view active learning?

CHAPTER 3

METHODS

This study is an exploration of the differing perceptions academic instructors, professional trainers, and students have regarding active learning in the diversity context. This study should be considered a preliminary study of the opinions of professors, professional trainers, and their students. The goal of this exploratory study was to capture a detailed understanding of how diversity teachers, trainers, and students view active learning concepts and describe the similarities and differences of perceptions between existing groups.

In order to gather an in-depth picture of the opinions of the study participants, this study used a qualitative research approach. Qualitative research has the goal of observing and understanding social phenomena (Marshall & Rossman, 2006). Qualitative researchers use interviews and focus groups to gather interactive and descriptive data that provides an in- depth look at the material being studied.

When studying people, qualitative research allows researchers to take into account the complexity of the human experience by hearing an individual's opinions (Meloy, 1994). Qualitative research generally takes place in natural settings and focuses on the content of the interviews or focus group (Marshall, 2006). Qualitative research is able to get a personal, reflective, and extensive understanding of participants' opinions (Marshall, 2006).

I conducted qualitative interviews of university lecturer, professional diversity trainers, and students of professional trainers. I also had access to qualitative data from a previous study of focus groups of students in undergraduate Electronic Engineering. The questions used for the lecturer, professional trainers and their students were modeled after the interview guide used for the student focus group of a bunch eElectronic student A copy of each interview and implementation guide is provided in Appendix A

Participants

Lecturer

I interviewed two lecturer at Electronic Engineering Faculty. Both lecturer teach at least one section of cross-cultural communication per year, have taught at the university level for more than three years and have utilized active learning methods in their teaching.

Professional diversity trainers.

The trainers were part of a small diversity consulting company in country. The company's owner and his team conduct professional diversity trainings throughout the country. I interviewed two trainers from the company. Both trainers were males, one Caucasian and one African American. Both were in their 50's, and both had extensive training experience. Both consultants have been involved in diversity consulting for many years and use active learning in their training.

Participants (university students)

As mentioned earlier, for the university students sample, I used data from three student focus groups . The students had just taken Electronic course. who shared their." The average age was 22 years old. The participants consisted of approximately 50% males and 50% females. A few participants declined to provide demographic information.

Participants (diversity trainers' students)

The participants for the students of professional diversity trainers consisted of a convenience sample of individuals who attended a diversity workshop during the spring of 2008. The participants were three women ranging in age from 40s through 60s, two males in their 50-60s, and another in his early 30s. Of the participants interviewed, 85% were Malay.

Procedures

In-depth interviews were used to gather data. An interview guide was used. (See Appendix B) but the interviewer could add to the questions in order to go more in-depth when appropriate. Participants first signed consent forms (Appendix C) before any of the interviews began. This reassured them that their answers would remain confidential and encouraged them to feel comfortable talking openly and honestly. In the write up, participants were given pseudonyms or were identified by initials or letters to ensure their anonymity. The interviews were taped and later transcribed. The interviews took place in local coffee shops, participants' offices, or in one case, the participant's home. The undergraduate students' focus group took place in a classroom.

The data were coded using thematic analysis. When conducting qualitative research, inductive analysis to look for themes in the data is common (Denzim, 1998). After the themes have been determined, the qualitative research will tell the story of the data (Denzim & Lincoln, 1998). The researcher and an assistant first read through the two professor interviews, two trainer interviews, the six participant interviews, and the three transcripts from the undergraduate focus groups.

A few prominent themes presented themselves during the read through. Based on those themes, the researchers then mutually created a detailed coding list. Finally, all the transcripts were reread and coded. The five broad categories are listed below:

1. Types of diversity exposure: (as a student, professor, trainer, travel)

2. Types of active learning activities: (discussion, team teaching, games, video clips and more)

3. Nature of the training: (time, layout of the room, trainers) This only applied to the professional participants

4. Benefits of diversity training: (sense of camaraderie, learning new information. in active learning motivation, fun enjoyable environment and more)

5. Weakness of diversity training (number of participants, workload, control issues)

CHAPTER 4

RESULT

This study sought to investigate perceptions of both instructors and students regarding active learning and diversity training in classroom and professional settings. The following results will be broken down into the perceptions of 1) professors, 2) professional diversity trainers, 3) students of the professors, and 4) participants of the professional trainers.

RQ1: How do academic professionals use active learning techniques in their teaching? What do they view as the strengths and weaknesses of these techniques?

Lecturer

The lecturer both had a number of years experience teaching Electronic Engineering and a few semesters experience teaching active learning classes in a team-taught structure. Both the professors utilize active learning techniques frequently, listing team teaching, activities/games, and discussion as elements of their classroom structure. A summary of the active learning techniques will include what they reported using most often, and the strengths and weaknesses of those techniques listed.

Active Learning Strategies

Discussion.

Discussion was referenced as an active learning activity commonly used by both lecturer. Both lecturers indicated that they used small group discussion. Topics for discussion were based off of video clips, readings, or activities and ranged from focusing

On Electronic engineering. Video clips included movies such *The behavior of electronic, photonic technologies, robotic automation* and *electronic genius*. Small group discussion could be on a variety of topics such as *circuit, programming* and *theoritical*

Lecturer B shared:

Discussion is an active learning technique that I use. Usually they are based upon maybe showing a video clip such as The behavior of electronic, photonic technologies, robotic automation and electronic genius

Lecturer A shared:

We also have a lot of discussion in Electronic field; it's the nature of the beast. There are at lot of discussion based assignments and activities.

The lecturer felt that discussion was able to bring in some of concepts that the video clips and games were demonstrating.

Activities

Experimental assignments, games, activities, and projects (which will be discussed more in- depth later) were cited by both of the professors as important active learning strategies. One activity mentioned was a game called "Barnga" where students are unsure about the rules of the game, and no talking is allowed during the activity. Another popular activity was a non-verbal game where students must learn to communicate without words or communicate in situations which are most the norm for their understanding. Lecturer B shared:

We have [the students] get up out of their seats and do some exercises with non-verbal communication such as standing very close to each other as they talk like other cultures might do. The non-verbal Barnga and other games help students to "feel" some of the concepts that the professors are teaching, enabling students to understand some of the emotions that go along with the concepts. They are more able to more fully understand an idea such as culture shock by experiencing the confusion and frustration that results.

The lecturer also mentioned an assignment called "the experiential learning assignment" where students must put themselves in a study casesand report about it. Some possible cross-cultural scenarios of trouble shooting the cicuit. This paper includes

a summary of the experience professors, trainers, and students had and an analysis of the communication, and tying in of class concepts that took place.

Lecturer B stated:

We [students in class] do an experiential learning assignment where they [students] have to interview someone from anotherknowledge, put themselves in another knowledge.

This activity is able to help students experience first hand a different culture, which is an important part of intercultural communication competency. It also helps the students to analyze the communication that took place when they were in their new cultural situation and apply it to what they have learned in class since they have experienced some of the concepts during the activity.

Team Teaching

Another active learning technique used by both lecturer, was team teaching. Both thought of it as a positive element of active learning. Professor A shared:

Different lecturer bring different expertise, different overseas experiences, different ethnic backgrounds and different racial heritage, perhaps, of course, gender [or] sexual orientation and so on. You'd have diversity in teachers as well as diversity of examples and so on.

Lecturer B added:
I think the strength is, you do get a variety of ideas.
Both the professors felt strongly about the benefit of multiple perspectives and expertise provided in team teaching. They felt that a professor who was an expert on a topic could provide a better lecture than they would have been able to do themselves.

Benefits of Active Learning

Engagement.

Professors felt that students were more involved or immersed in the material when active learning was used. Professors felt that active learning helped students to be more engaged, and that when students were more engaged, they were better able to apply information to the real world. Professor A states:

It (active learning) engages the student. It tends to increase motivation. It makes both the instructor and the student [I think] more engaged, and I think it does have a positive impact on learning and in the case of cross-cultural. while the learning is really important, we have, I would say, even a broader goal of acceptance. Engaging students and increasing motivation is a good way to help in retention of the material. Students who are interested in the materials may pay more attention and therefore, remember the material better.

Understanding and Exposure

Another common theme among the professors was that active learning techniques helped provide better, more in depth understanding of the material. Lecturer B stated:

I really feel that students or any of us learn best by experiencing something, really getting up and moving around, seeing, hearing and just totally experiencing something. So, that's definitely a plus to make the information hit home a little bit more.

In a Electronic subject classroom experiential learning arose as an important element in teaching. Both professors made comments about the positive aspects of "experiencing." Active learning can be a way for students to gain a little bit of that experience and exposure to diversity concepts which then helps the student to understand the material better. "Experiencing" the material helps to achieve the fourth level of intercultural competency (exposure) that is an important part of understanding.