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Science Teaching/Learning Processes in Preservice Teacher Education: The De La Salle University-Manila Experience

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ABSTRACT

This exploratory study was an in-depth analysis of effective teaching and learning processes and strategies in the preservice teacher education program in science at De La Salle University - Manila for school year 1999-2000. Three groups of respondents were involved in the study: college faculty, cooperating teachers and student practicumers. Interviews and classroom observations were done to describe the level of competence on skills/values of the respondents and their views on science teaching and learning. Questionnaires were utilized to determine the extent to which the respondents have demonstrated the necessary skills, processes and strategies in teaching and learning science. Results indicated that the teaching processes employed by the college faculty and cooperating teachers have influenced the learning process of practicumers. Such influence was manifested through the observed teaching competence of the practicumers. Congruences between teaching skills, thinking skills, laboratory skills, scientific and teaching values, and concepts taught and learned were observed. A prevalent science teaching philosophy that involves guiding and facilitating students through integrating concepts, skills and values to actual life situations was likewise revealed. Consolidated survey ratings of teaching processes and strategies and classroom observations confirmed that this prevalent teaching philosophy is actually being practiced.

Keywords: preservice teachers, teaching process, learning process, science education

INTRODUCTION

In the 1996 National Conference on Research in Teacher Education held at the University of the Philippines, the dearth of research on pre-service programs in the country was underscored. Yet, preparing future teachers for basic science education remains a crucial task in the development of a nation. Thus, in the 2nd Science and Technology Education Plan (2001-2005) of the Science Education Institute of the Department of Science and Technology, conducting researches on the teaching processes of science and mathematics teachers was emphasized in an effort to upgrade teacher capabilities (SEI, 2000).

On a global perspective, science educators continue to convey the need for reforms in science education in an effort to promote a more critical scientific literacy (Bybee, 1997; Hodson, 1998). Such critical scientific literacy has been described as multi-dimensional and considered in terms of three major elements: (1) learning science, (2) learning about science and (3) doing science. On the other hand, Lawson (1995) stated that the major objectives of effective science teaching are to help students: (1) develop creative and critical thinking skills, (2) construct understanding of the major conceptual thought and (3) develop the self-confidence to pose questions and problems to seek answers and solutions.

In the Philippines, the articulation of the needs of science education in the preservice education programs for teachers in terms of content and skills was recently tackled during the 1998 National Science Education Congress held in the University of the Philippines (Ibe and Ogena, 1998). In an earlier study (Pedro, 1996), it was revealed that 74% - 100% of beginning and prospective teachers perceived lectures, exercises, discussion, problem solving, projects and homework as the most effective teaching methods in pre-service mathematics courses. Pedro also found that the 6-12 weeks period for the practicum was perceived as inadequate to improve the practicumer's teaching competencies. In student practicum, student teachers often adopt the classroom management style and attitudes of their cooperating teachers (McIntyre, 1984). It was not surprising that Pedro (1996) likewise reported that beginning and prospective teachers claimed that they teach the way their college instructors taught them. It was noted however, that none of the strategies used indicated the emerging transformative role of teachers as learning facilitators or navigators rather than transmitters of knowledge (De Guzman and Golla, 1998). Indeed it is a challenge for the college faculty, cooperating teachers and the practicumers to utilize the appropriate teaching and learning processes in order to produce quality educational outputs (EDRENET, 2002).

Cognizant of the dearth of research on preservice teacher education programs in the country, particularly on the teaching-learning processes and strategies, the Education Research Network (EDRENET) institutions conducted a study on the science and mathematics teaching and learning processes and strategies of faculty, cooperating teachers and student teachers. This in-depth study is part of a collaborative project among seven EDRENET-member institutions in Metropolitan Manila. It aimed to address the main problem: What are the effective teaching and learning processes/strategies employed in pre-service teacher education programs in science in De La Salle University-Manila? Specifically, the study sought to answer the following questions:

1. What are the perceived effective science/mathematics teaching processes and strategies being done by the science/mathematics education faculty and cooperating teachers
2. What are the perceived effective science learning processes and strategies being practiced by the practicumers?
3. What are the perceived effective science student teaching processes being practiced by the practicumers?
4. What are their perceptions on how practical work enhances concept development? teaching-learning skills? thinking skills? scientific values?
5. How does the teaching process of faculty and cooperating teachers influence the learning process of practicumers?
6. How does the learning process of practicumers influence their teaching competence?

Moreover, the study intends to document teaching-learning philosophies of science faculty and their students. Results of the study could be valuable to the faculty and administrators of the Science Education Department, College of Education, De La Salle

University-Manila (DLSU-Manila) as the data gathered here could provide baseline information for the improvement of science instruction and the preservice teacher education program of DLSU-Manila.

CONCEPTUAL FRAMEWORK

In the preservice teacher education programs, the faculty and cooperating teachers demonstrate their teaching skills, thinking skills and laboratory skills when they teach their lessons. Their teaching philosophies are reflected in their choice of teaching processes and strategies (McIntyre, D.J., 1984). These teaching processes of college faculty and cooperating teachers influence the practicumer's learning process, which consequently affect the practicumer's competencies in teaching, thinking and laboratory skills, demonstration of scientific and teaching values and in the acquisition of teaching philosophies (Fig. 1). In this study, *practicum* is the culminating integrative course which provides senior students the opportunities for observing and teaching classes in their area of specialization. On the other hand, *faculty* refers to the DLSU-Manila teacher handling science courses where student respondents have enrolled. While *practicumers* refer to preservice education students majoring in science who are undergoing teaching practicum and *cooperating teacher* refers to the classroom teacher in the class taught/observed by the practicumers.

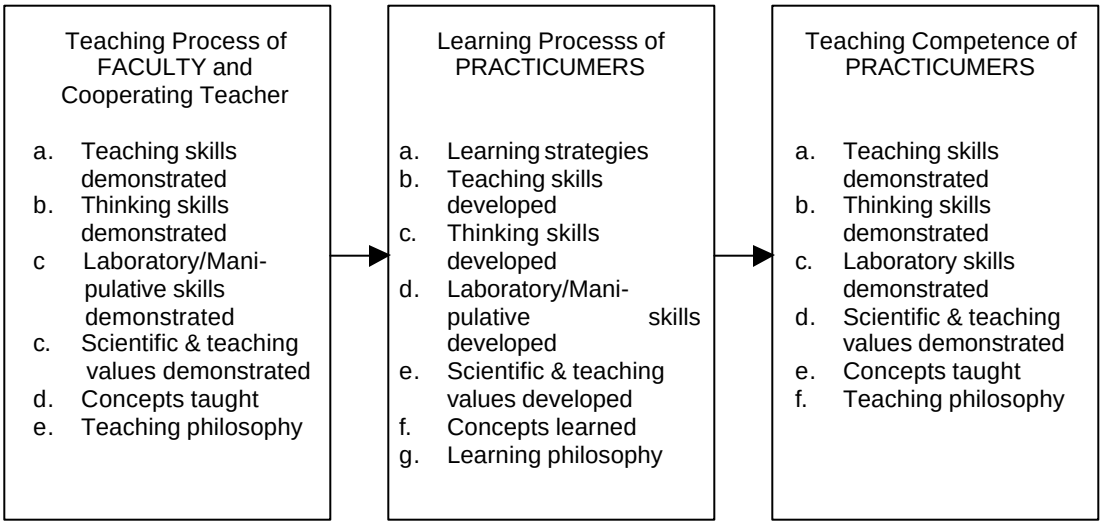

Figure 1. A Conceptual Framework on the Relationship of Teaching and Learning Processes and Strategies to Teaching Competencies of Practicumers.

METHODOLOGY

This study employed descriptive survey and case study methods and was conducted during the third trimester of school year 1999-2000. It was limited to two practicumers (P_1 and P_2), who constituted the total number of science majors enrolled in practicum for the term. It also included two of their cooperating teachers ($CT_1$and CT_2) and a faculty member of DLSU-Manila (F_1), whom the practicumers chose as the faculty who influenced them most in their teaching practices and beliefs. Both P_1 and P_2 are females and in their fourth year as BSE General Science/BS Biology students. While both $CT_1$and CT_2 graduated with the degree BSE major in General Science and minor in English and have taught Biology, Science 1 and Earth Science in the secondary level. However, CT_1 has 34 years of teaching experience while CT_2 has been teaching for a period of 10 years. On the other hand, F_1 has been teaching a variety of subjects in the tertiary level (*i.e.* Genetics, Physiology, Cell Biology, Bioresearch, Zoology and Parasitology) for the past 12 years. He is a medical doctor by profession, whose field of specialization is internal medicine.

Survey questionnaires focusing on teaching competencies were given to all respondents in order to determine their perceptions on effective science teaching processes and strategies. While to describe the teaching processes and philosophies demonstrated by both teacher and student respondents, classroom observations were done. Interviews were likewise conducted in order to confirm findings made based on the classroom observations. Responses culled from the survey questionnaires, interviews and data revealed from the classroom observations were interpreted and analyzed to establish possible influence of the teaching processes of faculty and cooperating teachers on the learning process and teaching competence of the practicumers. Means, frequencies and percentages were used to process the questionnaire data. Responses to the interview and open-ended questions were tallied, and the qualitative and quantitative data categorized, analyzed and interpreted.

RESULTS and DISCUSSION

Data on the effective teaching and learning processes and strategies in preservice teacher education at DLSU-Manila is presented as follows:

Effective Teaching Processes and Strategies

Table 1 presents the mean ratings (scale of 1=poor to 4=excellent) of the teaching processes and strategies demonstrated by the college faculty (F_1) and cooperating teachers (CT_1 and CT_2) as perceived by the practicumers and by the faculty and cooperating teachers themselves. It can be gathered that the demonstrated teaching skills, processes and strategies of F_1, CT_1 and CT_2 were rated very satisfactorily by the practicumers.

Table 1. Mean Ratings of Expected Teaching Skills, Processes and Strategies of F_1, CT_1 and CT_2.

Skills/Processes/ Strategies	F_1^*	F_1^{**}	CT_1^*	CT_1^{**}	CT_2^*	CT_2^{**}
Relates subject matter to previous topic/areas of interest	3.0	4.0	3.0	4.0	3.0	3.0
Uses methods appropriate for the attainment of objectives	3.0	4.0	4.0	4.0	4.0	4.0
Cites up-to-date information on the subject	3.0	4.0	3.0	4.0	3.0	3.0
Motivates, arouses and sustains the interest of the students	3.0	4.0	3.0	4.0	4.0	4.0
Presents the lessons systematically	3.0	4.0	3.0	4.0	3.0	3.0
Uses varied methods in teaching the lesson	3.0	3.5	4.0	4.0	4.0	4.0
Uses audiovisual aids/illustrations/multimedia to explain lesson	3.0	4.0	4.0	4.0	4.0	4.0
Encourages students to express their points of view	3.0	4.0	3.0	4.0	3.0	3.0
Maintains class discipline/order during laboratory work	3.0	4.0	4.0	4.0	4.0	4.0
Develops higher level of thinking in students	3.0	4.0	3.0	3.0	3.0	3.0
Maximizes the time for laboratory work	3.0	3.5	3.0	3.0	3.0	3.0
Handles/utilizes laboratory materials/equipment properly	3.0	4.0	3.0	4.0	3.0	3.0
Establishes safety precautions during laboratory work	3.0	3.5	3.0	4.0	4.0	4.0
Actively supervises student laboratory/practical activities	3.0	4.0	4.0	4.0	4.0	4.0
Comes to class promptly	3.0	4.0	3.0	4.0	4.0	4.0
Integrates scientific values in lessons	3.0	4.0	4.0	4.0	4.0	4.0
Is fair in dealing with students	3.0	4.0	3.0	4.0	4.0	3.0
Has mastery of the subject matter	3.0	4.0	3.0	4.0	3.0	4.0
Over-all Mean	**3.00**	**3.92**	**3.33**	**3.89**	**3.55**	**3.50**

**self-rating*
***as rated by practicumers*

College Faculty (F_1)

During class observations, F_1 got an average rating of 3.85 (Highly competent) and was observed to be applying teaching skills such as use of teaching aids, use of motivational activity, questioning skills and assessment skills. F_1 was asked to list examples of teaching skills he applies in class, and among those given were questioning skills, manipulative/procedural skills (*i.e.* manipulation of laboratory equipment), classroom management skills, skill on selecting and using appropriate teaching techniques (*i.e.* didactic lecture), thinking skills (*i.e.* use of analogies, analyzing and interpreting biological research data) and appropriate use of visual aids. Classroom observers noted that the questions asked by F_1 were both of low and high level types, with high level questions greater in number (87%) compared to the low level questions

(13%). Moreover, F_1 was observed to have answered very satisfactorily the students' questions. Regarding motivating students to learn science, F_1 cited the following activities he employs in motivating students to learn science: story-telling about his personal experiences as a medical doctor; use of films that are related to the topic; linking lessons to real life situations; giving students opportunities to reflect on their own experiences; reading assignments; field trips exposing students to the real world; use of slides, clippings and pictures; and conduct of research and laboratory experiments. When the practicumers were asked the same question, both P_1 and P_2 expressed that one of the motivating techniques their college teacher employed in making them effectively engaged in learning science/mathematics was through asking questions. This inquiry technique made thinking in class a continuous process, thereby keeping students engrossed in the learning process. It was also pointed out that the teacher's availability for consultation, where they could raise questions about the lesson, kept them motivated. Individual assistance seems to work here as a motivational strategy. The faculty member's enthusiasm in making the lessons interesting and his being fair in his dealings with the students were also considered to be motivating by the practicumers. Such perceptions seem indicative that the teacher's personality traits and attitude towards teaching have an effect on the student's interest in the learning process. Moreover, data gathered revealed that to ensure the practicumers learning of science concepts, F_1 made use of varied teaching aids, related lessons to everyday real life situations and by gave specific and concrete examples. On the teaching of science skills, F_1 gave the practicumers varied activities such as experiments, observation/exposure opportunities, and investigatory projects (where creativity is encouraged), problem-solving activities (as reflected in the exams and quiz given), and critiquing of research articles. These activities were perceived to have provided the practicumers the opportunity to put into practice the skills they had learned in class. As for the teaching of science values, F_1 was described by the practicumers as having integrated relevant values in their lessons by giving a detailed discussion and raising questions related to life problems. On human/material resources in the community utilized in teaching science, F_1 was asked to list three examples and the following were cited: models and specimens such as plants, animals, and medicines/drugs; resource speakers from relevant institutions and research agencies and research articles from science journals from the university library. Data on the same question gathered from both practicumers confirmed that the faculty indeed used models and specimens. Practicumers also added materials/equipment such as VHS, cassette, illustrations/posters and OHP transparencies used by F_1 in teaching science.

Cooperating Teachers

One of the Cooperating Teachers (CT_1) was given a rating of 3.75 (Highly Competent) in demonstrating teaching skills during the classroom observations, while CT_2 was rated 3.45 (Competent) (Fig. 2). Among the teaching skills demonstrated, the Cooperating Teachers were observed to be highly competent in demonstrating skills in the use of teaching aids, asking questions, and in motivational skills. As to the activities/strategies employed by CTs to help their students understand science/mathematics concepts, the number one activity that came out was experiments

or laboratory work. Other strategies employed were demonstration lessons, group work, giving reading assignments, use of varied visual aids, film shows and games. When the practicumers were asked about this matter, they validated the CTs answer regarding demonstration lessons and use of varied visual aids. Other strategies used by the CTs cited by both practicumers include giving examples, daily conferences, requiring and checking their lesson plans. According to the Cooperating Teachers (CT_1 and CT_2), the human/material resources in the community that they utilized most in teaching are as follows: actual specimen of living organisms (*i.e.* plants, animals, etc.), posters, charts, models, pictures, OHP transparencies and scientific journals, library, aquarium and garden. Practicumers (P_1 and P_2) were also asked to list the resources used by their CTs and their responses confirmed the answers given by the CTs. On helping students understand science skills, both CTs cited exposure to experiments as an important strategy. Giving examples, asking questions, giving explanations, practice exercises, observation activities, assignments, and making students prepare teaching aids were likewise cited. The practicumers also gave experiments as the strategy most used by their CTs to help them understand science skills. Both P_1 and P_2 also mentioned giving suggestions, checking their lesson plans, and serving as their model in the understanding of science skills. On helping their practicumers understand science/math values, both CTs said they usually gave situational analysis activities. Reminders, picture analysis, sharing stories, and giving assignments were also cited. Both practicumers confirmed the answers of the CTs to this question during the interviews and explained that the activities given to them included situational examples, application and integration of values in the lesson. Regarding the three important thinking skills emphasized in class, CT_1 cited the ability to think beyond the "what" of things, such that students are able to know the "why" and the "how" of things. On the other hand, CT_2 mentioned the interpretation and analysis of research data as well as the formulation of generalizations. It is also noteworthy that during the classroom observation, CT_1 was rated highly competent with the following thinking skills predominantly applied: observing, note taking, deductive reasoning, classifying, identifying relationship, defining key words, summarizing data and making hierarchical classification. On the other hand, CT_2 was given a less competent rating by the observer, however, competency on skills in observing and identifying relationships was demonstrated. Moreover, both CTs were noted to be highly competent in manipulative and procedural skills.

During the classroom observation, it was noted that although both CT_1 and CT_2 gave no wrong information during the class discussion. However, it was observed that CT_2 used the reference book verbatim in terms of formulating generalization of the concepts taught and which the class supposedly had learned. A constructivist perspective assumes that effective learning is self-regulated, that is, if a learner is better able to monitor the learning process, she will be able to control her own learning (Bernardo, 1998). In this case, since the students were not encouraged to express concepts learned in their own words, it is possible that effective learning may not have taken place.

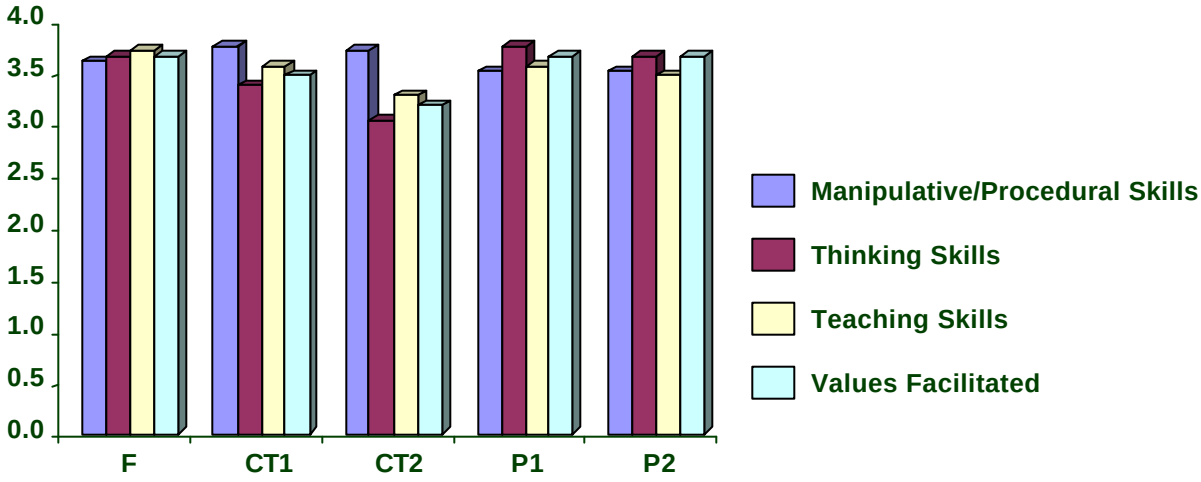

Fig. 2. Mean Ratings of Demonstrated Skills and Values of Faculty, Cooperating Teachers and Practicumers

The college faculty and cooperating teachers rated themselves satisfactory (3.0, 3.33 and 3.55, respectively). The self-ratings showed congruences with the very satisfactory ratings given by the practicumers. In particular, F_1, CT_1 and CT_2 were rated highly competent on the appropriateness of methods and audiovisual aids used in teaching, classroom management skills and ability to integrate scientific value in the lesson. While mastery of the subject matter by F_1, CT_1 and CT_2 was given very satisfactory rating. These results seem indicative of the practicumers' confidence in the content and pedagogical knowledge of F_1, CT_1 and CT_2. Similarly, F_1, CT_1 and CT_2 rated themselves satisfactorily on maximizing the time for laboratory work, which is consistent with the ratings given by the practicumers. It can also be gathered that the most important teaching skills used by F_1, CT_1 and CT_2 to help students understand concepts were: use of appropriate teaching aids, assessment skills and questioning skills. These teaching skills agree with those identified and described in earlier studies (Maeers,1997; Sovchik, 1996; Wilder, 1999) as necessary in effecting science learning. However, from the self-ratings obtained, it can be gleaned that developing thinking and processing skills appeared to be one of those skills less applied by F_1, CT_1 and CT_2 in their classes.

Learning Processes and Strategies of Practicumers

One of the questions asked in the interview with the practicumers dealt with how they were able to know that they had learned science concepts, skills, and values. Both P_1 and P_2 agreed that this happens when they could apply concept/s learned in class to actual and real life situations. This is an imperative goal of science teaching and learning – to enable students to be able to apply the knowledge of science to the world

around them. From this common response, it can be deduced that this particular science goal was effectively achieved as far as these two practicumers were concerned. Interestingly, P_1 indicated that she knew she had learned the concept when she was able to recall the concept even after a long period of time. Thus, her response pertains to the ontological understanding of the concept and being able to retain it in one's memory.

Practicumers' Views on Learning

During the interview, both practicumers were asked how they viewed science learning. Both P_1 and P_2 expressed that science learning is being able to apply the concepts in everyday life. It seems evident that science is perceived by both P_1 and P_2 as being relevant to their lives. It is likely that both practicumers were able to find the relationship/link between the study of science and their daily lives. As P_1 aptly wrote:

> "*Science learning is not just about understanding the concepts but appreciating and applying them to one's life.*"

Both P_1 and P_2 opined that the application of values learned in class to everyday life is the best way of knowing learned values. Likewise, on how laboratory/practical work helped the practicumers understand science concepts, the practicumer explained that through laboratory activities, abstract concepts become concrete and experience-based, because students are given the chance to explore.

Teaching Philosophies

1. Faculty and Cooperating Teachers - Interview with F1 revealed that science teaching was considered a venue for imparting important concepts that students can apply to practical life situations. He also considers it a fulfilling activity, where he derives a sense of contentment especially when he sees his students actually make the "*search of knowledge*" as one of their priorities in life. This view seems reflective of the teacher's clear grasp of what science teaching and learning is; that it is not just about concepts but more about the significance and application of these concepts in actual situations. Both CT_1 and CT_2 viewed science teaching as a responsibility and duty towards the attainment of a national goal, that is through having a scientific and technologically literate populace. These views most likely resulted from the in-service training, seminars and workshops they had both attended. They also believed that the success of the country depends greatly on the quality of science education. It seemed apparent that for both CTs, teaching science was less of a personal interest and more of a patriotic duty.

2. Practicumers - Both practicumers stated that good science teaching is not only based on the study of concepts but should include application of these concepts to daily life. This particular philosophy could be inferred to have been learned by P_1 and P_2 from the faculty member (F_1) and not from the CTs (CT_1 and CT_2). It is noteworthy that CT_1 and CT_2 did not have this view regarding science teaching. Interestingly, P_2 considers good science teaching as student-centered and opined that:

Good science teaching should allow students to learn the concepts by themselves with minimum assistance from the teachers. It is an exploration, a continuous learning as one should not be satisfied with what he/she knows.

Effective Teaching Processes and Strategies of Practicumers

Among the teaching skills learned by both practicumers (P_1 and P_2) from their most influential teacher (F_1), skills such as motivational activities, assessment and communication skills were cited. These data validated the findings presented earlier on the teaching skills most emphasized in class by F_1, CT_1 and CT_2. Thus, the teaching skills taught in the pre-service courses seemed to have been reinforced by both CTs. This is expected as it is in student-teaching (practicum) where student teachers (practicumers) are able to put into practice the theory/knowledge they have learned from the professional education courses. The field experience provided P_1 and P_2 the venues for actual application of the learning they had gained from their professional education classes.

Table 3. Demonstrated Skills/Values of Faculty, Cooperating Teachers and Practicumers.

Demonstrated Skills/Values	Faculty (F_1)	Cooperating Teachers (CT_1 and CT_2)	Practicumers (P_1 and P_2)
Manipulative/Procedural Skills	3.80	3.93*	3.70*
Thinking Skills	3.85	3.37*	3.90*
Teaching Skills	3.90	3.60*	3.70*
Values Facilitated	3.85	3.50*	3.85*
MEAN	**3.85**	**3.60***	**3.79***

*combined ratings

During classroom observations, the area researchers evaluated the level of competence of the student teachers on demonstration of teaching skills and a collective mean score of 3.70 was obtained (Table 3). This means that the practicumers were found to be "highly competent" in demonstrating teaching skills. Most of the teaching skills demonstrated were on the use of visual aids, questioning skills, and use of motivational activities (e.g. problems of real-life situations). On types of questions asked by the practicumers during classroom observation, there were more high level types of questions (83%) than low level types of questions (17%). The student teachers were also observed to have asked good motivational questions as the pupils reacted and raised some questions. In answering student questions, the practicumers were observed to have given satisfactory answers. While the area observers' ratings of practicumers' demonstration of thinking skills during the classroom visitation resulted in a mean score of 3.90. This means that the practicumers were found to be "highly competent" in this skill. The thinking skills observed to be mostly demonstrated were observing, note-taking, classifying, identifying relationships, defining keywords, becoming aware of the exact meaning, summarizing data, making hierarchical classifications and formulating hypotheses. A mean score of 3.70 was computed out of the ratings area researchers gave student teachers on level of competence in demonstrating laboratory skills. This finding reveals that the practicumers are "competent" as far as laboratory skills are concerned. Moreover, practicumers were observed to be "highly competent" in the demonstration of scientific and teaching values. They were rated favorably by the area observers, with a mean score of 3.85. Punctuality, accuracy and concern for others/environment were the values generally demonstrated.

Perceptions on Practical and Laboratory Work

A question on how practicumers find practical work as a teaching strategy was raised during the interview. Both practicumers' have positive perceptions on this teaching strategy. P_2 explained that practical and laboratory work will spare students from just sitting and listening to the teacher because through practical work, they can get themselves involved and actualize what they have learned. While P_1 expressed the opinion that practical/laboratory work encourages cooperation among the students as concepts are learned through "hands-on" experience.

When queried about the problems met during laboratory work, the CTs cited lack of materials as most pressing need. In an earlier study (Bernardo *et* al, 2000) on contexts and practices of science and math education in the Philippines, it was found that the most frequently mentioned problem in science education relate to availability of resources and materials for teaching-learning. Moreover, the practicumers disclosed that they improvised materials to answer this need; and sometimes the CTs purchased materials with their own money, hence adding more financial burden on their part.

SUMMARY

From the foregoing discussion, there are evidences that the teaching processes and strategies employed by the faculty and cooperating teachers influence the learning processes and strategies of practicumers as manifested by their demonstrated teaching skills and values (Table 3). Culled responses from the interviews conducted revealed that faculty respondents know they have taught science concepts when students can analyze and solve problems correctly ad apply the knowledge they have learned in actual life situations. Similarly, the practicumers believed that they know they have learned science they can apply the concepts to life situations. As for the skills, F_1 and CTs believed that they have taught it when students can work independently and perform accurately. Whereas practicumers shared that they know they have learned the skills when they can implement activities, manipulate instruments and evaluate results. On the other hand, the faculty and CTs know they have taught science values when students display/manifest these values in all their works/activities both inside and outside of the classroom. This prevailing perception was affirmed by the practicumers' collective belief that they have learned science values when they are able to practice and apply these values to everyday life.

On the science thinking skills emphasized in class, faculty and CTs claimed they have emphasized analyzing and evaluating skills. The practicumers likewise cited analyzing skills together with ability to reason as thinking skills they have learned. As for laboratory skills taught in class, F_1 and CTs elucidated that proper manipulation and utilization of instruments and equipment as well as following procedures were taught in their classes. This is in agreement with the practicumers' perception that measurement and manipulative skills, following procedures and manipulating models as the laboratory skills they have learned from the classes of F_1 and CTs.

Interestingly, the values integrated in class by the faculty were also cited by the practicumers. These values include honesty, open-mindedness, cooperation, accuracy and patience. On the other hand, the science concepts taught in class by the faculty were observed to be congruent with concepts cited by the practicumers as having learned from the faculty. It was also gathered from the interviews that the faculty respondents employ experiments, group discussion and games to ensure the understanding of the concepts. Aside from these pedagogical techniques, it is noteworthy that the practicumers cited the giving of examples as having facilitated in their learning of the concepts.

DRAWING IMPLICATIONS

The teaching processes and strategies that faculty and cooperating teachers said they have emphasized or those highly rated by practicumers were also the ones generally learned by the practicumers based on their self-reports. Consequently, among the learning process of practicumers that influenced their teaching competence were use of teaching aids, motivational activities, experiments and laboratory skills. The

results obtained in this in-depth study suggest certain directions in preservice teacher education especially for practicum and for interactions of college faculty with cooperating teachers and practicumers. In the light of pressent findings, DLSU-Manila through its Science Education Department and Preservice Extension Programs should endeavor to strengthen teaching skills, processes and strategies among its faculty and cooperating teachers. Updating of faculty and cooperating teachers on recent learning-teaching theories such as constructivism for concept acquisition and development is also encouraged. The need to provide harmonization on the science content and teaching, thinking and laboratory skills, values and philosophies of faculty and cooperating teachers through formal and informal interchanges to revitalize the practicum course is also recognized.

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