Analyzing the Effect of Instruction Based on Classroom Assessment Techniques in Prospective Teachers' Achievement

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ABSTRACT The purpose of this study is to investigate the effect of the implementation of an instructional process using Classroom Assessment Techniques (CAT) on student teachers' understanding of the instructional methods presented in the Instructional Principles and Methods course, which is taught in educational faculties. Moreover, it aims to determine whether using CAT while teaching contributes positively to students' learning as measured by students' feedback. The study was designed using a mixed method approach. Pre-test results suggested no significant difference between the learning levels of students in the experimental group and students in the control group. At the end of the teaching process, student achievement levels in both groups demonstrated significant progress. A comparison between post-test scores revealed that students in the experimental group had significantly better scores than those in the control group. 38 students in the experimental group stated that instruction with CAT made a positive contribution to their learning.

INTRODUCTION

During the 1990s, the educational practices in the United States exposed the problems associated with the quality of learning and teaching, especially in higher education. Researchers in the field of educational reform primary sought to answer two questions: (1) How well are students learning? and (2) How effectively are teachers teaching?(Angelo and Cross 1993). The research indicates that the ability of a faculty member to provide effective instruction isdependent on the vocational course she/he participated in during teacher training education and professional experience.

The Instructional Principles and Methods course, which is one of the most essential courses taught in teacher and educator training institutions, provides prospective teachers with effective teaching skills. Conducting this course in an effective and productive way is very important. Not only does it provide a basis student success in mulitple follow-up courses and practices, including special instructional methods,

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measurement and instruction, classroom management, and school practice etc., but it also ensures that prospective teachers will exhibit effective teaching skills as future teachers (Celikten et al. 2005; Arslan and Ozpinar 2008).

Academic research on the quality of teaching and learning processes in the USA has produced some recommendations for resolving the problems universities face in the learning and teaching process. One of the most important recommendations of this time was presented by Angelo and Cross (1993) who suggested using Classroom Assessment Techniques to improve classroom instruction and learning. It provides faculty with feedback about their effectiveness as teachers, and it gives students a measure of their progress as learners. Most importantly, because Classroom Assessments are created, administered, and analyzed by the instructors themselves, they address questions of teaching and learning that are important to them, so the likelihood that instructors will apply the results of the assessment to their own teaching is greatly enhanced (Angelo and Cross 1993). Moreover, Angelo and Cross asserted that the use of these techniques will help the learners become more aware of their own learning process.

Angelo and Cross (1993) explain 50 different techniques of Classroom Assessment. Since not all of these techniques are considered in the present study, only those used in the research are briefly defined here.

Memory Matrix

The Memory Matrix is simply a two-dimensional diagram a rectangle divided into rows and columns used to organize information and illustrate relationships. In a Memory Matrix, the row and column headings are given, but the cells, or boxes within the diagram, are left empty. By filling in the blank cells of the Memory Matrix, students provide feedback that can be quickly scanned and easily analyzed. The Memory Matrix assesses students' recall of important course content as well as their skill at quickly organizing that information into categories provided by the instructor. By using this technique, teachers can quickly see not only whether or not their students remember the basic information, but also how well they have organized that information in their memories.

Empty Outlines

The name of this technique is self-explanatory. The instructor provides students with an empty or partially completed outline of an in-class presentation or homework assignment and gives them a limited amount of time to fill in the blank spaces. Many instructors already provide outlines of their lectures at the beginning or end of class sessions to help students better organize and learn course content.The Empty Outlines technique helps faculty understand how well students have "caught" the important points of a lecture, reading assignment, or audio-visual presentation. It also helps learners recall and organize the main points of a lesson within an appropriate knowledge structure, which makes retention more likely and aids understanding.

Background Knowledge Probe

Background Knowledge Probes are short, simple questionnaires prepared by instructors for use at the beginning of a course, at the start of a new unit or lesson, or prior to introducing an important new topic. A Background Knowledge Probe may require students to write short answers, circle the correct responses to multiple-choice questions, or both. Background Knowledge Probes are meant to help teachers determine the most effective starting point for a given lesson and the most appropriate level at which to begin instruction. By sampling the students'

background knowledge before formal instruction on that topic begins, these probes also provide feedback on the range of preparation among students in a particular class. For students, the Background Knowledge Probe helps focus their attention on the most important material they will be studying, by providing both a preview of what is to come and a review of what they already know about that topic. Background Knowledge Probes can also be used as pre- and post-assessments: before instruction, to find out the students' "baseline" knowledge level and immediately after, to get a rough sense of how much and how well they have learned the material.

Minute Paper

To the best of our knowledge, no other Classroom Technique presented by Angelo and Cross has been used more often or by more college teachers than the Minute Paper. This versatile technique also known as the One-Minute Paper and the Half-Sheet Response provides a quick and extremely simple way to collect written feedback on student learning. To use the Minute Paper, an instructor stops class two or three minutes early and asks students to respond briefly to some variation on the following two questions: "What was the most important thing you learned during this class?" and "What important question remains unanswered?" Students write their responses on index cards or half-sheets of scrap paper hence the name "Half-Sheet Response" and hand them in.The great advantage of Minute Papers is that they provide manageable amounts of timely and useful feedback using minimal investment of time and energy. By asking students what they understand to be the most significant things they are learning and what their major questions are, faculty can quickly check how well those students are learning what they are teaching. That feedback can help teachers decide whether any mid-course corrections or changes are needed and, if so, what kind of instructional adjustments to make. At the same time, getting the instructor's feedback on their Minute Papers helps students learn how experts in a given discipline distinguish the major points from the details. The Minute Paper also ensures that students' questions will be raised, and in many cases answered, in time to facilitate further learning.

Studies on the use of Classroom Assessment Techniques during the learning and teaching processes revealed that learners largely achieved the desired learning goals of the course (Mansson 2013); learners appreciated the techniques for their comfort of learning (Ashakiran and Deepthi 2013); learners' working habits changed positively (Soataert 1998), communication and co-operation between learners and teachers improved; learners' interest in lectures, learning motivation, classroom control, and learners' satisfaction increased (Goldstein 2007; Tuby 2003; Cottell and Harwood 1998; Steadman and Svinicki 1998; Steadman 1998; Richlin 1998;), and learners' critical thinking skills improved (Angelo and Cross 1993). Additionally, Classroom Assessment Techniques helped learners learn how to learn (Cottell and Harwood 1998). As suggested by the findings of these studies, the use of Classroom Assessment Techniques in teacher training programs of higher education institutions will almost certainly contribute to the acquisition of required professional competences by pre-service teachers.

An analysis of the literature on Classroom Assessment Techniques reveals that these techniques have been used in different disciplines and courses with positive results on learners' learning, including clinical pharmacy (Whitley and Parton 2014), grammar learning of English as a foreign language – EFL (Baleghizadeh and Zarghami 2014), medicine (Ashakiran and Deepthi 2013), intercultural communication (Mansson 2013), research techniques courses (Nartgun 2010), measurement and evaluation (Uluman 2009), engineering (Agrawal and Khan 2008), political sciences (Cohen 2008), statistics (Goldstein 2007), culture and civilization (Hoegl 1999), accounting (Cottell and Harwood 1998).The present study aims to investigate the effect of Classroom Assessment Techniques on learners' achievement in an Instructional Principles and Methods course. So far, no previous research has specifically examined the impact of CAT in Instructional Principles and Methods courses.

Angelo and Cross (1993) briefly explained the properties of Classroom Assessment Techniques as being:

Learner-Centered

The primary attention of teachers and students in Classroom Assessment is to observe and improve learning, rather than to observe and improve teaching. To improve learning, it may often be more effective by helping students change their study habits or develop their metacognitive skills than by changing the instructor's teaching behavior. In the end, students must learn to take full responsibility for their learning if they are to become independent, life-long learners.

Teacher-Directed

A defining characteristic of any profession is that it depends on the wise and effective use of judgment and knowledge. No one can provide teachers with rules that will tell them what to the from moment to moment in the complex and fluid reality of a college classroom. What a faculty member does to use CAT depends on their skill, experience, professional knowledge, and insight.

Mutually Beneficial

Because it is focused on learning, Classroom Assessment requires the active participation of students. By cooperating in assessment, students reinforce their grasp of course content and strengthen their own skills of self-assessment. Faculty members also sharpen their teaching focus by continually asking themselves three questions: "What are the essential skills and knowledge I am trying to teach?" "How can I find out whether students are learning them?" "How can I help students learn better?" As teachers work closely with students to answer these questions, they improve their teaching skills and gain new insights.

Formative

Classroom Assessment is a formative rather than a summative approach to assessment. Its purpose is to improve the quality of student learning rather than provide evidence for evaluating or grading students; consequently, many of the concerns that constrain testing do not apply.

Context-Specific

To be most useful, Classroom Assessments have to respond to the particular needs and characteristics of the teachers, students, and disciplines to which they are applied.

On-going

Classroom Assessment is an on-going process perhaps best thought of as the creation and maintenance of a classroom "feedback loop." By employinga number of simple Classroom Assessment Techniques, teachers can collect feedback from students on their learning quickly and easily.

Rooted in Good Teaching Practice

Classroom Assessment is an attempt to build on existing good practices by making them more systematic, more flexible, and more effective. Classroom Assessment provides a way to integrate assessment systematically and seamlessly into the traditional classroom teaching and learning process.

Classroom Assessment Techniques are based on seven basic assumptions. They are summarized as follows (Angelo and Cross 1993):

1. The quality of student learning is directly, although not exclusively, related to the quality of teaching. Therefore, one of the most promising ways to improve learning is to improve teaching.
2. To improve their effectiveness, teachers need to first make their goals and objectives explicit and then get specific, comprehensible feedback on the extent to which they are achieving those goals and objectives.
3. To improve their learning, students need to receive appropriate and focused feedback early and often; they also need to learn how to assess their own learning.
4. The type of assessment most likely to improve teaching and learning is that conducted by faculty to answer questions they themselves have formulated in response to issues or problems in their own teaching.
5. Systematic inquiry and intellectual challenge are powerful sources of motivation, growth, and renewal for college teachers, and Classroom Assessment can provide such challenge.
6. Classroom Assessment does not require specialized training; it can be carried out by dedicated teachers in all disciplines.
7. By collaborating with colleagues and actively involving students in Classroom Assessment efforts, faculty members and stu-

dents enhance learning and personal satisfaction.

Angelo and Cross (1993) suggest that the effective use of Classroom Assessment Techniques entails an effective planning and implementation of teaching practices in accordance with this plan. Since these practices should be performed in the form of a project they are called the Classroom Assessment Project Cycle. The phases of this cycle are summarized below:

Phase I: Planning

Step 1: Choosing the class in which to carry out the Project

Step 2: Focusing on an "assessable question" about student learning

Step3: Designing a Classroom Assessment Project to answer that "assessable question"

Phase II: Implementing

Step 4: Teaching the "target" lesson related to the question being assessed

Step 5: Assessing learning by collection feedback on that assessable question

Step 6: Analyzing the feedback and turning data into usable information

Phase III: Responding

Step 7: Interpreting the results and formulating an appropriate response to improve Learning

Step 8: Communicating the results to students and testing the response

Step 9: Evaluating the project's effect(s) on teaching and learning

Step 10: Design a follow–up classroom research project.

Purpose

The purpose of this study is to investigate the effect of an instructional process using Classroom Assessment Techniques on students' understanding of instructional methods in an Instructional Principles and Methods course.

It also aims to ascertain whether or not the Classroom Assessment Techniques used during the instruction process made a contribution on students' learning as measured using students' feedback.

In line with these research purposes, we ask the following questions:

1. Is there a significant difference between the pre-test scores of students in the experimental group taught using Classroom Assessment Techniques and the pre-test scores of students in the control group taught without the use of these techniques?
2. Is there a significant difference between the pre-test and post-test mean scores of the students in the experimental group?
3. Is there a significant difference between the pre-test and post-test mean scores of thestudents in the control group?
4. Is there a significant difference between the post-test mean scores of students in the experimental group and those in the control group?
5. What do the students in the experimental group think about the contribution of using Classroom Assessment Techniques in the instruction process on their learning?

METHODOLOGY

An embedded design, which is a mixed method design, was used in the study since the researchers used both qualitative and quantitative research methods as required by the structure of the research questions.This design is based on the premises that a single data set is not sufficient, that different questions need to be answered, and that each type of question requires different types of data. Researchers use this design when they need to include qualitative or quantitative data to answer a research question within a largely qualitative or quantitative study (Creswell and Clark 2007).

For the quantitative strand of the study, a pre-test/post-test control group experimental design was used. Experimental designs are a type of research model used to determine causal associations where the data to be observed are produced under direct control of the researchers, (Karasar 2006). The pre-test post-test control group experimental design used in this study requires the comparison of pre-test and post-test conditions of the experimental and control groups; participants are randomly assigned to be in one of the two groups (Table 1).

Table 1: Research model

G1	R	T 1.1	X	O1.1
G2	R	T 1.2		O2.2

G1: Experimental Group,
G2: Control Group,
R: Random assignment,
T: Test,
X: Experimental

Secondly, qualitative research techniques were used since the participants in the experimental group were asked to report their views on the contribution of the use of Classroom Assessment Techniques in the instruction process on their learning.

Study Group

Since the aim of this study is not to generalize the results of the experiment to other populations, no population-sample association was used. Therefore, a study group was selected purposively in accordance with the objectives of the study. The study was conducted using 80 students, 41 female and 39 male, attending the day and night programs in the department of mentally disabled education at a state university during the 2013-2014 academic year.

The night students were assigned to an experimental group and the day students were assigned to a control group. The experimental group was composed of 40 students, with 19 males and 21 females, and the control group was composed of 40 students, with 20 males and 20 females.

Instruments

In line with the purpose of the study, a multiple-choice test comprised of 25 items was developed to test participants' initial levels of knowledge before the instruction as well as their learning attainment levels following the period of instruction about relevant topics in the Instructional Principles and Methods course. An initial form of the test comprised of 75 items was administered to another group with similar backgrounds, and the resultant data was subjected to item and test statistics analysis. The content validity of the test was ensured through expert opinion and the use of a table of specifications. The internal consistency reliability of the test was estimated using the KR-20 formula, which a result of 0.83.

The test was administered to the participants at the beginning and at the end of the experimental process. The raw scores were estimated and then converted into a score ranging from 0-100, with each correct response worth 4 points. The data was then entered into the SPSS 16 software program. The pre-test and post-test scores of the students in both the experimental and control groups were analyzed using descriptive statistics and compared using both paired and independent samples *t* tests.

The qualitative data was collected from the experimental group using an open-ended, structured question:*"What do you think about the contribution of using Classroom Assessment Techniques in the instruction of Instructional Principles and Methods course on your learning? Please explain briefly."*The students' responses were analyzed using content analysis. Content analysis is defined as summarizing a text into smaller content categories with certain coding procedures (Buyukozturk et al. 2013). Content analysis is used to detect and evaluate common data in terms of the research problem among several texts rather than analyzing a single text (a novel, a book etc.). Content analysis is used to obtain systematic and common data from many texts (Bilgin 2006; Gokce 2006).

Procedure

The Instructional Principles and Methods courseis offered over 15 weeks with 3 lesson hours per week. Before the teaching process begins, the researcher identified the subjects that would be covered according to the course definition of the Instructional Principles and Methods course prepared by the department. The experimental procedure covered the units covered during the first two weeks of the term. Next, the primary reference sources to be used were determined and the list was handed to the students. Moreover, the students in both the experimental and control groups were informed about how the lessons would be taught.

In the control group, all the subjects covered as part of the study were taught by the researcher. The content was presented in lecture using examples from different disciplines. The researcher encouraged the students to ask questions about any content they did not fully understand.

The instruction in the experimental group was also performed by the researcher. However, unlike the control group, students in the experimental groupwere taught using proper Classroom Assessment Techniques, including the use of memory matrices, empty outlines, background knowledge probes, and minute papers, in order to assess whether students learned the content and to identify and address learning problems. At the beginning of the instructional process, studentsin the experimental group were informed about these techniques and their inclusion was made compulsory.

RESULTS

Problem 1: Is there a significant difference between the pre-test scores of student teachers in experimental and control groups?

No significant difference was found between pre-test scores of student teachers in the experimental group and those in the control group ($t_{(78)}$=1.49, p>0.05). By analyzing the mean scores and standard deviations, it is clear that students in both the experimental group (X=57.50; S=15.09) and the control group (X=61.65; S=11.48) had similar initial levels of knowledge about the research methods under question. This finding is important as it proves that before the instructional process the knowledge levels of student teachers in both the experimentalgroup and the control group were equivalent.

Table 2: The results of analysis regarding the comparison of the pre-test mean scores of student teachers in experimental and control groups

Groups	N	X	S	df	t	p
Experimental	40	57.50	15.09	78	1.49	0.14
Control	40	61.65	11.48			

Problem 2: Is there a significant difference between the pre-test and post-test mean scores of students in experimental group?

As indicated in Table 2, the attainment levels of the students in the experimental group increased significantly after the experimental process ($t_{(39)}$=7.68; p<0.05).While the pre-test mean scores and standard deviations were 57.50 and 15.09 respectively, they were 82.30 and 10.67 after the experimental process. Based on this finding, it can be suggested that instruction using

Classroom Assessment Techniques has a positive impact on enhancing the attainment levels of student teachers.

Table 2: The results of analysis regarding the comparison of pre-test and post-test scores of student teachers in experiment group

Groups	N	X	S	df	t	p
Pre-test	40	57.50	15.09	39	7.68	0.000*
Post-test	40	82.30	10.67			

*p<0.05

Problem 3: Is there a significant difference between the pre-test and post-test mean scores of students in control group?

The knowledge attainment levels of the students in the control group also increased significantly after the instructional process (t(39)=8.41; p<0.05).

While the pre-test mean scores and standard deviations representing student teachers' initial levels of knowledge were 61.65 and 11.48 respectively, they were 76.75 and 5.42 after the instructional process (Table 3). Although this difference was statistically significant, the control group students' level of attainment about the instructional methods cannot be said to be at a desired level when compared to the students' attainment in the experimental group who were taught using Classroom Assessment Techniques.

Table 3: The results of analysis regarding the comparison of pre-test and post-test scores of student teachers in control group

Groups	N	X	S	df	t	p
Pre-test	40	61.65	11.48	39	8.41	0.000*
Post-test	40	76.75	5.42			

Problem 4: Is there a significant difference between post-test mean scores of students in experimental and control groups?

There was a significant difference between the post-test mean scores of the student teachers in the experimental group and those in the control group ($t_{(76)}$= 2.67, p>0.05). By comparing the mean scores and standard deviations of both group, it is clear that that students in the experimental group (X=82.30, S=10.67) demonstrated significantly higher levels of attainment about the instructional methods compared to the students in thecontrol group (X=76.75, S=5.42) (Table 4). Based on this finding, the researchers suggest that instruction using Classroom Assess-ment Techniques has a positive impact on enhancing the attainment levels of the student teachers.

Table 4: The results of analysis regarding the comparison of the post-test mean scores of student teachers in experiment and control groups

Groups	N	X	S	Df	t	P
Experiment	40	82.30	10.67	76	2.670	0.011
Control	40	76.75	5.42			

Problem 5: What do the students think about whether the use of classroom assessment techniques promote students' learning in the experimental group?

The qualitative portion of the study examined the students' opinions on the use of Classroom Assessment Techniques and whether or not they promoted students' learning in the experimental group.Table 5 illustrates the resulting data and distinguishes between the positive and negative feedback recieved. It is clear that the majority of students were very positive. 27.5 percent of them reported that the techniques enabled them to better understand the material, 20 percent reported that it helped them consider their own weaknesses, 15 percent reported an increase in attention, 10 percent recognized that the various methods were different from the traditional ones, and 7.5 percent though the lessons were more pleasurable. However, some of the students expressed negative opinions; 2.5 percent thought it took too much time and 2.5 percent reported that they got bored when forced to go into more detail.

Table 5: The views of the use of classroom assessment techniques in the experimentalgroup

	Views	f	%
Positive	It enabled me to understand better	11	27.5
	I considered my weaknesses	8	20
	Itenabled me to listen to the teacher more attentively	6	15
	I recognized various methods apart from the traditional methods	4	10
	I wishother teachers taught by using these methods	3	7.5
	Itgave me a different point of view	3	7.5
	Lessons have become more pleasurable.	3	7.5
Negative	It takes much time.	1	2.5
	It became boring when it went into much detail.	1	2.5
Total		40	100

DISCUSSION

This study investigated the impact of instruction based on Classroom Assessment Techniques on students' knowledge attainment in the Instructional Principles and Methods course. The student teachers in both the experimental groupandthe control group demonstrated similar levels of knowledge about instructional methods at the beginning of the study and no statistically significant difference was found between their pre-test scores. Following the instructional procedures, significant increases were observed in the attainment levels of the students both in the experimental group and in the control group. However, when the post-test scores of the students in the experimental group are compared with those in the control group, the attainment scores demonstrated in the experimental group were significantly higher than those demonstrated by the control group students. Therefore, it can be concluded that instruction using Classroom Assessment Techniques has a significant effect in enhancing the students' level of attainment. This finding is supported by the findings of previous studies which have also tested the effect of using Classroom Assessment Techniquesinteaching different subjects (Baleghizadeh and Zarghami 2014; Ashakiran and Deepthi 2013; Mansson 2013; Nartgun 2010; Nartgun and Uluman 2009; Cohen 2008; Goldstein 2007; Gaeddert 2003; Cottell and Harwood 1998). As for the results of the analysis of the qualitative data, 38 out of 40 students in the experimental group stated that instruction using Classroom Assessment Techniques had a positive effect on their learning. This finding is consistent with the findings of previous research (Nartgun 2010; Nartgun and Uluman 2009; Cottell and Harwood 1998).

CONCLUSION

The purpose of this study was to investigate the effect of the implementation of an instructional process using Classroom Assessment Techniques (CAT) on student teachers' understanding of the instructional methods presented in the Instructional Principles and Methods course. It also aimed to determine whether the use of Classroom Assessment Techniques during the instruction process made a contribution to students learning as measured by students' feedback.The comparison between the post-test scores of students in the experimental group and those in the control group revealed that students in theexperimental group demonstrated significantly higher scores than those in the control group. Qualitatively, 38 out of 40 students in the experimental group stated that instruction using Classroom Assessment Techniques had a positive effect on their learning.

RECOMMENDATIONS

Considering the findings of this study, the researchers recommend that Classroom Assessment Techniques should be used in different courses as well. Further investigation might include a study of the effect of other Classroom Assessment Techniques not used in the present study on students' attainment. Additionally, Classroom Assessment Techniques can be used and their efficacy can be tested for other units of the Instructional Principles and Methods course. Finally, the researcher suggests that Classroom Assessment Techniques should be used in higher education, particularly in the Measurement and Evaluation course and Instructional Principles and Methods course.

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