

Analysis of Preservice Elementary Teachers' Lesson Plans

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ABSTRACT

The purpose of this study is to analyze lesson plans from third to sixth grades of science and to find out teaching strategies in respects of learning functions provided by preservice elementary teachers in education university. On the whole, to control students' learning process preservice teachers used more shared-regulation strategy than strong teacher-regulation one. Teaching activities for regulative learning function were most used in strategy of strong teacher-regulation, and in strategy of shared-regulation those for cognitive learning functions were most used. But teaching activities for affective learning functions were used a little considered in both teaching strategies. In introduction step of instruction, affective and regulative learning functions were more instructed by strong teacher-regulation strategy and cognitive learning functions were more instructed by shared-regulation strategy. The affective, cognitive, and regulative learning functions were largely planned by shared-regulation teaching strategy in development. The regulative learning functions were planned by strong teacher-regulation strategy than by shared-regulation strategy and affective learning functions were considered a little bit in consolidation. There was a tendency that strong teacherregulation strategy was increased in lessons for fifth and sixth grade.

Key words: lesson plans, preservice elementary teachers, learning functions, strong teacher-regulation, shared-regulation

I. Introduction

In recent views of constructivism, the learning is considered as an active process. New knowledge is constructed by individuals as sensory data are given meaning in terms of prior knowledge. Learning is also an interactive process, involving constructions of individuals and social collaboration (Marin *et al.*, 2000). Knowledge is created through social interaction as individuals test the fitness or usefulness of their conceptual understandings in interactions with others and in the context in which the knowledge is applied (Hodson & Hodson, 1998).

Therefore, constructivist views on learning are different from traditional learning views which focused on transferring information from the teacher to the learner who is seen as an empty vessel to be filled with knowledge. According to appearing new views on learning, the role of teaching has been changed from transmission of knowledge to supporting and guiding construction of knowledge (Vermunt & Verloop, 1999). Considering in this respect, teachers' efforts and teaching strategies focused on provoking students' knowledge construction have to

be designed. The idea that practices and theories of teaching should be based on knowledge and theories of how students learn can already be found in Gagne's work (Gagne, 1970). Glaser (1991) also emphasized this view in teaching science, and Shuell (1993) also highlighted integration of both teaching and learning theories. As considering the above mentioned, teaching effects will be maximized when teachers' teaching activities are matched with students' learning activities. It also means that teachers should make lesson plans giving special attention to the joint effects of teaching and learning. The lesson plans are very important in appropriate teaching and effective learning (Reigeluth, 1999). In lesson plans, generally teachers plan to teach content by using what kind of procedure and method (Lee, 2002).

Even though teaching is not entirely worked out according to a lesson plan in classroom, teachers base considerable parts of teaching on their lesson plans. In case of preservice teachers in educational university, they will make lesson plans according to good teaching practices they have learned in university.

Analysis of the science lesson plans made teachers or preservice teachers can give information of their teaching style. For example, if it is analyzed the learning tasks, questions, assignments, and exam questions that teachers offer to students in respects of the learning functions, it can be found out that these tasks are whether one-sided or not, and also the reflection degree of students' need. Consequently this analysis on lesson plans can be very helpful for transition their teaching styles from strong teacher-regulation to shared-regulation. It is also very useful for evaluate preservice teachers' teaching practices, because it reflects how they understand about science teaching and learning. In prior research (Pate, 1991) analyzing lesson plans was very helpful in determining improvement of teaching strategies. Therefore, the analysis of what strategies are used by preservice teachers in lesson plans can give insights of present and future teacher education.

The purpose of this study is to find out what teaching activities and strategies were used to design lesson plans of science by preservice elementary teachers and to see what tendencies in their plan shown at the grade level of science lessons. In this article, the frame for analyzing the types of teaching strategies is based on view of constructive teaching activities and learning functions. In addition, the implications for elementary teacher education are discussed.

II. Theoretical Background

When learning is conceived more as self-regulated knowledge construction than as taking in already existing external knowledge, the object of teachers' efforts have to focus on the processes of students' knowledge construction. This calls for theories of teaching that are firmly based on an analysis of student learning processes (Duffy *et al.*, 1993; Brown, 1994; De Corte, 1995). The literature on student learning is extensive, and different researchers use different concepts for similar or partly overlapping learning activities. As a whole, many researchers classified common elements of learning components into three types of learning activities: cognitive, metacognitive and affective/motivational (Short & Weisberg-Benchell, 1989; Pintrich, 1994; Wagner & McCombs, 1995; Shuell, 1996). Therefore, a first organizing principle in the categorization of learning activities concerns three types of learning activities. Vernunt and Verloop (1999) also tried to develop the categorical system explicitly from the viewpoint of three main learning components: cognitive, affective and regulative. They analyzed the cognitive,

affective and regulative activities students use to learn, and then categorized three groups of teaching activities in which teachers can regulate students' the learning and thinking activities: cognitive, affective and regulative (metacognitive). They also categorized teaching strategies in three dimensions according to learning activities: strong teacher-regulation, shared-regulation, learner-regulation. Table 1 shows categorical system of three main learning components.

Table 1. Contents of the questionnaire and response types

Cognitive	Affective	Regulative
Relating/structuring	Motivating	Orienting/planning
Analyzing	Concentrating/exerting effort	Monitoring/testing/diagnosing
Concretizing/applying	Appraising	Adjusting
Memorizing/rehearing	Dealing with emotions	Evaluating/reflecting
Critical processing		
Selecting		

Cognitive processing activities are those thinking activities that students use to process subject matter and that lead directly to learning outcomes in terms of changes in students' knowledge base. Affective learning activities, which students employ to cope with emotions that arise during learning, lead to a mood that may foster or impair the progress of the learning process. Regulative(metacognitive) activities are those thinking activities students use to decide on learning contents, to exert control over their processing and affective activities and to steer the course and outcomes of their learning.

As looking for studying the literature on teaching and teaching activities, in the domain of teaching, categories show up that are very similar to those in the domain of learning. It seems that learning and teaching activities are one another's mirror image and may be described in the same terms (Vernunt & Verloop, 1999). Hence, The teaching activities can be divided into three types of teaching activities.

Teaching is considered here stimulating or helping learners to employ thinking activities to construct, change and utilize their knowledge. Accordingly, teaching strategies can be categorized as level of stimulating or controlling students' learning activities. Various teaching strategies can be placed on a dimension ranging from very strongly teacher-regulated to very loosely teacher-regulated.

In a strong teacher-regulation strategy, the teacher tries to perform the learning functions. The teacher substitutes cognitive, affective and metacognitive activities from students, so that minimize the need for students to utilize their thinking strategies.

On the other hand, learner-regulation strategy is loose teacher regulation. Students are expected to be able to cognitively and affectively process the subject matter and to regulate their learning process on their own initiative. The teacher' role is to monitor the self-regulated learning of students and provide feedback and assistance when needed. In shared-regulation strategy, the responsibility for performing the learning functions is shared between teachers and students. Teachers are stimulating students to carry out the suitable learning activities.

III. Method

The taxonomy of teaching activities and strategies used in this study is summarized by Vernunt and Verloop (1999). Teaching activities used by preservice elementary teacher in lesson plans were extracted and then, were analyzed in based on these three types of teaching. Because there were not learner-regulated strategies in their planning, all analyzed teaching activities were sorted in strong teacher-regulated or shared-regulated teaching. Probably they might think that students were not regulate entirely their learning process in real elementary science lessons.

The preservice elementary teachers enrolled in 1st semester of 3rd grade at national education university in Seoul. They, 70 students of two classes, were required to make lesson plans after being taken theoretical classes for science education in the course of elementary science teaching. They worked in groups of 4-5 students to design lesson plans. All lesson plans were made in biological domain of elementary science subject from third to sixth grade. In making lesson plans, they were required that they should consider learning and teaching theories on science learned in class. The total 32 lesson plans, 8 lesson plans by each grade, were analyzed.

The examples of each teaching strategy and activities extracted from lesson plans made by preservice elementary teachers, and coding systems to classify them are shown in Table 2 and 3. Considering students' activities or indications of remarks column by instructional steps, the lesson plans were segmented into the sentences including a unit of teaching activity. If one teaching activity includes two characteristics of subcategories, then it was classified into two subcategories. All of the lesson plans were analyzed independently by two coders, researcher and another expert of science education. The interjudge agreement between two coders was 0.95. Finally, processing of the coding was performed by researcher because the level of interjudge agreement was desirable.

In each teaching step, introduction, development and consolidation of one lesson plan, the total ratios representing how many what types of teaching strategy are used for one learning function were showed in percentage. The percentages of one type of teaching strategy for one learning function in each teaching step were classified into four groups, 0-25(above 0 under 25), 25-50, 50-75, and 75-100. The total frequencies of each range of percentage were counted respectively, and this was done by grade. It was also analyzed what differences in the teaching strategies that were predominated by preservice teacher were existed according to grade.

III. Results

The preservice elementary teachers used more teaching strategy of shared-regulation than of strong teacher-regulation in designing lesson plans as shown in Fig.1 & 2. The frequencies of teaching activities included in strong teacher-regulation were high on low level of percent range. On the other hand, the teaching activities of shared-regulation had high frequency on high level of percent range. Considering that percent ranges of middle levels of each teaching strategy were very little, it seemed that they showed consistency in designing lesson plans. It means that if one teaching strategy is used, the other teaching strategy is used a little and two teaching strategies are scarcely worked together. Teaching activities for regulative learning function, which they used in lesson plans, were mostly included in strategy of strong teacher-regulation,

Table 2. Examples of teacher substitution and coding system of learning functions in a strong teacher-regulation strategy

Learning function	Teaching activity
Cognitive	Presenting and clarifying the subject matter.
Relating/structuring (T-C-1)	Explaining relationships, Giving analogies, Presenting overview, summaries, or schemes.
Analyzing (T-C-2)	Explaining in detail, step by step.
Concretizing/applying (T-C-3)	Offering examples, applications or illustrations, Indicating relations with practice, Interpretations of actual events, Explaining or asking with models, Offering analyzed data of experiment.
Memorizing/rehearsing (T-C-4)	Rehearsing the subject matter regularly, Giving rehearsal units.
Critical processing (T-C-5)	Telling arguments for and against a point of view, Pointing out different possible conclusions.
Selecting (T-C-6)	Revealing the main and minor points, Marking central concepts.
Affective	Creating a promoting affective climate.
Motivating/expecting (T-A-1)	Presenting the learning content in a captivating way, Generating interest. Making students believe in their own capabilities.
Concentrating/exerting effort (T-A-2)	Directing attention to task-relevant aspects, Building in variation and pauses, Giving task and assignments that require mental effort, Encouraging observation or inquiry process.
Attributing/Judging oneself (T-A-3)	Giving realistic attributions, Ascribing failure to controllable factors, Giving constructive judgments.
Appraising (T-A-4)	Pointing out the relevance of a course or task. Reassuring learners, Reducing fear and anxiety.
Dealing with emotions (T-A-5)	Reassuring learners, Reducing fear and anxiety.
Regulative	Regulating learning process.
Orienting/planning (T-R-1)	Giving introduction, Ascertaining prior knowledge, Informing learners of the learning objectives, contents and activities, Orienting inquiry process.
Monitoring/testing/diagnosing (T-R-2)	Observing students facial expressions, Asking questions, Administering tests, Making students solve practical problems, Examining the kind and cause of problems with understanding.
Adjusting (T-R-3)	Giving additional explanations, Changing tasks and assignments.
Evaluating/reflecting (T-R-4)	Administering summative tests, Supplying sample exams, Giving feedback on learning and suggestions for improvements in the future, Offering total summary of learning contents.

Table 3. Examples of teacher activation and coding system of learning functions in a shared-regulation strategy

Learning function	Teaching activity
Cognitive	Presenting and clarifying the subject matter.
Relating/structuring (S-C-1)	Asking for similarities and differences between theories, Instructing to make an overview, Asking for explanation by picture, Asking for prediction about some relationship, Letting students observe something freely.
Analyzing (S-C-2)	Asking detailed questions.
Concretizing/applying (S-C-3)	Having students make connections with their own experiences. Letting students solve a problem, Asking for practical meaning, Having students make search for characteristics or survey on something, Having students present briefly results of inquiry, Asking for thoughts after presentation of some multimedia materials.
Memorizing/rehearsing (S-C-4)	Administering tests asked factual knowledge, Administering tests checked contents of last lesson.
Critical processing (S-C-5)	Having students present arguments, Presenting conflicting views, Organizing a group discussion.
Selecting (S-C-6)	Asking for main points and central concepts.
Affective	Creating a promoting affective climate.
Motivating/expecting (S-A-1)	Giving students personal responsibility for their learning, Giving tasks such as role-playing or exploring problems students can handle.
Concentrating/exerting effort (S-A-2)	Recommending not to study too long in succession, Making students talk about the results of their thinking process in a group.
Attributing/Judging oneself (T-A-3)	Stimulating students to make attributions based on a realistic diagnosis, to estimate their competence and self-efficacy highly.
Appraising (S-A-4)	Emphasizing the importance of a task to realize personal goals or public goodness.
Dealing with emotions (S-A-5)	Having students experience success, Praising them.
Regulative	Regulating learning process
Orienting/planning (S-R-1)	Activating students prior knowledge, Giving students freedom of choice in subject matter, objectives and activities, Letting students survey subject freely, Letting students make plans of inquiry activities or role plays.
Monitoring/testing/diagnosing (S-R-2)	Making students monitor each others process, Letting students invent test questions. Making them analyze the cause of problems or control of variables to perform experiments, Letting students put questions with each other.
Adjusting (S-R-3)	Encouraging students to search for solutions on their own Difficulties, Having them tackle problems together, Letting students discuss some problems in inquiry process.
Evaluating/reflecting (S-R-4)	Letting students make items and test each other, Instructing to compare their own approach with that of others, Letting students listen to others presentation carefully, Letting students make decisions on true or not of hypothesis, Giving students freedom of choice in solving problems.

and teaching activities for cognitive learning functions were in strategy of shared-regulation. But teaching activities for affective learning function were considered a little bit in both teaching strategies.

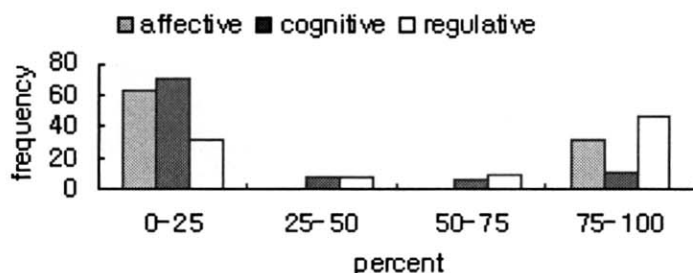


Fig. 1. Total frequency of teaching activities included in strong teacher-regulation strategy

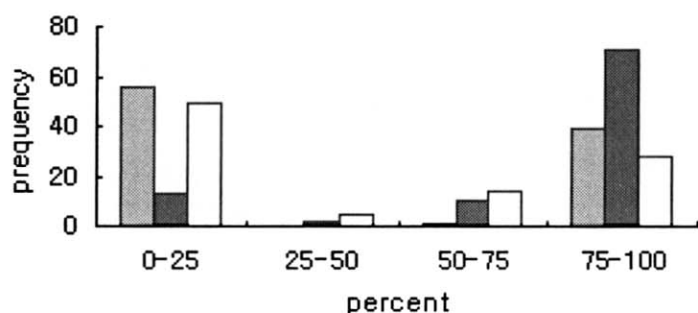


Fig. 2. Total frequency of teaching activities included in shared-regulation strategy

Table 4 shows teaching activities in introduction step of instruction. The teaching for affective and regulative learning functions were much considered by strong teacher-regulation strategy and, on the other hand cognitive learning functions were much planned by shared-regulation strategy. Most preservice teachers planned that after presenting some multimedia materials or subjects, then asked students some questions about these in this step. By doing this, they evoked students' interests on learning. In order for students to recognize the objectives of learning, they repeat the presented objectives of lesson.

Table 4. Frequency of teaching activities in introduction step

Ranges of percent	Strong teacher Regulation			Shared-regulation		
	affective	cognitive	regulative	affective	cognitive	regulative
0-25	10	29	4	23	1	27
25-50	0	0	1	0	0	0
50-75	0	2	2	0	2	3
75-100	22	1	25	9	29	2
Total	32	32	32	32	32	32

In development step, affective, cognitive, and regulative learning functions were mostly instructed by shared-regulation teaching strategy, but the case of regulative learning functions was partially depended on strong teacher-regulation strategy, as shown in Table 5. In the cases of observing freely, doing a role-playing, presenting, or surveying, progressing problems solving generally were done by students themselves. But explanation about manipulation method of microscope or what and how to do according to experimental stage were intended to perform by teachers themselves. These support that the both teaching strategies contributed to regulative learning functions. On the other hand, preservice teachers did not design lesson plans in a way that they controlled directly students' cognitive learning functions or motivated students.

Table 5. Frequency of teaching activities in development step

Ranges of percent	Strong teacher Regulation			Shared-regulation		
	affective	cognitive	regulative	affective	cognitive	regulative
0-25	28	24	18	7	0	1
25-50	0	7	7	0	1	4
50-75	1	1	4	1	6	9
75-100	3	0	3	24	25	18
Total	32	32	32	32	32	32

Table 6 shows results of consolidation step. Regulative learning functions were more instructed by strong teacher-regulation strategy than by shared-regulation strategy, but the case of cognitive learning functions was vice versa. The affective learning functions were hardly considered. For example, they planned to ask important concepts or contents to check out how much students understood learning points. They also required students to test summative assessments or gave them some problems to be solved.

Table 6. Frequency of teaching activities in consolidation step

Ranges of percent	Strong teacher Regulation			Shared-regulation		
	affective	cognitive	regulative	affective	cognitive	regulative
0-25	25	18	10	26	12	21
25-50	0	1	0	0	1	1
50-75	0	3	3	0	2	2
75-100	7	10	19	6	17	8
Total	32	32	32	32	32	32

In third grade(Table 7), teaching activities for affective and cognitive learning functions were almost designed by shared-regulation strategy, but the case of regulative learning functions were designed by strong teacher-regulation strategy. In fourth grade(Table 8), using strategy for cognitive and regulative learning functions were the same as third grade, but in teaching for affective learning functions was used strong teacher-regulation strategy more than shared-regulation strategy.

In fifth and sixth grades(Table 9-10), there was a tendency that a strong teacher strategy use

for regulative learning functions was increased but a strategy for cognitive learning functions was generally planned in shared-regulation. The teaching for affective learning functions was changed from shared-regulation to strong teacher-regulation strategy in fifth and six grades. Therefore, it is suggested that strong teacher-regulation strategy was more utilized than shared-regulation strategy in upper grade.

Table 7. Frequency of teaching activities in third grade

Ranges of percent	Strong teacher Regulation			Shared-regulation		
	affective	cognitive	regulative	affective	cognitive	regulative
0-25	17	18	6	14	5	14
25-50	0	2	0	0	0	3
50-75	0	1	4	0	2	2
75-100	7	3	14	10	17	5
Total	24	24	24	24	24	24

Table 8. Frequency of teaching activities in forth grade

Ranges of percent	Strong teacher Regulation			Shared-regulation		
	affective	cognitive	regulative	affective	cognitive	regulative
0-25	14	18	8	16	3	13
25-50	0	3	2	0	0	0
50-75	0	0	2	0	2	4
75-100	10	3	12	8	19	7
Total	24	24	24	24	24	24

Table 9. Frequency of teaching activities in fifth grade

Ranges of percent	Strong teacher Regulation			Shared-regulation		
	affective	cognitive	regulative	affective	cognitive	regulative
0-25	21	17	10	10	2	10
25-50	0	1	3	0	2	2
50-75	0	4	2	0	3	4
75-100	3	2	9	14	17	8
Total	24	24	24	24	24	24

Table 10. Frequency of teaching activities in sixth grade

Ranges of percent	Strong teacher Regulation			Shared-regulation		
	affective	cognitive	regulative	affective	cognitive	regulative
0-25	11	18	8	16	3	12
25-50	0	2	3	0	0	0
50-75	1	1	1	1	3	4
75-100	12	3	12	7	18	8
Total	24	24	24	24	24	24

IV. Discussions and Conclusions

In constructive view of learning, it seems desirable that the preservice teachers have preference for shared-regulation teaching strategy to design lesson plans. This also means that recent constructive learning and teaching theory has been taught well in preservice elementary teacher education, and preservice elementary teachers have recognized about it well. But they think that shared-regulation strategy can be applied depending on lesson contents. In lessons of fifth and sixth grades they generally used strong teacher and shared-regulation teaching strategy with balance because they may have judged that strong teacher-regulation strategy is relatively appropriate on abstract or difficult contents of lessons such as human breathing, excretory organs, health, evaporation and photosynthesis of plants. Irrespective of students' thinking level required, the role of teachers as facilitators should not be interpreted differently. Therefore shared-regulation teaching strategy must be much weighed on designing science lessons in upper grades. This result probably came from preservice teachers do not have thoroughly understanding of constructive learning theory. Why students have much difficulty in science is not that they are too young or lack intelligence but rather that they simply do not know to construct conceptual models of scientific phenomena and how to monitor and reflect on their process. White & Frederiksen (1998) concluded that inquiry and reflective processes can and should be taught as early as possible. They also found that curriculum based on inquiry and reflective process was particularly beneficial for low-achieving students. That is to say, in despite of requiring level of thinking, the teacher must much more teach by shared-regulation or learner-regulation strategy such as introducing various inquiry activities or a peer and self-assessment activity into the classroom than by strong teacher-regulation strategy.

In addition, it is needed to utilize various teaching models in planning lessons. It is recommended that teachers had better have more flexibility in using teaching models (Dick & Carey, 1996; Lee, 2002). Most preservice teachers followed instructional construction of three steps: introduction, development and consolidation. In prior research (Lee *et al.*, 1979) it was also reported that the format of most lesson plans made by teacher consisted of three steps. In introduction step, creating affective climate such as paying attention, having interests in lesson points and making students read the objectives of lessons was mostly planned. In considering processes of introduction step, teaching for affective and regulative learning functions cannot but depend on strong teacher-regulation strategy. In consolidation step, teaching activities such as giving example problems or asking principles were largely planned, and consequently strong teacher-regulation strategy for regulative learning functions were predominately utilized. There was also a little consideration for affective learning functions in this step. It is suggested that although many teaching models have been introduced in the curriculum of science education for preservice elementary teacher education, but they seem to be unable to apply various teaching models to plan lessons. The best way which can avoid gap between theory and practice, is that science teaching educators themselves much effort to teach the theory in a way of constructive teaching. If preservice teachers experience conceptual change from their learning experiences, they might seek more constructivist models of teaching science (Thorley & Stofflett, 1996).

As shown in the results, the affective learning functions had a tendency not to be considered in planning lessons. The affective learning functions have important role to enhance students' achievement level. Paik *et al.*(1999) reported that the concept change teaching model based on

students' learning motivations were more effective in concept understanding than traditional and concept change teaching model considering only cognitive level. Therefore, it is desirable that affective factors including interests, motivation, expectation and self-efficacy must be considered in respects of shared-regulation strategy in all steps of lesson.

Forthcoming researches need to inform how different levels of self-regulation and teacher-regulation of learning processes operate one another in different kind of learning environments. The research for practical diagnosing way of one's teaching style should be deeply conducted in future, too.

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