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The Reflection of 2000 and 2004 Science Curricula on the Prospective Teachers

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ABSTRACT

The purpose of this study was to determine how both 2000 and 2004 science curricula were evaluated by prospective teachers. For this purpose, prospective teachers were asked to compare the content in both science curricula. Comparison criteria were not provided for the prospective teachers; it was deemed that they could determine their own criterion in the context that they can express their own thoughts freely and unrestrictedly.

In this study, third year university students in the science education department, were selected as a sample (n=60) who was deemed to have sufficient knowledge about how to evaluate and how to use a curriculum since they had attended Science Laboratory Applications-I-II, Subject Methodology-I, School Experience-I courses respectively. Another reason for selection of this sample was that they were willing to make such an evaluation. The results obtained from the comments of prospective teachers were important since their views reflected their thoughts.

When the thoughts of prospective teachers are taken into consideration, it can be expressed that they have more positive thoughts about 2004 curriculum.

Keywords: Science Curriculum; Prospective Teachers' Perspectives; Curriculum Developments

INTRODUCTION

It can be said that educational development is not only an indicator of civilisation but also parallel to individual and social needs in a society. The aim of the curriculum is to develop pupils' cognitive or emotional abilities with its content (Tertemiz, 2003). Additionally, the aim is to get individuals to acquire the facts, processes, and basic ideas, which are consistent with concepts related to individual and social development in the present and in the future (Saylan, 1995).

The expectations of societies change over time since the needs differentiate (Ersoy, 2000). Similarly, the development of science and technology modifies the expectations of the individuals from education. For this reason, development of a curriculum has been constructed continuously. For instance, about the development of science education in

Turkey, it is being discussed that how qualified science education would be, or how students could reach scientific knowledge and how we can get students to think scientifically. We can also see this effort if we summarise the aims of the last two curricula (MEB, 2000, 2005): the main aims are (1) to encourage student-centred learning, (2) to improve the country economically and technologically, (3) to make individuals scientifically literate, (4) to develop students' scientific and creative thinking ability, (5) to teach students by using constructivist approach.

It is emphasised that there are 4 fundamental issues in a curriculum; *objectives (for students to acquire), content, the process of teaching and learning,* and *measurement and evaluation* (Demirel, 2004). *Main aim of the curriculum* could be added to these issues (Tertemiz, 2003). In sum, 5 issues should be discussed while developing a curriculum.

If our social expectation is to increase the number of individuals educated science and technology, in the process of teaching and learning, students should have the opportunity to develop their ability of scientific, creative and critical thinking, ability of problem solving, ability of doing research and working collaboratively. Moreover, individuals should capture scientific literacy, to follow and use technology, and to investigate an affair they encountered (Ekiz, 2001). To reach our expectations, teachers should develop students' learning skills by helping them to recognise their learning style and how to work for developing their learning skills. For instance, students should be able to work and organize carefully, work with partners/small groups during assigned tasks, work independently when appropriate, use time efficiently, find and use resources and information (RPS, 2006). On the other hand, it should be noted that every student joins classroom environment with his/her own knowledge or thinking process. That is the reason that students need to do individual activities to satisfy their own expectations (Ekiz, 2001). Below, social and individual expectations stated in the guide prepared by Ministry of National Education (2005) are presented.

(a) The views about social expectations

Social expectations stated by Ministry of National Education (2005) emphasize students' critical thinking, development of reasoning ability and the importance of investigating. Related items about these expectations are as follows:

(**i) Scientific literacy**: It is known that in order to get every one scientifically literate, science education plays an important role. A scientifically literate person, who is able to do research and ask questions, is the one who learns in whole life time period. Additionally, he/she has full of curiosity so that he/she is able to use his/her scientific knowledge.

(**ii) Life long learning:** Scientifically literate person can be compatible with changeable conditions since he/she knows how to use their knowledge, and how to learn.

(**iii) Science-technology-society-environment:** Students need to make a connection between science and technology or understand the interaction between science and society. This is expected from a scientifically literate person.

(b) The views about individual expectations

(i) Teaching science: Students have to understand science in order to learn both the nature and the meaning of science. The meaning of science includes scientific process skills. Students' understanding of scientific process skills should be efficient that they can understand the meaning of science so that, they can understand the importance of science in a society for its development.

(ii) Using technology: During a problem solving process students should use their scientific knowledge with technology.

(iii) Problem solving: Since, in people's life, problem solving is inevitable it should be a part of science curriculum. In this way, students not only have an opportunity to think scientifically but also become useful for their society.

(iv) Learning how to inquire: Inquiry activities include science experiments, or activities in informal settings. Learning inquiry in science is an important technique for understanding how to collect and use data. An inquiry activity, not only makes students understand science but also help them to discover how to think scientifically.

(v) Reasoning: Students possess reasoning ability only if they have the items stated above. If they have the ability of reasoning, they can understand daily life phenomena, construct their knowledge, and make comments on them (Ministry of National Education, 2005).

The items stated above are all necessary for students to make them think scientifically when they need to solve a problem. The same points can also be seen in 2000 curriculum (Ministry of National Education, 2000). For instance, in the curriculum it is stated that an effective teaching method should develop students' abilities of critical thinking, creative thinking, scientific thinking, and reasoning (Semenderoğlu, 2002). She also pointed out that the importance of the awareness of being scientifically literate had been realised by curriculum developers.

The Turkish Academy of Sciences (TUBA, 2005) also stated some views (views on educational philosophy, students' social and psychological skills, textbooks, and objectives) about 2004 curriculum. According to TUBA the philosophy of the curriculum has not been stated clearly. They argued if the constructivist approach was really necessary. On the other hand, TUBA stated positive ideas about being scientifically literate and emphasised the importance of teaching students the 'nature of science' and doing experiments. However, the relationship between science and technology has misunderstood. Some of the negative ideas have also been stated. For instance they stated that there was a lack of relation between mathematics and science. It was suggested that the objectives should include more details and be related to mathematics.

A commission (URL-1, 2005) prepared a report paper about 2004 curriculum. In general the commission has criticised the curriculum, as it would encounter so many problems. The problems they have stated are presented below:

- Before developing a new curriculum, it should have been searched out the social and individual needs by referring scientists or any other related people.
- The curriculum developers were disregardful of the previous curriculum development processes. They did not claim the reason why a reform was needed.
- The constructivist approach should not be the only philosophy of the curriculum.
- Socio-economically and culturally, the 2004 curriculum is not suitable for our country. Social needs were not found out before developing the curriculum.
- Preparing the curriculum in a short time period (in six months) prevented curriculum developers to analyse the whole system of the country to determine the needs for the country's improvements.
- Before applying the curriculum, there should have been in-service training for teachers.

They concluded by pointing out the urgent importance of the need of an effort to overcome the problems stated above. TUBA discussed mostly about the objectives of the program, on the other hand the commission dealt with mostly about the process of the curriculum development.

In their research, Ünal et. al (2004) analysed the studies on curriculum development in Turkey and made some suggestions for further curriculum development efforts. They concluded that the most important reason for being unsuccessful about curriculum developments was that the process of the development was not continuous. They also stated that more research is needed to be done about the analysis of the curricula in order to make the process continuous. From the professional perspectives the curricula have been analysed mostly about the development process. What are the teachers' points of views?

The literature showed that there are not so many researches about the views of the teachers on a curriculum. Some research findings are as follows. For instance, Cronin-Jones (1991) found out that teachers try to match the curriculum with their belief and their teaching environment. Similarly, Clark and Elmore (1981), and Smith and Anderson (1984) depicted that teachers modify for example the objectives of the curriculum according to their knowledge, the environment of the class and their own. However, it is suggested that teachers could prepare teaching activities according to students' social and cultural, and learning levels. On the other hand, the most important thing is that teachers are able to prepare activities in accordance with social and individual expectations. It becomes dangerous when teachers do the opposite.

Akdeniz et. al. (2002) showed that teachers have difficulty in understanding curriculum material, and lack of understanding of the vision of the curriculum. To solve this problem a teacher guidebook was published after developing the science curriculum in 2004. Savran et. al. (2002) aimed to determine teachers' beliefs and attitudes towards 2000 science curriculum and reported that science teachers have quite positive thoughts about the topics, objectives, teaching and learning activities and measurements and evaluation techniques suggested by it. Ercan and Ateş (2006) asked prospective teachers to state their general views about 2004 curriculum and especially about alternative assessment techniques. They drew out that prospective teachers have a positive inclination for science curriculum in 2004 because it is student-centred, flexible, and emphasises process evaluation. If science curriculum developers aim to improve its quality and applicability, research identifying teachers' and prospective teachers' views may make a contribution to them. Therefore, to make a comparison between 2000 and 2004 science curricula has a significant role for such a goal.

Since prospective teachers will track the same curriculum in their teaching carrier, it is important to answer the following questions: What do they think about science curricula? Is there any idea about how to use science curriculum? What would be their problems before their teaching profession? It is expected that this study is helpful in solving the problems about science teaching and science teacher training programs.

The purpose of this study was to determine how both 2000 and 2004 science curricula are evaluated by prospective teachers.

METHODOLOGY

(a) Sample

Third year university students in the science education department, were selected as a sample (n=60) who was deemed to have sufficient knowledge about how to evaluate and how to use a curriculum since they had taken Science Laboratory Applications-I-II, Subject Methodology-I, School Experience-I courses respectively. Another reason for selection of this sample was that they were willing to make such an evaluation.

(b) Data Collection

In this study, the data collected qualitatively. For the purpose of this study, prospective teachers were asked to compare the content in both science curricula. Examining their evaluations emerges the following criteria: their understanding of the curriculum, whether or not they distinguish the differences between the curricula, whether or not they realize the process of development of curriculum, how they use a curriculum and how they overcome the problems they encountered. Data were collected as prospective teachers' written reports incorporating in their comments and comparisons of both curricula. Apart from the general comparisons the sample was required to examine the curricula in terms of curricula's scientific contents. Comparison criteria were not provided for the prospective teachers; it was deemed that they could determine their own criterion in the context that they can express their own thoughts freely and unrestrictedly. The titles of the units which were decided to analyse by the prospective teachers are as below:

- Our body
- Matter
- Force and motion
- Light and sound
- Living organisms
- Electricity

(b) Data Analysis

In this research, prospective teachers are asked to prepare a written report about the curricula by generating their own criteria. Then the reports have been examined in depth. The steps of the analysis of this qualitative research data can be summarized as follows. The ideas and comments stated by prospective teachers were categorized. For the reliability of the analysis, the researchers made the categorizations independently. As a matter of fact, the agreement point between researchers (consistency) was found out (.91). The categories stated by prospective teachers are; (1) the views of the curriculum on learning, (2) the content of the curriculum, (3) the attainment targets (objectives) in the curriculum, (4) the teaching and learning activities, and (5) the issue of assessment. They also report exactly the same explanations from the curriculum materials such as aims stated by the Ministry of National Education, the expectations from science curriculum, the vision of the curriculum. Since these explanations were the copy of the curriculum material they were not evaluated in the data analysis.

FINDINGS

The categories which show prospective teachers' ideas as a reflection of both curricula are presented here.

I-Ideas about the Views of Both Curricula on Students' Learning

According to the prospective teachers in 2000 curriculum, although the theoretical background of the meaning of learning is not clear, the emphasis is on individual learning. On the other hand, prospective teachers realize that 2004 curriculum has been prepared on the basis of constructivist approach. The other points about this curriculum, which the prospective teachers assimilates, are: Collaborative learning is emphasized; the importance of students' differences is stated, discovery approach is assimilated; and it uses the word 'learning' instead of 'teaching'.

II- Prospective Teachers' Views about the Content of The Curricula

Prospective teachers stated that the content of 2000 curriculum was so comprehensive that they did not find it necessary. That is why the sample found 2004 curriculum was better about the content comprehension. They also emphasized that the title of the subjects were more motivating and interesting to students in the latest curriculum.

III- The Views about the Objectives

The prospective teachers paid attention to the points below:

- The complexity of the objectives in both curricula,
- Whether the presentation of scientific process skills is adequate or not,
- Whether the content knowledge is based on memorizing or not,
- Whether there are technological (science and technology) objectives or not.

According to the prospective teachers the objectives are more complex and scientific process skills are not stated clearly in 2000 curriculum. Additionally, they stated that content knowledge is based on memorization and there is no emphasis on technological objectives in the curriculum.

IV- The Views about the Teaching and Learning Activities

When prospective teachers compare both curricula they conclude that teaching and learning activities are presented in 2004 curriculum and this guides teachers in a positive way, however, the previous curriculum does not have much emphasis on teaching and learning activities. On the other hand, prospective teachers realize that in both curricula it was stated that getting students to acquire critical thinking abilities is necessary. Two quotations showing the reflection of the new curriculum are presented below:

> *"…when we prepare a lesson plan we will be able to predict when the (students) would be successful or not since we are able to determine the factors affecting students' learning. Additionally, it is not going to be hard to find teaching activities….the curriculum is helpful" (S: 4).*

> *"…we will give an opportunity for students to use scientific method, and we will give importance to integrated learning" (S: 1).*

V- Prospective Teachers' Views on Assessment

When prospective teachers were examining the curricula about 'assessment' they used Bloom's Taxonomy as a criterion. They found out that in 2000 curriculum, the suggested assessment activities tried to test students' memorization or procedural learning rather than conceptual understanding. On the other hand, prospective students realized that the latest curriculum suggests some assessment activities which allow students to think and make comments about phenomena. However, they did not present an example for this knowledge claim. After they analyse the curriculum they also state their ideas about assessment as below:

> *"…we let students know about how to assess them, the curriculum material will help us when we need to choose an assessment method" (S: 3).*

Finally, prospective teachers were asked to analyse the curricula by evaluating the units. They did this by using the same criteria for every 6 units stated in the methodology section. Table 1 shows the evaluation of a unit entitled "Light and Sound-5th grade".

Table 1. Prospective Teachers' Evaluation of the Unit of "Light and Sound-5th Grade"

2000 Curriculum	2004 Curriculum
The purpose of the unit is presented as the summary of the unit. It is suggested that students should carry out experiments and projects, make observations, and do investigations.	**The purpose** is that students should learn by observing, hypothesizing and by understanding technological relationship. The purpose also includes; • how to make connections between scientific knowledge and daily life, • how students who need special education, can learn.
The focus is not clear**.**	**The focus** is on developing scientific process skills and the connection between science and technology.
The subjects are; generation of sound, propagation, speed, insulation and reflection of sound, voice recording machines, light sources, refraction, reflection and velocity of light, light and matter.	**The subjects** are; different voices, sound sources, vibration, generation of sound, sound pollution, propagation and insulation of sound, light and matter, propagation of light, sun clock, sun and moon eclipse.
Objectives are based on knowledge and understanding.	**Objectives** are based on knowledge, understanding, application, analysis, synthesis and assessment.
Concept map of the unit is not presented.	**Concept map** of the unit is presented.
There are not any explanations and suggestions about **activities** for teachers.	There are explanations and suggestions about **activities** for teachers.
Misconceptions are not mentioned.	**Misconceptions** are mentioned.

CONCLUSION

First of all, the findings point out that the prospective teachers analysed the curricula about teaching and learning issue. They did not make the analysis from the perspective of the curriculum development. They are only interested in how to teach students by using different teaching methods. It can be concluded that prospective teachers have more positive thoughts about the new curriculum than the previous one. It is understood that the reason for this is that the prospective teachers assimilates the constructivist approach. The findings show that prospective teachers feel more comfortable whey they use 2004 curriculum. They stated that, according to their criteria 2000 curriculum was more complex and difficult to understand. For instance, they realise that, in the latest curriculum, there is a clear emphasis on what scientific process skills are or how a teacher can get students to acquire the understanding of scientific process skills. Since in the new curriculum the objectives generally exploit the words *"...realise", "...discover", "...give examples about...", "...decide by inquiry activities"* or *"...discuss"*, the prospective teachers think that the curriculum eliminates rote learning. Another point is that prospective teachers realise that there is no emphasis on developing skills or attitudes and on the connection between science and technology in 2000 curriculum.

The analysis of the data shows that the sample has some understanding of learning theories. They have positive thought about constructivism and think that they should develop their teaching activities based on this approach.

Since 2004 curriculum is based on constructivist approach it can be said that prospective teachers support to use constructivist approach during teaching and learning process because they have positive thoughts about 2004 curriculum.

Both curricula have the examples of teaching and learning activities. This is preferable by the sample who thinks that this guides them positively.

They did the analysis on the basis of Bloom Taxonomy. Prospective teachers analysed the objectives by thinking of the steps of the taxonomy (knowledge, understanding, application, analysis, synthesis and evaluation). They concluded that there was more emphasis on how to reach knowledge rather than didactic learning.

In view of the prospective teachers, in 2000 curriculum, the suggested evaluation methods were only suitable if students were successful on rote learning or not. However, activities suggested in the latest curriculum enable teachers to evaluate their students in the aspects of the abilities of thinking and making comments. On the other hand, it was expected that prospective teachers would analyse this issue together with the objectives in the curricula as it is only possible to make comments on if the activities is suitable for students to make concept analysis and synthesis.

Prospective teachers did realize the positive sides and the improvements of a curriculum which shows that they are in a right way (Akdeniz et. al., 2002; Cronin-Jones, 1991; Ercan and Ates, 2006; Savran et. al., 2002). As a result, during the process of developing a curriculum the views of the teachers and prospective students would become important.

Studies with prospective teachers are also important in terms of self evaluation of the teacher training faculties so that the quality of the teachers could increase. Prospective teachers come across a curriculum material firstly in their faculties so they are informed about the meaning of a curriculum, its usage, and how to evaluate it. At least this is an expected situation. If there is a success after implying a new curriculum then it could be thought that teachers' contribution to this achievement would be important. If not, the teachers can not be blamed for this responsibility.

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