Students' Motivation to Learn Chemistry in Turkey

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Abstract

In this report, a general overview of students' motivation to learn chemistry in the Turkish context has been carried out. In addition, positive effects and features of Chemistry is All Around Network activities has been overviewed and clarified. The initial part of the report comprises the current situation of science education with special focus on chemistry teaching at all levels of education in Turkey. Various studies and researches on science education and especially chemistry education concerning students' motivation were reviewed, examined and evaluated. Moreover, an analysis of the teaching resources on the Chemistry Network Portal and their effects on enhancing attractiveness and effectiveness of chemistry teaching has been carried out. The results and suggestions from the workshop which has been organized by the network of teachers and experts from Turkey have also been presented.

1. Introduction to the National Situation

The rapid growth in science and technology after World War - II, the examination of the data through various researches caused important innovations in science education. The achievement of the improvement in science and technology areas resulted in the revision of the subjects in the science books. For this reason; the objectives of the education were discussed again; the occurrence of knowledge and the styles to teach them began to be emphasized (MEB, 1967).

The USA and some of the European countries; the organizations such as OECD (Organization for Economic Corporation and Development), Ford Foundation, NSF (National Science Foundation), TÜBİTAK (The Scientific and Technological Research Council of Turkey) support new curriculums and new methods of instruction both by financially and by the seminars and conferences they have organized (Demirbaş, 2001).

Turkey also followed closely the studies abroad for the science instruction and put the prepared science instruction curriculum into practise in primary and secondary levels. The program development studies held by Turkey were shaped according to the results of the international researches such as PISA, TIMSS.

As for Turkey's insufficiency has been proved by international achievement evaluations, Ministry of National Education has made significant changes in the science curriculum of primary schools. The name of "science curriculum" has been replaced by "science and technology curriculum".

In the preparation of the curriculum, various countries' science curriculums have been examined and Turkey's regions' geographical and physical infrastructure and facilities have been considered. Weekly hours of science and technology lesson have been increased to 4 from 3. In the curriculum of science and technology lesson, it has been aimed "to make all students science and technology literate whatever their individual differences are". It is suggested that science and technology literate individuals will be more effective in reaching and using information, solving problems and producing

new information. Seven dimensions have been identified for science and technology literacy (MNE, 2005):

1- Nature of science and technology,
2- Key concepts of science,
3- Scientific process skills,
4- Science-technology-society-environment relations,
5- Scientific and technical psychomotor skills,
6- Values that form the essence of science,
7- Attitudes and values concerning science.

The principles of the new Science and Technology Curriculum are constructivist, thematic, active and student-centered. Constructivist approach adopted in the program, a philosophical theory of knowledge about the nature of knowledge, has affected lots of education programs. Programs prepared in the light of constructivist approach have been implemented in countries especially such as the United States, Australia, Finland and New Zealand.

The main purposes of education are to teach the ways to access information rather than to transfer this existing knowledge to individuals directly, to help students to use science process skills to find solution related with new situations problems in guidance of teachers. Especially, these purposes are achieved in science lessons. Scientific and technological developments which leaving all societies under the influence and the information age brought, caused to find out a new approach, methods and techniques in educating individuals equipped. Therefore, Science lessons required the renewal program.

"Constructive and creative" method was adopted in the former science of program accepted in 2000 and so the program was prepared according to "student-centered" approach. The former one trying to take based on constructivist learning theory has some expression part of this theory in the principles of the program. For example, information structured by students, dealing actively in the learning process and learning better and using all kinds of communication skills were mentioned as basic learning principle of the program.

When the approaches of former and new program are examined, both programs contain positive claim and expectation. In both program, it is seen that constructivist approach which assert that information must be constructed by student in a active way is adopted. However, "constructivist learning" is emphasized more clear and we to the fore.

3. Setting up of the Network

After a thorough analysis of the project's objectives, project team decided to select target group members. Many schools and universities were contacted by phone and e-mail in Kırıkkale and Sakarya cities in order to comply with the project's needs.

In order to create the network of teachers and experts, project team contacted the schools and institutions by fax and e-mail, as well as in person. E-mails inviting schools and institutions to participate in the network were sent in Turkish to enable a wider response of experts and teachers. They contained basic project objectives and concepts and presented the portal briefly, together with the accompanying instructions how to analyse and use its contents. Schools and institutions were carefully selected, previous years experiences were taken into consideration.

Schools:

As a result of the networking activity Kırıkkale University Education Faculty managed to recruit 16 teachers and 6 experts to its network. In the network, there are -3 high schools and 4 primary schools. 2 of the high schools are vocational high schools. -Of 16 teachers in the network, 3 teachers are English teachers and 13 teachers are science teachers. 8 teachers are working at high schools and 8 teachers are working at primary schools.

A total of 490 students in 12 classrooms have been involved in the network.

Experts: 6 experts have been recruited to our network. The experts are from three different universities in Turkey. The names of the universities are Kırıkkale, Ahi Evran and Sakarya Universities. There are

3 Assistant Professors and 3 instructors in the network. One of the experts is studying on educational sciences and the others are experts in science education.

4. Main obstacles to Students' Motivation to learn Chemistry

According to the results of the analysis of the reviewed national publications and comments on the portal, we can state the following points concerning students' motivation to learn chemistry in Turkish national context:

Positive and negative directions of the new primary school curriculum appeared with the implementation. While Aydede, Caglayan, Matyar and Gulnaz (2006) in their related study determined that teachers use more direct expression method, question-answer, brainstorming, concept map to support education, Tekbiyik and Akdeniz (2008) mentioned that teacher are struggling to apply the program but they face some problems in practice due to lack of knowledge. They also stated that teachers have difficulties to cover all curriculum to with use of appropriate methods and techniques in crowded classroom.

The reason of insufficient program's curriculum development efforts in our country can be that teachers who apply the program have less knowledge about implementation and also they can't get enough feedback and benefit from them. With this point, the contribution of getting the opinion of teachers who are practitioners of 2004 - 2005 Science and Technology Program about the program's content and application conditions must have place in intended program.

In addition, are the implementation of targeted training, the preparations, the level of readiness of schools and teachers about the new programs prepared according to the constructivist learning approach enough? Do teachers understand and accept the program in desired level? Are new programs carried out in desired level? Is there any missing point or one that must be added in the content of program? Which steps in practice do teacher have difficulties? What are the problems that teachers face in practice? Teaching-learning and evaluation process should be planned according to answers of these questions or similar questions for more appropriateness with the goals of new programs.

Students' "lower motivation to Chemistry" as a subject was apparent in the database of publications and the results of the papers.

Reasons for Lower Students' Motivation are generally stated as;

- Students' lack of previous academic knowledge,
- Poor number of experiments and virtual methods,
- Teachers' methodology of presentation of topics,
- Textbooks with fewer practical knowledge

In addition, it is emphasized that,

- Time allocated for chemistry courses is insufficient for making experiments, activities etc.
- Physical facilities were limited for laboratory studies.
- Science and chemistry in particular are difficult subjects to learn.

5. Analysis of Teaching Resources

Chemistry is All Around Network Portal has a wide range of innovative resources and on-line materials to teach chemistry. Those resources are very useful to enhance attractiveness and effectiveness of chemistry teaching in many different ways. The benefits of on-line resources and e-contents are explained as follows:

-Effectiveness of on-line resources, content, benefits and impact of the Student's Motivation

The use of educational technologies in learning environments, offer students a richer learning situations, evokes interest, learning and motivation increases the individual receiving center. In this

respect, the use of technology plays an important role in the process of learning and teaching (İşman and others, 2002). In parallel with developments in technology, especially with the help of computer animation, simulation environments, such as audio-visual educational materials have been used frequently. Computers in learning environments are utilized for presenting directly course content, repeat the learning in different ways, solving problems, doing a variety of exercises as online.

It is important that maintaining the sustainability of the presented information in lectures and draw attention of students to the lesson. Online resources are seen as educational tools for the realization of this situation. Science lessons are especially suitable for the implementation of online resources. Because the visually transfer of scientific concepts and principles of this courses with course software to student can be possible with applications of computer-assisted instruction. Computer-assisted instruction offers significant opportunities for development and implementation of scientific thought and facilitating science teaching thus in the process of teaching and learning is utilized information and communication technologies as much as possible (MEB, 2006). When the use of online resources on science and technology are examined at current literature, seen that studies like online resources effect on success, permanence, attitudes and student motivation.

Education within a new project in Turkey, Fatih Project, Technology and Leadership Courses are prepared. Beginning school with interactive boards, all the educational administrators and teachers continue at courses. Participants expressed that there is a promising development with the entry of interactive boards and other components to the classes and these buildings would be positive repercussions on the students. They stated that it is no longer a great extent of inequality of opportunity will disappear and the students will reach the same materials and resources all around Turkey. Also at the described with interactive whiteboard lessons it is seen the augment of the student motivation.

Online resources, teaching-learning process by using information technology equipment, teachers' effective use of materials appropriate to the class level, reliable and examination of social history can find the correct e-content platform. Designed online resources for all stakeholders especially teachers and students in education:

- Present different, rich and educational contents,
- Popularized the IT culture and provide it's use,
- To respond to the content requirements,
- Making exchange of information with social network,
- Contributing to lessons to a rich and ever-growing archive,
- Produce information and knowledge at the same time learning to re-configure the information,
- Include students with different learning styles, (verbal, visual, numerical, social, individual, visual learning)
- Uniting all teachers at a common area and guide to direction to education with collaboration.
- It is a social learning platform that designed for use technology as a tool, not as a goal.

Teaching Resources

Contents of online resources which were created for science lessons contain some vital parts. These are:

- 1-News module: This is a module that designed to develop even better by taking example, of everyone's beautiful work. All kinds of newsworthy event or activity will be included here and published.
- With the "news module" you can follow the news on education, both your announce of local and national works, you can learn all kinds of information newsworthy and now you are both aware of anyone else, and you are all aware...
- 2-Earth Module: In this module which is about to implementation nowadays, various games, interactive applications, simulations, and different educational e-content from each other is planned to be involved.

- 3 - E-book: This module has been designed for downloading and using lessons in the textbooks in PDF e-book form to tablet or a board. With E-book module, teachers and students do no longer have to carry all books; they can reach books with their tablets.
- 4 - Video Module: This module has been designed to locate the address of the videos for educational purposes. You will find a wide range of videos to use in your studies like in areas such course support, personal development, documentaries, cartoons, guidance, including individual and collective learning in so many courses like chemistry and mathematics.
- 5 - Audio Module: With this module you can download to your tablet voice-based courses, personal development, history and culture programs, audio books, foreign language listening texts or music player. An archieve was prepared to listen, audio books, educational radio programs, music, and to use with walking, spending time on the subway-bus-traffic, Also you can share audio files that you prepare as well.
- 6 - Audio Module: In this module there will be conversion of maps, graphics, animations, and also simulations will take place for students. A photo archive will be in this module so different classes can use this material to enrich the visual aspect of the course, will provide a better understanding of the subjects.
- 7 - Question and Answer Module: Is designed to use the system effectively and more efficient, you can share your thoughts on all kinds of new ideas about education, about which is more useful than e-content; colleagues benefited from the exchange of ideas on how you can learn what other teachers while. You can give and take ideas with colleagues, so no teacher would be alone and will give the message of "You are not alone!", "I'm here!". In addition, your students can ask questions and answer questions here as well. This module makes decisions about education, teachers, students and anyone interested in education.

Those continue;

E-course module: This module will put in the video line application; students who cannot go to school on that day will watch videos in electronic form courses. They can watch videos on a detailed knowledge of the subject and reinforce their knowledge and consolidate what they have learned.

Experiment: Experiments in subjects such as physics, chemistry and biology will be in videos and uploaded to the system for use. Thus, students learn by watching the monitor and improve their own levels.

Why e-content?

- Societies are no longer satisfied by learning the information. They use information in the right place, in the right form and produces knowledge resources.
- In 21. Century the previous generation cannot keep up the speed with the new generation in terms of increasingly gained technological developments.
- Information Science branches increased steadily deeper and deeper, areas of specialization are wanted. * Gradually increase the use of technology in education, information society, is becoming a new destination to train individuals to adapt.
- The level of using technology in classroom lessons is increasing; is becoming a new destination to train individuals to adapt to information society is becoming the new target.
- Appropriate level and reliable e-content is needed with using ICT in classes.

Therefore, e-content is the main component of the electronic-based learning a new tool new for teaching, sometimes it's a web page, sometimes a video, a presentation sometimes, sometimes animation, sometimes an audio file, sometimes a photograph, a case study can be an e-content, in an animation or map. Your e-content can be a news story you want to share, can be shown as an application of "good practice in education".

E-content is any kind of training material you transferred in any media or received electronic media. Every file related to education that added to this big pool, is candidate of being your e-content in the future.

6. Workshop

The workshop was held on the 28th September, 2012, in Kırıkkale, Turkey. Ten teachers and six experts have participated in the workshop. The results of the workshop carried out with teachers and experts are as follows:

In science lessons, it can be said that chemistry has maybe the most abstract concepts. Students find chemistry difficult because of abstract concepts and being at molecular levels. It is important to concrete these abstract concepts for learning with understanding and for resolving misconceptions. To concrete abstract concepts make easier everything for both students and teachers. In respect to this, in Turkey, it's seen that science curriculum and especially chemistry curriculum has many activities based on contextual learning. In contextual learning, students learn with making connections between the concepts and events that happening around. So, they can make connection to these concepts and they learn them with understanding.

Effective chemistry teaching can be made with animations, simulations and videos, with all these alternative ways, students can concrete concepts in their minds. During these kind of activities teachers attract students attention, motivate them and make learning occur quickly. So in the learning environment with animations and simulations, students can study individually and they can control their learning according to their own individual learning speed. At the same time manipulative, time and money savings can be made. One of these kind of projects is FATİH Project and with this project classrooms are equipped with smart boards and tablet computers are given to each students. All classroom have ınternet connection, WEB Portals (Vitamin, Morpa) are made for students. Students, teachers and parents can use these portals free of charge. Students can use these portals and follow up their own individual development.

Nowadays theoretical knowledge has been put into practice and learning with practicing is provided. For example, formerly in chemistry lessons, the structure of atom has been taught by just explanations but nowadays these kind of lessons can be made with 3D videos and materials with computers software. With all these up growth, learning with understanding can be provided and students can make active participation to the lessons.

Laboratory applications are important in chemistry teaching and it is effective in concept learning. So there are many laboratory approaches that are used to make efficient laboratory applications and experiments. Among those kind of approaches, research-based approaches should be chosen. During the lessons, students should be motivated to make hypothesis, make guesses, make reasoning, collecting data and analyse the data and then to make some inferences about their data. That is to say, students should participate actively to the learning process. As a result of the process, students should have all these skills.

In this context, with laboratory studies, the following results are aimed:

- Understanding of the essence and the method of science
- The development of problem-solving ability
- Examination of detected events encountered in everyday life
- The development of technical and scientific process skills
- The development of analyzing and making generalizations skills
- To increase the interest and motivation of chemistry lessons
- Presentation of information within a sequential order
- The idea of changeability of well-known theories and models in the acquisition of overtime
- To intend to provide contributions to acquire positive attitude of the students towards scientific research and to be a scientist.

Besides laboratory studies help students to critical thinking, reasoning, to recognize the nature of science, to develop the ability of operation and etc. In laboratory atmosphere, individual or collaborative models can be used and the ability to use these kind of models can be improved.

It is necessary for students to connect their daily knowledge with their lessons. A student who cannot explain the concept in daily life cannot be efficient in learning with understanding. In this regard, examples should be given with connecting daily life events. Informal learning environments provide students to use their knowledge, especially science centers and science festivals motivate students towards science. Besides the manipulative and experiment environments in these festivals and centers help students to resolve their misconceptions and help them to understand the nature and science deeply.

When ongoing project is analyzed, the Chemistry is All Around Network Portal helps;

- To increase the interest in teaching chemistry
- How to explain everyday events of chemistry and how it helps to explain the affects to daily life
- •To provide cooperation between teachers and experts

In respect to this, with this project, we have the chance to compare the different countries' science teaching curriculum and make exchange of information to each other. Besides conferences related to science teaching will be made up. It is considered that this project will have very positive contributions to science teaching. In addition, it is a very useful initiative to bring together teachers from schools and experts from academia by international conferences, networks and on-line platforms.

7. Conclusions

As a result of the literature review which has been done by a part of the research activity and the workshops, the main obstacles to students' motivation to learn chemistry in Turkey are students' lack of previous academic knowledge, poor number of experiments and virtual methods, teachers' methodology of presentation of topics. In addition, classrooms are very crowded and physical facilities are limited for laboratory studies. On the other hand, on-line learning materials and e-contents offer students a richer learning environment, evokes interest, learning and motivation. Chemistry Network Portal is a very useful tool for teachers and experts to find a variety of on-line materials and resources to enhance attractiveness and effectiveness of chemistry teaching concerning students' motivation.

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