STUDENT TEACHERS' PERCEPTION AND PRACTICE OF THE TEACHERS' ROLE WHEN TEACHING WITH COMPUTERS

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ABSTRACT

This study investigated the student teachers' perception and practice of the teacher's role teaching with computers. The teacher's role was measured as teacher-centeredness and student-centeredness. The result of the study showed that there was no significant difference between the student teacher's perception of teacher-centered roles and their perception of student-centered roles. The student teachers perceived that they would likely engage teacher-centered activities and student-centered activities on an equal basis while teaching in classrooms with computers. Nevertheless, the further test of the study showed that there was a significant difference between the student teachers' teacher-centered computer use and the student-centered computer use during the practicum. The student teachers used the computer significantly more as a teacher-centered tool than a student-centered tool.

LITERATURE REVIEW

It is a challenging process to prepare prospective teachers to use technology effectively in their future teaching practice. Teacher education, for more than a decade, has been offering computer training courses in the hope that the new graduates would be confident and competent computer users once they are on the job. "To realize any vision of smarter schooling by using technology, . . . college education must prepare teachers to use the technology. Adequate teacher preparation is probably the most important determinant of success" [1, p. 29]. Nevertheless, research indicates that the computer use of the new graduates was

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low. When the new graduates did use computers, their use fell into the traditional teaching practice and related to low levels of instructional activities [2, 3].

It is far from adequate training simply teaching prospective teachers computer skills. The study by Diem [4] found that the prospective teachers seemed to have mastered the necessary technical skills, however, they had difficulties incorporating computers into instructional activities. "They could identify parts of the computer. . . . However, they could not delineate how the computer fit into their subject matter content areas" [4, p. 35]. Dunn and Ridgway's studies yielded the same result [5, 6]. They found that prospective teachers could not embrace the wide range of instructional uses of computers although the majority of them reported that they did not experience problems technically while using the computer.

To successfully integrate computers in the teaching practice, it is essential that prospective teachers develop appropriate teaching styles incorporating computers to impact student learning. There was a great concern about the prospective teachers' perception of the role of the computer in the learning process. Prospective teachers during the practicum [5, 6] did not seem to consider the computer's role as one of helping to develop students' higher order thinking skills as much as their students' computer skills. They adopted the Noah's Ark teaching style and would send students in pairs to get their "weekly dose of the computing" which was not related to their learning task [6, p. 239].

Teaching with computers require a shift from the traditional teaching practice. "Technology affects the way teachers teach, students learn, and administrators operate. Roles and teaching and learning strategies are changing because technology fosters the use of more student-centered learning strategies" [7]. Computers changed the arrangement of classrooms, social organization of student learning, and interactive patterns between teachers and students. Classrooms needs to be arranged in a way so that students and teachers could move around for individual and group work. Computers facilitated more independent learning. Students assisted each other completing the learning task and solving problems collaboratively often with their teachers as partners. Students participated in the evaluation process and frequently evaluated each other's work. Teachers worked with individual students and small groups rather than directing the attention to the whole class [8-14]. "The direction of their change was toward child-centered rather than curriculum-centered instruction" [15, p. 50].

Teachers teaching in the classroom with computers quickly realized that they cannot assume the traditional authoritative role and conduct the teaching business as usual—". . . the new technology implies a major change in the role of the teacher" [16, p. 99]. Research found that technology-rich classrooms tend to be more student-centered rather than teacher-centered [10, 16-20]. "Technology forced a re-evaluation of the authoritative teacher role" [9, p. 83]. The teachers' role has been shifted from an "information dispenser" to a "coach" [20]; from a "centralized authority" to a "decentralized facilitator" [9]; and from a "sage on the

stage" to a "guide at the side" [21]. "If teachers are to adopt instructional reforms in ways that truly change their practices, they will need to engage in conceptual change regarding their beliefs about the nature of learning, the role of the student, and their role as teacher" [22, p. 157].

The discussion of the teachers' role shift has significant implications for teacher education. It is imperative to prepare prospective teachers for their future role teaching in the classroom with computers. "An essential part of integrating technology into the educational curriculum is the training of persons who will ultimately use the technology" [23, pp. 259-260]. The instructional technology (IT) training in teacher education should reflect and lead the trend and edge in the field of educational computing to ensure that future teachers function efficiently when they teach in the classroom with computers.

Student teaching is a crucial period for education majors. Their experiences in this period help prepare their future teaching styles. "It is in these experiences that education majors become acquainted with the realities of life in elementary and secondary classrooms, look for real-world connections to content presented in their university foundations and teaching methods classes, and develop their instructional and managerial skills" [24, p. 37].

Research on student teaching is important since the student teachers' perception and practice during the practicum closely reflect the training they have received in teacher education. What are student teachers' perceptions of the teachers' role in the classroom with computers? How do they practice the teacher's role teaching with computers during the practicum? The investigation of these questions will yield useful information assisting teacher education to restructure its IT training program and adjust its IT training courses accordingly.

Nevertheless, research is scarce on student teaching in the field of educational computing. A few studies were found that examined this crucial period [4-6, 25-28]. These studies mainly focused on student teachers' computer attitudes, their training adequacy, and the frequency of their computer use during the practicum. While these studies did attempt to investigate the pattern of the student teachers' computer use, the pattern was more often than not described by the frequency of student teachers using certain types of software. "Questions remain unanswered on the nature of student teachers' computer use" [27]. Up until now, no study has ever been conducted to evaluate student teachers' teaching styles when they teach with computers.

This study was conducted to gain an insight into the student teachers' perception and practice of the teachers' role teaching with computers during the practicum in terms of teacher-centeredness and student-centeredness.

PURPOSE OF THE STUDY

This study investigated the following questions: 1) What were the student teachers' perceptions of the teachers' role when teaching with computers? The

student teachers' perception of the teachers' role was measured as teacher-centeredness versus student-centeredness. 2) How did the student teachers practice the teacher's role when teaching with computers during the practicum? The student teachers' computer use was measured as the teacher-centered computer use versus the student-centered computer use. 3) Were there any differences between the student teachers' perception and their practice of the teachers' role when teaching with computers?

METHOD

Sample

The setting for this study was at the University of Guam, a public university in a territory of the United States in the Western Pacific Rim. The sample of the study was all the student teachers ($N = 46$) who completed student teaching in May 1999. All current student teachers participated in the study.

At the University of Guam, the instructional technology training of prospective teachers was offered through a three-credit core course—Computers in Education. Elementary education majors were required to take this course. The course taught computer literacy as well as classroom uses of educational software and tool software. This course was an option for secondary education majors. In addition, education majors were exposed to some computer uses in another required three-credit core course—Audio Visual Education. Educational majors had options to take computer courses as electives in other departments such as Computer Science and Business. Students completed all the course work before they started a semester-long teaching practicum.

Computer integration into other methods courses were not required, although encouraged. As a result, the decision was left completely to individual course instructors depending on their pedagogical beliefs, interests, and computer expertise. At the time this study was conducted, the computer was integrated unevenly across methods courses. Some instructors introduced computer uses into the teaching of their content areas, while others tended to avoid it.

Instrument

The data collection instrument for this study was a survey questionnaire modified slightly from the one developed by Bichelmeyer, Reinhart, and Monson at the Indiana University [29]. The survey was originally used to measure teachers' beliefs and practices about the teachers' role of teaching with technology. In the study by Bichelmeyer, Reinhart, and Monson, the survey questionnaire was administered to a sample of 225 school teachers. The modified questionnaire contains three sections: 1) information about participants and practicum schools;

2) student teachers' perception of the teachers' role in the classroom with computers; and 3) student teachers' computer use during the practicum.

Section 1 collected the information about the subject's background and the practicum school: 1) gender; 2) age; 3) years of computer experience; 4) home computer ownership; 5) types of practicum schools; 6) hardware resources in practicum schools; and 7) software resources in practicum schools.

Section 2 included twelve items on a 1-5 Likert scale (1 = strongly disagree and 5 = strongly agree) measuring student teachers' perceptions of the teachers' role when teaching with computers. Six items dealt with teacher-centeredness and the other six items student-centeredness. Teacher-centeredness defined the teachers' role primarily as: 1) planning instructional activities for the whole class; 2) being the main directing force in conducting the class; 3) keeping order and quiet in the classroom; 4) presenting lectures; 5) attending to the class as a whole; and 6) being the main resource in the student learning process. Student-centeredness defined the teachers' role primarily as: 1) collaborating with students in planning lessons; 2) providing individualized learning objectives; 3) using authentic assessment methods; 4) evaluating students on an individual basis; 5) including students in the evaluation process; and 6) creating student sub-groups for class projects.

Section 3 collected data on the student teachers' computer use during the practicum. All the items are on 1-5 Likert-scale (1 = Never and 5 = Frequently). Six items in this section were the teacher-centered computer use and six items were the student-centered computer use. The teacher-centered computer use was defined as *teachers* using computers to: 1) create instructional materials; 2) find resources; 3) communicate with others; 4) keep track of students' grades; 5) present information to the class; and 6) provide computer enrichment activity. The student-centered computer use was defined as *students* using computers to: 1) create learning resources; 2) find resources for learning activities; 3) communicate with others; 4) present information; 5) complete class projects; and 6) engage in computer hands-on learning activities.

Reliability of the Instrument

The Cronbach's coefficient alpha ( ) was used to assess the reliability of the constructs surveyed by the instrument: 1) teacher-centered role; 2) student-centered role; 3) teacher-centered computer use; and 4) student-centered computer use. Table 1 presents the reliability scores of these constructs.

Missing Values

When a missing value is found, the whole case is excluded from the statistical analysis. In section 1, the missing values were reported as no responses. In section 2, there was one missing value. In section 3, there was one missing value.

RESULTS

Data was analyzed by using SPSS (Statistical Package for Social Sciences).

Participants' personal information is presented in Table 2. The majority of the student teachers were female (76%). Over half of the student teachers were ages twenty to twenty-five (59%). Student teachers' computer experiences were varied, ranging from one year to over fifteen years. An overwhelming number of student teachers owned home computers (83%).

Table 1. Reliability Scores

Construct	Number of Items	Cronbach Alpha
Teacher-centered role	6	.94
Student-centered role	6	.93
Teacher-centered computer use	6	.86
Student-centered computer use	6	.93

Table 2. Demographic Information

	Number	Percent
Gender		
Female	35	76
Male	11	24
Age		
20-25	27	59
26-30	8	17
31-35	5	11
Over 35	6	13
Computer Experience in Years		
1-5	20	44
6-10	15	33
11-15	6	13
Over 15	2	4
No response	3	7
Home Computer Ownership		
Yes	38	83
No	8	17

Information about practicum schools is presented in Table 3. Over half of the student teachers did the practicum in elementary schools. Hardware and software resources were distributed unequally among practicum schools.

Statistical analysis was conducted to answer the three research questions.

1. What were student teachers' perceptions of the teachers' role teaching with computers? The paired-sampled *t*-test was used to compare the means of student teachers' perceptions of the teacher-centered role versus the student-centered role. This comparison showed that there was no significant difference between student teachers' perceptions of teacher-centered roles and the student-centered roles (Table 4).

2. What was the student teachers' computer use during the practicum? The paired-sampled *t*-test was used to compare the means of the student teachers' teacher-centered computer use versus the student-centered computer use. The

Table 3. Practicum Schools

	Number	Percent
Types of Practicum Schools		
Elementary	27	59
Secondary	19	41
Rating of Hardware Resources in Practicum Schools		
High	16	35
Medium	18	39
Low	9	20
No response	3	7
Rating of Software Resources in Practicum Schools		
High	15	33
Medium	17	37
Low	10	22
No response	4	9

Table 4. Student Teachers' Perceptions of the Teachers' Role Teaching with Computers

	N of Pairs	Mean	*SD*	SE of Mean	*t*-value	*p*
Paired-sample *t*-test	45				−.48	.637
Student centered roles		3.8407	.864	.129		
Teacher-centered roles		3.8407	.856	.128		

comparison showed that there was a significant difference between the student teachers' teacher-centered computer use and the student-centered computer use (Table 5).

3. Did the student teachers' perception of the teachers' role differ from their practice of the teachers' role when they teach with computers? The paired-sampled t-test was used to compare the means of the student teachers' perception with their practice of the teachers' role. This comparison showed that there was a significant difference between the student teachers' perception of the teacher-centered role and their teacher-centered computer use (Table 6). There was a significant difference between the student-teachers' perception of the student-centered role and their student-centered computer use (Table 7).

Table 5. Student Teachers' Computer Use during the Practicum

	N of Pairs	Mean	*SD*	SE of Mean	*t*-value	*p*
Paired-sample *t*-test	45				−7.48	.000
Student centered computer use		2.1905	1.096	.163		
Teacher-centered computer use		3.2037	1.113	.166		

Table 6. Student Teachers' Perception versus Their Practice Student-Centeredness

	N of Pairs	Mean	*SD*	SE of Mean	*t*-value	*p*
Paired-sample *t*-test	44				−8.78	.000
Perception		3.8144	.855	.129		
Practice		2.2175	1.094	.165		

Table 7. Student Teachers' Perceptions versus Their Practice Teachers-Centeredness

	N of Pairs	Mean	*SD*	SE of Mean	*t*-value	*p*
Paired-sample *t*-test	46				−3.62	.001
Perception		3.8225	.907	.134		
Practice		3.2138	1.103	.163		

Further statistical tests (e.g., multiple regression and MANOVA) could have been conducted to correlate the independent variables (gender, age, computer experience, home computer ownership, hardware and software resources in practicum schools) with the dependent variables (student teachers' computer uses during the practicum). However, the small sample size of subgroups (e.g., only 11 students were males and 8 students who did not own home computers) made it meaningless to carry out these tests. The discussion of the factors associated with student teachers' computer uses, therefore, was drawn from other studies in the literature.

DISCUSSION

The student teachers in this study perceived no significant difference between the teacher-centered role and the student-centered role when teaching with computers. They did not appear to share the belief that the availability of technology in the classroom should change the teacher-centered teaching style to the student-centered teaching style. The data indicates that these student teachers preferred a combined teaching-style which balanced teacher-centered activities and student-centered activities rather than a dichotomous teaching style leaning toward teacher-centeredness or student-centeredness. These student teachers might consider the two teaching styles complimentary rather than exclusive to each other.

This finding was in agreement with that found in the study by Bichelmeyer, Reinhart, and Monson [29], which compared practicing teachers' perceptions of the teachers' role in the classroom *with* computers and in the classroom *without* computers. Teachers in the study perceived no significant difference between the teacher-centered role and the student-centered role in the classroom *with* computers. Further tests showed that teachers perceived their roles to be less teacher-centered, but not more student-centered in the classroom *with* computers than that in the classroom *without* computers. The seemingly contradictory results puzzled the researchers and made them wonder what then should be the teacher's role in the classroom with computers. One of their explanations was that teachers might become unsure of their roles in the information-age classroom. They might be still struggling to come to terms with their new roles.

If these student teachers were making efforts to keep a balance between the two roles conceptually, they then abandoned their efforts in the practice. Their computer use revealed a huge gap between the teacher-centered computer use and the student-centered computer use. These student teachers used the computer significantly more as a teacher-centered tool than a student-centered tool.

Although the student teachers' computer use might be impacted by a number of factors such as their computer experience, home computer ownership, and the practicum school computing environment, the literature points out that the most powerful factor associated with the student teachers' computer use was the type of IT training they received in their teacher training programs [5, 23, 25, 30].

These student teachers might lack strategies to use the computer as a student-centered tool. Although these student teachers had completed university IT courses, their IT courses might get them to the level of using computers as a teacher-centered tool, but not a student-centered tool. The student-centered computer use requires different strategies including scheduling the computer use, using different classroom management skills, designing curriculum-related activities, and developing evaluation methods accordingly. Their computer use might reflect their IT training orientation which exposed them to the teacher-centered computer use, but not the student-centered computer use.

The student teachers' practice might reflect the ambiguity of their beliefs in teacher-centered roles and student-centered roles. Although conceptually these student teachers endorsed the student-centered classrooms, they were, in actuality, still holding onto the deeply-entrenched belief of teacher-centered classrooms. Thus, they had not made the transition to embrace the student-centered approaches in the teaching practice. Research indicated that the transition from the teacher-centered role to the student-centered role was a difficult one to make. "Restructuring one's beliefs, however, is difficult and often creates feelings of uncertainty and discomfort . . ." [22, p. 158]. Even with teachers who are willing to experiment with innovative technology. The change is slow, and sometimes includes temporary regression [13, p. 35].

The student-centered computer use is grounded in one's belief about the nature of teaching and learning. Ertmer, Ross, and Gopalakrishnan conducted a study examining seventeen exemplary technology-using teachers [31]. They found that teachers' exemplary technology practices were guided by their pedagogical beliefs about student-centered classrooms. These teachers "share a common vision of their students as self-regulated learners, capable of setting goals, making choices, monitoring progress, and evaluating learning outcomes" [31, p. 1523]. Nevertheless, teacher candidates continue to enter teacher education with a view that teaching is a didactic way of transmitting knowledge and learning is a passive and receptive activity [32-34]. "Preservice teachers instructional beliefs are often firmly entrenched and resistant to change because of their experiences as students in traditional classrooms . . ." [22, p. 157].

Changing prospective teachers' pedagogical beliefs has been a neglected area in teacher education. "Few courses relate teachers' delivery styles to what types of materials and activities they select and it is even more difficult to find courses that are addressing teaching styles and how they impact the use and misuse of technology" [35, p. 337]. Teacher education needs to develop courses that address student-centered teaching strategies. IT training courses should support student-centered instructional approaches by addressing teaching styles explicitly and their impact upon learning with technology, having faculty model student-centered computer uses, and involving prospective teachers in designing and participating in student-centered technology projects.

The student-centered computer use develops through practice. Field experiences should be incorporated into IT training courses. Field experiences can provide models of effectively using computers with students. Parkinson suggested that IT training courses should be taught both through a university-based component and a school-based component [36]. Prospective teachers should be offered opportunities to observe how exemplary classrooms teachers use computers with students and be able to practice the student-centered computer use in real classroom settings. Downes [25] observed the student teachers' computer use throughout three practicums and noticed there were shifts in the way student teachers' using computers with students. Student teachers' computer use with students progressed from Practicum 1 to Practicum 3.

Practicum school environments play an important role in influencing the student teachers' computer use [25-27, 36]. Student teachers need a supportive practicum environment to be able to use computers with students. "Practicing teachers are role models for student teachers. Student teachers learn from their cooperating teachers as well as other practicing teachers they observe" [26]. Student teachers are facing many challenges as they are trying to cope with their first experience in the real classroom setting. Often they are mentored into the culture of the practicum school. "Pressure existed on student teachers to conform to the instructional patterns of their cooperating teachers. If the cooperating teachers did not use the computer as part of their instruction, the student teachers did not have models to follow" [4, p. 35].

The university and the school district should work collaboratively to create and maintain a supportive practicum environment. University supervising faculty, classroom cooperating teachers and student teachers can form a team, supporting each other and utilizing each other's expertise. Student teachers can tutor computer skills to cooperating teachers. Cooperating teachers can demonstrate teaching strategies and the curriculum. Supervising teachers can advise on instructional technology design and its integration in the curriculum. Sharing and openness can transform the practicum into an opportunity of professional development for every party involved. This cooperation should be an on-going, long-term relationship rather than a special one-shot event in order to nurture a positive practicum environment.

Hardware and software resources in practicum schools might be another reason affecting the student-centered computer use in this study. The data indicated that technology resources were distributed unequally among practicum schools. Although the abundance of hardware and software does not necessarily guarantee the effective computer use by student teachers, using computers with students is demanding on the availability of and convenient access to computer hardware and software. One way a school of education can help alleviate resource problems is setting up a check-out system for equipment for student teachers to use in practicum schools. Unfortunately, technology resources are spread unevenly among schools as of other resources. Until equity is achieved, teacher education

should take this as a challenge to prepare prospective teachers on how to utilize limited IT resources in schools to its maximum to enhance the quality of teaching and learning.

Finally, the comparison of the student teachers' perception versus their practice of the teachers' role using computers shows a dramatic drop not only in student-centered computer uses, but also teacher-centered computer uses. Both teacher-centered computer uses and student-centered computer uses were much lower than what the student teachers themselves perceived. This discrepancy might be an indication that student teachers would always perform lower than they themselves expect due to "external circumstances or those over which they have no control unless they are extraordinarily motivated" [37, p. 194].

Another reason for this drop might be that the student teachers had perceived the computer as an unwelcome intruder in the classroom, since teaching was traditionally viewed as a human interaction between teachers and students. Larry Cuban spoke out his worries about the invasion of the computer into the classroom: "I worry that extensive classroom use of computers ultimately may corrode the teacher-student relationship, the social climate of a classroom, and the importance of students' learning to work collaboratively" [38, p. 205]. His worries might as well be shared, consciously or unconsciously, by these student teachers.

RECOMMENDATIONS

1. It is recommended that this study be replicated at other academic sites using larger samples. Replication at other sites would enhance the generaliziability of this research. Larger samples would make it possible to conduct other statistical tests such as the correlation between independent variables (e.g., age, gender, computer experiences, practicum school computing environment) and dependent variables (student teachers' computer uses), which would help identify factors influencing student teachers' perceptions and practices.

2. This study attempts to reveal the nature of student teachers' computer use in the classroom, in terms of teacher-centered uses versus student centered uses. However, some of the constructs might have been too abstract to operationalize. An alternative assessment instrument could be designed to measure these constructs more specifically. Software applications can be categorized as instructional tools (e.g., drill and practice), constructive tools (e.g., spreadsheet), communicative tools (e.g., e-mail), and informative tools (e.g., internet resources) [39, 40]. For each of these categories, the use of each computer application can then be assessed as teacher-centeredness or student centeredness. For example, my students use the spreadsheet to formulate math models and test hypotheses (student-centered computer uses); or I assign students to use instructional software to reinforce what they have learned in class (teacher-centered computer use).

3. To provide more insights into the student-teachers' perception and practice of the teachers' role of teaching with computers, future studies need to employ a

mixed-method approach including both quantitative and qualitative data. In addition to interviewing students, a focus group could be selected for classroom observation. The mixed-method approach will help researchers to more accurately interpret data and thus enhance the overall quality of the study.

4. Student-centered computer use is rooted in one's belief about the nature of teaching and learning. How do student teachers view teaching and learning in general? What are the student teachers' perceptions of teaching in the classroom *without* computers? A study can be conducted to compare the student teachers' perception of teaching in the classroom both *with* computers and *without* computers. The answer to this question will not only help to restructure IT training programs, but also improve teacher education programs as a whole.

CONCLUSION

This research is the first attempt to investigate the student teachers' perception and their practice of the teacher's role when teaching with computers. IT courses at the university should lead the trend and advance the "edge" of IT practices in the classroom instead of lagging behind it. Teacher education needs to offer IT courses that emphasize appropriate teaching styles and expose prospective teachers to strategies and models of student-centered computer uses. Due to the exploratory nature of this study, many questions remain unanswered, which, hopefully, would be addressed by future studies.

ACKNOWLEDGMENTS

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