IMPROVING PROFESSIONAL SKILLS OF PRACTITIONERS BY CONSTRUCTING AN EFFECTIVE APPROACH IN SCIENCE TEACHING*

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ABSTRACT
This study has been made to construct a different effective approach in science teaching by implementing cooperative learning and discussion to increase achievement in science teaching/learning and improve professionals' skills of practitioners in pre-service teacher education. This approach indicates that as teachers know their students well especially regarding cognitive skills, affective domain, and level of achievement, they can separate their students into three groups, the first of which is presenter responsible for discussing theoretical section, the second of which is project responsible for developing science activities related each unit, and the third of which is implementer responsible for practicing developed activities in front of all class and the evaluation of those activities by all practitioners regarding level of applicability, convenienceness, and efficiency. A valuable aspect of this approach was that it reflected an effective way to increase level of achievement in science teaching/learning by means of giving inspiration through developed activities and implementation and evaluation of them in interactional classroom atmosphere offering practititoners the chance to elicit ideas about effective science teaching/learning in their own practice in science teaching lesson before actual practice in school. This approach ensures the practitioners many kinds of opportunities thorough emerged specific references, regarding learner participation, learner relationships, teaching methods and the use of teaching aids by improving social skills participating cooperative learning groups and discussing and evaluating developed activities. The article concludes by discussing the contribution to presented approach with regard to increasing achievement in science teaching and improving professional skills of practitioners and by giving some suggestions for further research.

INTRODUCTION

As knowledge is not completely transferable by the way recording documents, teaching and learning process must be managed in an effective classroom atmosphere in science teaching (Ovens, 1999). Furthermore, there are no formulations to arrange rules and standards to prompt teacher for professional development and no pre-defined parameters' results which can be suitable for all kinds of situations. So, professional development doesn't involve a formulated plan of skill improvement, but includes approval circumstances which are experienced in advance to be evolving (Holly, 1989) In this regard, student teachers need to know requirements and act accordingly in order to meet the complex demands of preparing their students in profession for the 21 st century. It is emphasized that all teachers could have an ability to become competent and some of them, proficient; but a few of them would become expert (Eisenhart & Behm, 1991). Therefore, pre-service teacher education programs need to be given crucial importance to prepare student teachers for actual world in profession. Hovewer, it is drawn out by both student teachers have insufficient basic knowledge of convenient strategies to make effective decisions about teaching and could have not the necessary information of what they need to know about activities in relation to science teaching (Eisenhart & Behm, 1991).

Students could develop their cognitive and affective domain and individual critical thinking competences by means of cooperative learning (Slavin, 1987). They could have more concious for improving their practice teaching in class when they set regular interaction with peers about their own cooperative learning. They need to be preserved for improving their professional skills' level and reach sufficient level until finishing pre-service teacher education. However, student teachers emphasize that they do not implement profoundly the application activities during teaching practice because of the limitations of the process, especially regarding time (Saka, 2001). Besides, it is drawn out that this situation requires giving importance to the practicing practice science teaching rather than informing the practitioners throughout the application activities in science teaching/learning. Hence, practicing much more practice in science teaching during pre-service education have crucial role to improve professional skills of practitioners. In order to maximize the efficiency of collaborative efforts, stronger linkages and more on-going suppuration between trainers and practitioners at the boundaries of higher education system need to also fastidiously be constructed and sustained. So, student teachers begin to recognize the need for various forms of alignment related to professional skills development.

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It is indicated that elementary teachers need to be aware of the effectiveness of hands-on activities and implementing cooperative learning from their pre-service education program but enable to develop science context from the activities (Tobin et all, 1994). Elementary teachers perceive their role in elementary science as dispenser of facts to transmit a body of knowledge. Hands-on activities are believed to be the best way for science learning. Practitioners discover their own capacity in science learning even go further than they aim. Teachers indicate that science teaching and learning process need to be constructed with the student-centered activities such as engaging hands-on activities, participating actively in learning science, gaining meaningful knowledge, improving positive attitudes about science learning (Levitt, 2002). When hands-on activities orientated by teacher to develop of practitioners implemented in class, students could get through the steps of the activities more effectively during the science teaching lesson by observing all class. Teachers are not generally effective to contribute to students' learning in terms of constructing knowledge and integrating it to practise especially in science learning. And also, they indicate that teachers are not able to constitute right balance between directed learning process of students and giving them responsibilities for learning themselves (Lunenberg & Korthagen, 2003).

One of the major purposes of the study is to construct a different effective model in science teaching by the way implementing cooperative learning and discussion to increase achievement in science teaching/learning and improving professional skills of practitioners in pre-service teacher education. The structure of this study is as follows. In the next section, it is described the conceptual framework of the developed approach in this study. Then, the article is concluded with the discussion and conclusions section.

CONCEPTUAL FRAMEWORK

It is stated that teacher educators teach their students according to traditional methods. In this regard, it emerges the question of what the situation is today. To construct remarkable educational implementation in teacher education, it is necessary to "break this circle" in terms of avoiding preparing the students of pre-service teacher education for profession traditionally. In this regard, this study offers a basis approach for argument and persuasion to improve further professional development in the quality of science education. Having developed professional skills is not very sufficient for some but others use insights and framework as learning resources. Considering how we can constitute an approach for science teachers in schools to support and develop their teaching and social abilities, the framework needs to indicate especially these points:

► How can our in-service teacher education program connect to what science teacher should do in their classroom?
►The desired change is seen ultimately in terms of better or more effective learning environments for students.
► How can we help them about evaluating their own progress and constitute establish future learning goals based on this self-assessments?
► How do teachers see their own responsibility?
► How can we make effective our science teaching?
► How can we improve student learning?
► What are more effective teaching techniques?
► How do we have students and teachers want to implement in new methods?

There is an agreement with the effectiveness of collaborative approaches for professional development in teacher education (Stalings, 1989). Interaction with their peers could make a significant contribution to the quality of the science teaching/learning and professional skills improvement of students (Hayes, 1997). In this regard, teachers point out effective participation of students in learning science and applying hands-on science activities and discussions have remarkable contribution to expected achievement in science learning (Levitt, 2002). Students' responsibility is to be engaged and responsible for their own learning in science. Student-directed learning activities could provide improving students' enthusiasm and competences to continue learning (Eisenhardt et. al., 1988). Hence, when students engage in learning science activities, their teachers could observe them to examine and orientate their practice. Constructing change in classroom practice could evolve of teachers' beliefs. As teachers' beliefs about science teaching and learning are confirmed and determined, professional skills development of students could be improved more successfully in terms of providing remarkable changes (Levitt, 2002). Therefore, science educators must orientate their students for discussion, argumentation, social negotiation, and cooperative learning to improve remarkably students' learning (Springer, Stanne & Danovan, 1999). This approach which involves cooperative learning and discussion for implementing in science teaching/learning could provide the more opportunity for the student teachers by means of learning by teaching, learning by doing, learning by collaborating (Hammond, 1994). This approach could also guide student teachers in terms of gaining motivation related to their own individual professional development. Because, learning orientations could motivate students toward individual interest. Implementing this approach

by teacher educators has close relationship with the orientation of the student teachers. Therefore, it is drawn out that this process could broaden their mental model of learning (Lunenberg & Korthagen, 2003).

Process: This study is presenting a new approach that widely prevailing model of science teaching. The development of the approach involves the following steps:
1) Explaining the conceptual framework of the process.
2) Grouping process (defining and selecting the presenter, the project, and the implementer group and determining their roles and responsibilities).
3) Observing and recording the performance of practitioners (as presenter and implementer group and collecting the documents of developed science activities of project group).
4) Analysing the recorded observations for evaluating (using documents and teaching materials to identify and describe features of effective instructional and classroom settings).

Following is a brief explanation of each step:
1) ***Explaining The Conceptual Framework of The Process.*** Many countries face to improve science education. Having prepared to teach well emphasized gaining of the fairly sophisticated cognitive and pedagogical concepts and skills (Eisenhart & Behm, 1991). Teacher educators could make explanation to practitioner that how they are to participate, what is to be evaluated in this process. This approach has overall goals when compared with usual in terms of providing practical experiences and opportunities for integration subject matter in a classroom teaching experience and preparation practitioners further, both personally and professionally, to reflect their roles as science teachers. It is necessary to establish co-operative and competitive atmosphere in grouping process. In this approach, trainee could elaborately settle in a large extent on task routines of practitioners and on careful arrangement of the learning situations for being effective in teaching.

- Practitioners know how to work together strong students interact peers and help each other during developing science activities.
- The learning conditions need to be well organized.
- In this process, teacher educators need to have sufficient skills to orientate their students for especially constructing cooperative learning environment.
- However, this approach could be used in the context of the science teaching lessons which second term of the continuining two terms. Because, in order to implement this approach, teacher educators need to know their students well regarding cognitive skills, affective domain, and achievement level. They could have known their students at least one semester during the first part of the science teaching.
- In this process, it has crucial importance to identify roles, responsibilities, sequences, and "who is going to do what ", student strengths, weaknesses, and special needs.
-This process facilitates their progression with full details.
- As a result of their collaboration, instructional continuity results in more efficacious outcomes regarding practitioners.
- All of the practitioners in this science teaching/learning approach responsible for preparing their own "experiment diary" by paying attention to the this different teaching/learning process comparing usual one.

2) ***Grouping Process.***
- Teacher educator could select project group members among science education students which have sufficient cognitive skills and affective domain according to their ability in learning science in terms of participating learning process actively and gaining expected achievement in first part of the science teaching.
- The selected project group needs to be capable of establishing effective routines and procedures which allow them to successfully develop science activities task.
- Similarly, it is important to determine the number of the project group as activity developer.
- When project group is selected, it is necessary to give importance to the features of them in terms of providing continuous and consistent high achievement within this group.
- Project group could consist of fourteen or fifteen students to develop science activities and will engage in improving new skills in science learning/teaching and heterogeneity is required within the all group.
- Teacher educator gives responsibility to the members of project group for developing science activities related to the each unit during the second part of the science teaching process.
- Implementer group could be constituted from the rest of the students of the class when project group selected to practice developed science activities.
- And, implementer group is responsible for improvement at least one science activities from the unit they are assigned to.
- To present theoretical section of the each science teaching unit in class, it is also necessary to establish another group which is defined as presenter group and its member the same as the implementer group.

- When presenter group member who is responsible to teach related unit is discussing in class, teacher educator could give some critical focusing questions when necessary to presenter by writing on a small paper for enriching and underpinning the learning and teaching process in science.
- But, presenter group number has sequentially in inverse rotation with the implementer group number to take responsibility in class.
- While theoretical section of each related unit is being discussed in class, project group will be engaged in developing science activities out of class in laboratory related to the next unit in ongoing learning process.
- Before, developing science activities, project group members are responsible for studying by recording important points on their notebook related to the unit in which they will develop activities.
- A research assistant is assigned for project group to guide them when they need and control their study record.
- Presenter group discuss related science teaching unit in theoretical section of science teaching lesson in class rotationally between groups according to the order of the group on going process.
- Presenter group explains the unit it is responsible to discuss it in class with critical questions.
- Then, developed activities by project group are practiced by implementer group member in the following practice section of science teaching lesson.
- Project group members could split into 4 or 5 groups and each group involves 3 or 4 students.
- When group members plans to develop 5 or 6 activities they form groups among themselves according to account of the activities in each unit during the ongoing process.
- Teacher educator also chooses 4 students within project group to be group leader according to effectiveness and achievement level during first part of the science teaching.
- Each group leader who is responsible for the achievement of the each small group is orientated by teacher educators to participate and motivate each small group while they are developing science activities.
- Group leaders assign tasks in which students play a different role and the product requires the integration of the individual contribution to cooperative teaching/learning process.
- Each small group has one strong leader and there could have at least also two stronger leaders are selected among the leaders to be in charge of all project group.
- Teacher educator could give responsibility to project group and they share responsibility among each small group according to necessity of developed activities.
- Each group develops 1 activity and group leaders collect and arranged them.
- The group leaders will give the copies to the selected leaders who will duplicate them to give one copy to the teacher educator and the other to the presenter group for implementing in class.
- After implementer group member practiced each activities in class, they need to be evaluated by all class to have given the last modified format them in collaboration.
- The leaders of this project group are responsible for giving developed activities to implementer group 2 or 3 days before the next implementation lesson in science teaching.
- Implementer group consists of 3 or 4 students but, two of them will take more active role to practice developed activities in classroom.
- Each two members take active role practicing 2 activities by sharing 6.
- Each two of the other members take passive role practicing 1 activity they developed themselves.
- When presenter group member takes active role during the implementation section of science teaching, they will get passive role in theoretical section of science lesson by not taking responsibility to prepare conceptual instruction.
- When each of two presenter group members get passive role during the apply section of science teaching by practicing only 1 developed activities in class, they can get active role in the section of conceptual instruction of science teaching lesson in classroom.
- Then, next responsible implementer group member goes on practicing next developed activities by project group and the process could continue in this order rotationally.
- Implementer and presenter group members are responsible for studying sequentially the related theoretical unit which will be discussed in class and practiced developed activities by means of preparing special report and giving it to teacher educators week by week.
- With this task distribution of group members develop activities practice during the process.

3) ***Observing and Recording the Performance of Practitioners.***
- After each developed science activities is practiced by the member of implementer group, all the activities could be evaluated by whole class that also includes the project group regarding effectiveness, convenience to curriculum, relevancies with the units and applicability, and degree of difficulty.

4) ***Analyzing the Recorded Observations for Evaluating.*** In this process, when presenter group members apply developed activities, it makes meaningful contribution to improve professional skills of practitioners regarding peer teaching. It is emphasized that this process provides open ended non threatening learning and teaching

atmosphere and encourage brain storming of practitioners (Moshe & Pinchas, 1991). The collected documents could be used to support the process of analysis to find out considered individualized instruction for practitioners. Task analysis of the instructional science activities are included in the developed teaching materials could be evaluated by discussion. After implementing them in classroom, it is indicated that this kind of assessment of the activities and instruction could stimulate remarkably different students' motivation and interest, the expected cognitive and affective abilities for necessary task related to learning (Moshe & Pinchas, 1991).

The process includes the followings:

- They could be informed about personal strengths and weakness (For example; how do they conceive this case?, do they like these behavior patterns?, do they agree about the theories?, can they use successfully the recommended strategies in classrooms?)
- Refocusing developed activities during classroom practice upon gains in student understanding, reasoning, applicability and learning retention.
- Redesigning learning and teaching activities to engage practitioners in their own teaching and to give feedback to teacher educators.
- Developed activities tested in classroom by implementer group regarding applicability, convenience for curriculum and relevance with unit could create higher retention for science education.
- So, developed activities need to be evaluated step by step rethinking and focusing on them for enriching perspectives of practitioners on science teaching/learning.
- It is clear that working out the practical implications of the developed activities in this process, improvement, and assessment of the science activities takes time and engagement and experimentation.
- And, the evaluation of the developed activities in terms of measuring what the value of difficulty and labeled in collaboration is necessary.
- This process could ensure practitioners to clarify what exactly it is that you want students to learn in science teaching.
- Teacher educators in this approach undertake a serious role by participating in all phases as a co-evaluator, director, coach, supporter, reflector, controller, and supervisor.
- Science teaching process must be elaborately evaluated with respect to experiment diary records of practitioners.

We have presented information about stages of the process regarding grouping, orientation, planning and evaluation related to teaching and learning expectations regarding behavior management, teaching methods, roles and responsibilities (e.g., see Appendix A. for grouping process and see Appendix B. for clarifying of the dimensions of the implementation process).

DISCUSSION AND CONCLUSIONS

The emphasis of this paper lies on the construction of what could be done while applying the cooperative learning and discussion in science teaching in the ligth of the conceptual framework of developed approach. In order to construct effective student-directed learning in pre-service teacher education, teacher educators must orientate student teachers to gain a more realistic self-image and to have more self-confident in their profession (Lunenberg & Korthagen, 2003). It is emphasized that majority of elementary education program does not provide sufficient competency in science teaching of their students (Moore and Watson 1999). And also these programs are not able to improve enough self confidence in science either. Researchers point out that science teaching methods have remarkable impact on improving self-confidence and positive self-efficacy in terms of providing professional skills development of students (Palmer, 2002). Such as Jarrett (1999) point out that an inquiry-based science teaching methods improve both interest and confidence with respect to teaching science. Besides, some researchers point out that teaching methods including hands-on experience, peer teaching and tutoring develop students' self-confidence in terms of gaining professional skills especially in science teaching (Butts, Koballa & Elliot, 1997).

As teacher education programs do not meet expectations of practitioners at sufficient level, they could be defined to use of former decisions as a guide to present actions when practitioners teach in their classroom settings, student teachers treat as unworthy of notice during pre-service education especially teaching practice process (Eisenhart & Behm, 1991). Having lack of confidence in science teaching could be stated as consequences of gaining insufficient experiences teaching science with different methods. This also explains the situation of having provided students with didactic approaches rather than inquiry based activities in their classroom practice in science teaching during their pre-service teacher education (Bencze & Hodson, 1999). Therefore, it is drawn out that teacher education programs must establish the student teachers "quick fixed" (Eisenhart, et.al., p.13) activities related to the learning to teach. Being informed about the complexity of the teaching circumstances could provide practitioners to improve their professional skills while gaining actual

teaching practice experiences. When practitioners confront this kind of situations during teaching practice or the first years of profession, they need to have had experiences to prepare plan, implement and reflect on application of alternative teaching methods in pre-service education (Eisenhart et.al.). It could be explained that this study is presenting a productive process to build upon the practitioners' needs by means of focusing on the perception and reflection of individual and cooperative learning to teach with respect to being successful in science learning/teaching and improving professional skills of practitioners. This process points out a different approach in science teaching to design a transitional stage in constructing effective professional growth of student teachers during pre-service teacher education.

Student teachers need to become more aware of the personal practical teaching models that shape their classroom practice (Tabachnick & Zeichner, 1999). Hence, student teachers want to give more attention to their individual professional skill development than teacher educators supported (Lunenberg & Korthagen, 2003). So, they could have conscious of recognizing all of the situations related to their practice are externally produced and they have sufficient knowledge that emerges to improve their practice teaching (Tabachnick & Zeichner, 1999). Therefore, they could plan and prepare work for the forthcoming practice. This process could help practitioners construct their own personal style of teaching and stimulate reflection on personal style and professional skills development. Morrisey (1981) indicates that to construct effective science teaching in pre-service teacher education, practicing practice teaching, student-centered approaches, and process approaches could have remarkable positive contribution to students' attitudes. When the science teaching methods focus on the inquiry or other student-centered approaches such as cooperative learning and discussion in pre-service education program, students could improve their own professional skills especially in teaching science. Besides, researchers indicate that many elementary teacher education program have tendency to apply different kinds of teaching methods in science teaching especially such as cooperative learning, discovery, student-centered and teacher as a guide (Palmer, 2002).

Student teachers would expect to develop a basis conceptual understanding of what they would do when teaching science. This process could provide avoiding dead time by establishing an effective and efficient learning environment. It is pointed out that this process could emerge precious effort and motivation for practitioners in science teaching/learning by the way differentiating teaching in terms of applying cooperative teaching and discussion together (Moshe & Pinchas, 1991). This process could be seen as an important source of inspiration for practitioners with respect to both providing achievement in science learning and professional growth. In this regard, it is emphasized that teacher educators could inform their student teachers to reflect elaborately and properly on different aspects of the experiences in profession (Lunenberg & Korthagen, 2003). Clear reflection on the criteria for successful inquiry could ensure more effective teaching competences (Toth, Suthers & Lesgold, 2002). Besides, reflection involves sharing practitioners' own ideas, listening and responding to someone else's ideas, listening to colleagues' responses to their ideas, and trying to integrate these into their thinking. In this regard, reflective teaching has meaningful positive affection in improving professional skills of practitioners (Wubbels & Korthagen, 1990). But, it is indicated that this reflective process need to be constructed at the early stage of pre-service training to establish a baseline for future development in profession (Moshe & Pinchas, 1991). Hence, effectiveness of reflection for learning experiences of practitioners could be increased throughout endeavoring more collaboratively. It is pointed out that when student teachers applied more routine activities in teaching such as cooperating teaching/learning they do not need to consider deeply what they are doing in classroom setting and how to construct their teaching style (Wubbels & Korthagen, 1990). The performance or competency orientations of students could be seen learning situations as normative implementations which involves comparing one's performers with others' and gathering the differences to competency. This process could have positive impact to sharpen teachers' reasoning potentials and facilitates the improvement of the disposition to self-monitor one's practice teaching in science during their preservice teacher education.

When students participate in cooperative learning, they improve their professional skills in terms of peer teaching and have conscious understanding of cooperation (Slavin, 1987). Practitioners could improve their social skills working cooperatively. This approach also provide them to increase self-confidence, to establish face to face interaction in group and between groups, and to encourage their motivation (Veenman, Benthu, Bootsma, Dieren, & Kemp, 2002). Hillkirk (1991) explained that as cooperative learning experiences provides student teachers valuable opportunity to improve their professional skills than usual and to reflect and colloborate on the cooperative skills required to help their own students in the future. Being in the circumstances of lively, empathic, affirming, interactional and critical friendship with peers can extremely improve sense of mutual encouragement (Ovens, 1999). Thus, this process can emerge unexpected professional development. Taking the rapid changes in teacher education into account and the consequences of these changes for the task of teacher educators, this approach would be remarkably positive. In this process, interaction among

practitioners by means of causal relationships while trying to develop science activities and taking responsibility to practice those activities or discussing theoretical section of related unit in class could make meaningful contribution to improvement their professional skills in terms of social skills and achievement level in science learning and teaching.

Recent science standards indicate the effectiveness of the training students learning to engage in authentic scientific inquiry. In order to reach this aim, students need to participate in authentic inquiry activities. In this regard, schools orientate students in scientific inquiry task which involves hands-on activities has remarkable effect to provide reasoning scientifically learning science (Chinn & Malhotra, 2002). The effectiveness of presented approach for teaching science, the hands-on developed science activities, opportunities to ask questions to teacher educator, working cooperatively in groups, and social skills of group members have crucial impact on contributing to improve professional skills of practitioners in teaching science. Practitioners could apply hands-on activities; dramatizations, and demonstrations, presenter modeled how to teach science by pretending as an elementary teacher to improve their own professional skills. Therefore, it is possible that this process could provide vicarious experiences for practitioners in terms of working cooperatively, having interaction by the way discussion and reflecting science teaching skills of all practitioners by means of sharing each others' experiences. Besides, this process could be also improve academic outcomes among practitioners in science teaching and learning by the way undermining and sustaining communication and sharing and interacting experiences (Trent, Driver, Wood, Parrot, Martin & Smith, 2003).

We claim that this process helps to improve accordance and efficiency of classroom activities science teaching/learning skills of practitioners. Because, the process allows both teachers and practitioners to monitor gains in the process of science teaching/learning as well as their outcomes. This process could ensure practitioners to gain active knowledge in science teaching/learning in terms of understanding, reasoning and utilization of developed activities. It is indicated that when practitioners attempt to elicit their knowledge, experience and skills by the way cooperative teaching/learning and discussion, this process has very remarkable contribution to construct mutually acceptable benefit and when necessary, allowed practitioners to decrease misunderstandings of teaching (Trent et.al., 2003). It provides practitioners mutually satisfying co-teaching relationship about science teaching/learning by the way discovering, sharing, and testing each other's assessment ideas. Moreover, practitioners could have an opportunity to try to recognize their own problems in science teaching. Then, they could make some kinds of brainstorming and foreseeing of limitations to overcome. It could be expected from them to be thinkers, decision makers, be able to cope with the constrains themselves. Thus, this process could be seen as a part of professional development.

This approach ensures practitioners more efficiency and reflective instruments of science teaching/learning gains. In this regard, current science education reforms need to have elaborate preparation to construct purposeful practice in science teaching for practitioners (Levitt,2002). Besides, teacher educators must obtain necessary knowledge how to apply differential approaches and construct them in classroom settings to orientate students in science teaching to provide utmost profit for their professional growth during preservice teacher education program, if we are to develop the quality of science teaching in elementary schools. In the light of this study, it is necessary to examine how to help science teaching students acquire better understanding of science teaching and learning for having remarkable contribution to professional growth of practitioners during their pre-service teacher education by means of developing such differential teaching approach in science. However, it could be examined for future research is that what institutional evaluation instruments would be developed to elicit and measure what practitioners gain from various aspect of this process. When effectiveness of this approach needs to be determined, it could be focused on what practitioners have gained from particular aspects of science teaching/learning by the way developed activities besides professional skills development.

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Appendix A. Grouping Process

Science Teaching-I (first term)	50 students (participants)	selected 14-15 active students (end of the term) considering the cognitive skills and affective domain		
Science Teaching-II (second term)				
Project Group (do not participate theoretical section)	14-15 students	working collaborately in lab for developing at least 4 or 5 science activities in relation to each unit Sequentially according to material and give them to the implementer group for practicing in class and being evaluated them by all class		separate 4 or 5 group select group leaders for each one and select two of strongest ones to become real leaders
Presenter Group	35-36 students (Rest of the class)	responsible for discussing the theoretical section of science teaching		separate 12 groups (the same member as implementer group)
taking responsibility of each group in ordering			**Group:**	1, 2, 3, ...10, 11, 12
Implementer Group	35-36 students (Rest of class)	responsible for practicing developed activities		separate 12 groups (the same member as Implementer group)
taking responsibility of each group in ordering			**Group:**	1, 2, 3, ...10, 11, 12

Appendix B. Dimensions of the Implementation Process

Science Teaching-II ***in Theoretical Section*** ***in Laboratory*** ***in Application section***

The role of groups **presenter** **project** **implementer**

week 1. ***group:1.*** (1 + 2) students → take passive role by not to presenting subject; takes active role by discussing related subject

4 or 5 developed activities

group:12.(2 +1) developed extra 1 activity → (2 students) take active role each one implement two activities; takes passive role (1 student) implement 1 activity

When each group member ----take active role in presenting ----they will take passive role in implementing.

With this manner,

When each group member--- take passive role in presenting ----they will take active role in implementing.

(All this process -----will be done in reverse rotation)

week 2. ***group:2.*** (1 + 2) students → take passive role; takes active role by discussing related subject

4 or 5 developed activities

group:12.(2 +1) developed extra 1 activity → (2 students) take active role each one implement two activites; takes passive role (1 student) implement 1 activity

week 3. *group: 3.* (1+2) — *group: 10.* (2+1)
week 4. *group: 4.* (1+2) — *group: 9.* (2+1)
week 5. *group: 5.* (1+2) — *group: 8.* (2+1)
. . .
. . .
. . .
week 11. *group: 11.* (1+2) → take passive role; takes active role — *group: 2.* (2+1) → (2 students) take active role; takes passive role

week 12. *group: 12.* (1+2) — *group: 1.* (2+1)