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A Case Study About Using Instructional Design Models In Science Education

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Abstract

The purpose of the study is to identify the perceptions of preservice science teachers' about using instructional design models in terms of planning and using their lesson plans during Teaching Applications course. This research is based on qualitative methodology. Study group consists of 12 preservice science teachers who take Teaching Applications course. Semi-structured questions were used for focus group interviews. Content analysis was used as a statistical technique for analyzing qualitative data. Bloom's Learning Taxonomy, Gagne's Nine Events of Instruction, Dick&Carrey Model and Kemp's Instructional Design Model were mostly preferred by student teachers in terms of results.

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1. Introduction

The instructional theory used depends upon the learning situation, just as the atomic theory used, depends upon the learning situation. The bohr atom is often used to introduce the concept of protons, neutrons and electrons to grade school students. Perhaps behaviorism is suitable to certain basic learning situations, whereas "quantum" constructivism is better suited to advanced learning situations (Good & Brophy, 1990).

The classification of instructional theories is somewhat analogous to the classification system designed by biologists to sort out living organisms. Like any attempt to define categories, to establish criteria, the world does not fit the scheme in all cases. Originally there was a plant kingdom and an animal kingdom, but eventually organisms that contained chlorophyll and were mobile needed to be classified. The protist kingdom was established. The exact criteria for protists are still not established, but it is a classification that gives us a place for all of the organisms that don't fit neatly into either the plant or animal kingdoms (Lewis, 1996).

To extend the analogy, biologists continued to modify the classification system as new knowledge and insights into existing knowledge were discovered. The advent of new technology such as the electron microscope enabled the addition of the monera kingdom. Recently, the distinctive features of fungi have brought about a proposal for a fifth kingdom, fungi. This development and adjustment of the taxonomy reminds one of behaviourism, cognitivism, constructivism, postmodernism, contextualism, semiotics... (Reigeluth, 1995).

This research study starts on what makes one a good teacher question and focuses on instructional design models. There are lots of instructional design models in education. Student teachers were asked about which instructional

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design models they prefer during their teaching practices and their reasons. In terms of this background investigation, The purpose of the study is to identify the perceptions of preservice science teachers' about using instructional design models in term of planning and using their lesson plans during Teaching Applications course.

2. Method

This research is based on qualitative methodology. Study group consists of 12 preservice science teachers who take Teaching Applications course.. 12 preservice teachers take the all courses related to pedagogical knowledge and pedagogical content knowledge such as Introduction to Education, Educational Psychology, Instructional Methodologies, Science and Technology Planning, Classroom Management, Counseling, Special Teaching Methods I and II. They are academically successful students and dedicative student teachers. They voluntarily participated this research study. Researcher observed 12 student teachers during their teaching experince in an elementary school with an observation form. Observation form consist of 10 open-ended items related to instructional methodologies and design models. Each student teacher was observed at least two times. After the observation process, focus group interviews were conducted with group of students. Focus group interview consists of 6 open-ended questions. Focus group interviews identify the student teachers' mostly preferred instructional models, their reasons and in what ways they use them. Semi-structured questions were used for focus group interviews and observation form. Content analysis was used as a statistical technique for analyzing qualitative data. Themes were identified by researcher by investigating related literature and codes which are taken from student observations and interviews were related with the proper themes.

3. Findings and Results

In terms of observation results all of the student teachers prefer mostly cognitive based instructional design models. They use mostly Bloom's learning taxonomy. During the focus group interview process,

Participant B: *"I like to use Bloom because I understand all stages and I can find examples related to this stages during my teaching process. I believe that students understand better this way and concepts will be more concrete....."*

Bloom identified six levels within the cognitive domain, from the simple recall or recognition of facts, as the lowest level, through increasingly more complex and abstract mental levels, to the highest order which is classified as evaluation. This hierarchy is proper to concrete to abstract, simple to complex, familiar to unfamiliar approach of learning.

Eight of the twelve student teachers used Gagne's Nine Events of Instruction and Dick and Carrey model during their teaching application process. Related to this finding during the focus group interview;

Participant A *"When I construct my daily plan and instructional strategies I prefer to use Dick and Carrey model because it is more systematic, I can easily understand components and make relations with my daily plan. As a teacher, it is easy to prepare and act plans doing by Dick and Carrey Model"*

Dick and Carey made a significant contribution to the instructional design field by championing a systems view of instruction as opposed to viewing instruction as a sum of isolated parts. The model addresses instruction as an entire system, focusing on the interrelationship between context, content, learning and instruction. According to Dick and Carey, "Components such as the instructor, learners, materials, instructional activities, delivery system, and learning and performance environments interact with each other and work together to bring about the desired student learning outcomes.

Participant E *" Gagne's Nine Events of Instruction is a very good model focusing on students' individual characteristics and differences during their learning process. This model gives systematic characteristics of providing feedback and assessing performance..."*

Participant E also deals with considering individual characteristics and superiority of systematic levels of Gagne's approach. Robert Gagné is considered to be the foremost contributor to the systematic approach to instructional

design and training. Gagne and his followers are known as behaviorists, and their focus is on the outcomes (or behaviors) resulting from training. Gagné's book, *The Conditions of Learning*, identified the mental conditions for learning. Gagné created a nine-step process called the events of instruction, which correlate to and address the conditions of learning.

Six of the twelve student teachers prefer to use Kemp's instructional design model during their teaching application process. Related to this finding during the focus group interview;

Participant D *"Kemp's Model is the best model to use when I make my plan because it is more flexible than the others. If I make a false during the preparation process, I can easily make corrections on the plan by the characteristics of the model. I feel that students can easily internalize their learnings with this model..."*

This student teacher underlines the flexibility of the model. The Jerold Kemp instructional design method and model defines nine different components of an instructional design and at the same time adopts a continuous implementation/evaluation model. Kemp adopts a wide view, the oval shape of his model conveys that the design and development process is a continuous cycle that requires constant planning, design, development and assessment to insure effective instruction. The model is systemic and nonlinear and seems to encourage designers to work in all areas as appropriate. This model is particularly useful for developing instructional programs that blend technology, pedagogy and content to deliver effective, inclusive (reliable) and efficient learning such as gaining attention, informing learner of objectives, stimulating recall of prior learning, presenting stimulus material, providing learner guidance, eliciting performance, providing feedback, assessing performance, enhancing retention transfer.

4. Conclusions and Recommendations

In terms of results and findings student teachers prefer mostly systematic linear instructional design models such as Bloom, Dick and Carrey and Gagne's Nine Events of Instruction. Flexible instructional design models were also preferred for making possible changes related to planning process. Instructional design models are important to identify relationship between the philosophy of the program and application processes. Micro teaching applications could be provided for student teachers to analyze different instructional models in different contexts. Studies with both learners and teachers together can be conducted for identifying the effectiveness of the instructional models. Research studies about theories of learning, teacher thinking, decision making and planning processes and their relations with instructional models can be conducted.

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