

# THE TECHNOLOGY IN THE PROGRAMS OF LIFE SCIENCES IN TURKEY AND SACHUNTERRICHT IN GERMANY

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## SUMMARY

The purpose of this study is to compare the gains of the Life Sciences program in Turkey and the Life sciences program (Sachunterricht) used in the state of Niedersachsen in Germany. The study aiming to compare the technology-related acquisitions in Life sciences program in Turkey and Germany is a comparative education research that used qualitative method and descriptive approach. In the study, the Sachunterricht (Life sciences) course's technology acquisitions and the use of technology in Germany were briefly mentioned and then the differences were evaluated by comparing to the usage of Life sciences course technology in Turkey. It was found that, the acquisition groups in Germany focus on technical perception and solving of the problems, describing the use of simple materials, having basic knowledge about transportation of wastes, having knowledge about the assembly, being well-informed about the effects of technical inventions, and becoming familiar with the energy and water supply. When the related gains were examined, the gains in the production area were observed to remain superficial in the Life sciences program according to the Sachunterricht program. The students in the Life sciences program only have a role to observe production, while the students are performing the production itself in the Sachunterricht program.

**Keywords:** Life Sciences, Sachunterricht, technology

## INTRODUCTION

The technology including various applications that people use to solve problems has become a great power in the ever-changing world. Nowadays, the conveniences and opportunities it provides make the technology an indispensable element of everyday life, and a life without technology has become unimaginable (Pamuk, Ülken and Dilek, 2012). For technology, many definitions have been made from past to present time. Technology is the implementation of scientific principles and innovations to facilitate life and solve problems (Erdemir, Bakırcı and Eyduran, 2009). Another definition is that technology is to create the necessary structures to dominate the nature with the ability to develop acquired skills actively (Alkan, 1998). McDermott defines the technology as a technically qualified small group's controlling over machines, events, people, etc. with the help of an organized hierarchy. (McDermott, 1981 cited in Alpar, Batdal and Avci, 2007), Simon defines it as the form of discipline (Simon, 1983), which is designed to dominate the nature by using science.

Technology has been evolved and used in many fields since the day human used fire. It has been an indispensable part of life with telephone, television, radio, internet in the communication area and with airplanes, trains and automobiles in transportation area. It is not possible to transmit and memorize information in traditional ways today with the rapid development of science and technology (Yavuz and Coskun, 2008). As Akkoyunlu (1995) has stated, using the technology is a necessity rather than a privilege today. People need to acquire knowledge, skills, attitudes and habits in order to adapt to the changing and constantly evolving technology, to understand technology and take advantages of the opportunities offered by technology. The acquisition of knowledge, skills, attitudes and habits is possible by individuals to recognize, use and adopt technology at a young age. Families, teachers and educational institutions should know how to use technology to raise individuals who meet the technology at a young age.

The use of technology in educational institutions reveals the abilities of students, by increasing the motivation for them to learn, and providing benefits to students as well as giving the talents of the age. In addition, it is possible to make students active while practicing the teaching methods and techniques. Education and teaching activities are more successful because students who are active in learning achieve more permanent learning. In classrooms where technology is used and an efficient learning environment is provided, the teacher is also a researcher and learns with the student (Keeler, 1996). Teachers can practice the works that they cannot practice in the classroom environment with technology so they can provide a permanent learning by touching various senses (Swords, 2011).

The purpose of this study is to compare the gains of the Life Sciences program in Turkey and the Life sciences program (Sachunterricht) used in the state of Niedersachsen in Germany. In the direction of this aim, the following questions were asked.

- What are the acquisitions of technology-related Life sciences programs in Turkey?
- What are the acquisitions of technology-related Life sciences programs in Germany?

- What are the similarities of technology-related acquisitions of Life sciences programs in Turkey and Germany?
- What are the differences of technology-related acquisitions of Life sciences programs in Turkey and Germany?

## METHODOLOGY

The study that aims to compare the technology-related acquisitions in Life sciences program in Turkey and Germany is a comparative education research that used qualitative method and descriptive approach. Comparative education research is a study area that the countries' education systems are examined, similarities and differences are identified and some solutions are recommended for the similar problems (Adıgüzel and Tatlı, 2012). The descriptive approach is a kind of approach which a general analysis is provided by comparing the similarities and differences in the literature review (Ültanır, 2000).

## FINDINGS

In this chapter, firstly, the Sachunterricht (Life sciences) course's technology acquisitions and the use of technology in Germany was briefly mentioned and then the differences were evaluated by comparing with the use of Life sciences course technology in Turkey.

Sachunterricht in Germany is a course given to the third grade students. When the technology acquisitions in Sachunterricht program are examined, it is recognized that there are six groups. They can be seen in the Table 1.

**Table 1.** *The technology acquisitions in sachunterricht program*

No	Acquisition Groups
1.	Students detect specific problems that can be technically resolved and solve easy problems.
2.	Students describe the use of selected sample operations and simple materials used daily.
3.	Students have basic information about the transportation of wastes.
4.	Students describe the technical function by removing and assembling a sample of their daily lives.
5.	Students can develop samples, change technical inventions, and understand the consequences over time.
6.	Students have the basic information about supply and waste transportation in the field of energy and water supply.

When the acquisition groups in Table 1 are examined, It is observed that it focuses on the points such as technical detection and solving of the problems, describing the use of simple materials, having basic knowledge of the transportation of waste, having knowledge of installation, having an idea about the effects of inventions and having knowledge of the energy-water supply dimensions. The skills for students to detect specific problems can be technically resolvable and solving easy problems are seen in Table 2.

**Table 2.** *Students understand the problems as technically solvable and solve the simple problems*

Information and skills	Possible tasks
Students;	• Using the vehicles correct and environmentally harmless and to know the names of the materials
• Recognize tools and uses them correctly.	• Making a correct model/object according to simple plans
• Use the materials properly and with an environmental consciousness.	• Making a model/object based on previously given criteria (durability, load portability)
• Understand and applies simple instructions.	• Separating the objects into pieces and saying the basic parts with the technical terms
• Build bridges, towers, buildings, wheeled vehicles, etc. models from structured and unstructured materials.	• Establishing a connection between the model/structure and picture (plan)
• Assemble and disassembles objects with pre-staged parts.	
• Make drawings that represent the artifacts-structures.	

When the table 2 is examined, it is observed that the statements in the acquisitions of the Germany Sachunterricht program integrate the students into the education process actively. Students can practice the information in addition to learning theoretical information about the situations which they might encounter in daily life and they have information about energy saving, wastes, recycling and gain environmental awareness.

The statements " Students build bridges, towers, buildings, wheeled vehicles, etc. models from structured and unstructured materials." and " Students assemble and disassemble the objects with pre-prepared parts." are

involved in the acquisitions of German Sachunterricht course. It is observed that the acquisitions in the production area are limited when compared to the acquisitions of "3.5.4. Students examine the stages of production activities in the surroundings." and "2.5.2. Students observe the production activities in the surroundings" in Turkey Life sciences course. It is observed that these Life sciences acquisitions in the 2<sup>nd</sup> and 3<sup>rd</sup> grade programs are limited regarding observing the production activities of the students but in the Sachunterricht program, the student performs the production activities from the very beginning. In addition, There are no statements in the program of Life sciences against the expression of "drawings-structures that represent buildings." in the Sachunterricht program.

**Table 3.** *Students describe the sample procedures and the use of simple tools from daily life*

Knowledge and skills	Possible tasks
Students; <ul style="list-style-type: none"> <li>• See tools and simple machines as a means of help.</li> <li>• Learn the function of the tools and uses them correctly.</li> <li>• Introduce and describes the use of simple tools and tools (hammers, scissors, tongs) by drawing.</li> <li>• Separate simple mechanical objects (air pump, bicycle bell) into parts and learn their functions.</li> </ul>	<ul style="list-style-type: none"> <li>• Linking and explaining the functions and use of tools, appliances, simple machines.</li> <li>• Telling the correct usage criteria.</li> <li>• Describing the parts of simple objects and their function.</li> <li>• Introducing pictures of vehicles, instruments and simple machines previously given.</li> </ul>

The skills related to selected sample procedures and describing the use of simple tools of the students in the program of Sachunterricht can be seen in table 3. The Sachunterricht program acquisitions aim to raise individuals who can use the tools correct and environmentally harmless in addition to recognize them. Students are intended to be able to make models based on simple plans and pre-determined criteria, take these models apart and to know the basic parts with technical terms. Students know the correct usage criterion of tools, appliances and simple machines, and understand the parts and functions of simple models. Additionally, they are able to make a connection between the functions of tools and simple machines and their use.

Corresponding to "Students learn the function of the vehicles and uses them correctly." statement, there is "1.1.3 Students recognize the corner of success with the educational tools and tools in the classroom." statement in Life sciences program. It is observed that the acquisition of Life sciences is limited by the tools in the school to recognize the tools, and there is no indication of the use of tools in the acquisition. In the acquisition of "2.4.5 Students use the technological tools and equipment safely.", It is observed that the "Students use safely" statement is similar to "use correctly" statement in the Sachunterricht. Another Life sciences acquisition is "2.0. Students know the basic rules to ensure safe use of electrical appliances and other tools used at home. " and it is similar to the aim included in Sachunterricht program.

Another phrase in the Sachunterricht program is that "Students recognize and describe the use of simple tools and tools (hammers, scissors, tongs) by drawing". An acquisition similar to this statement is not included in the gains of Life sciences. Again, Sachunterricht program's " Students separate simple mechanical objects (air pump, bicycle bell)into pieces and learns their functions." is similar to "3.2.3. Students do the simple works at home. " expression when they are compared to "maintenance-repair".

**Table 4.** *Students have the basic information about the transportation of wastes.*

Knowledge and skills	Possible tasks
Students; <ul style="list-style-type: none"> <li>• Have information about the transport of regional waste and the disposal of the litter.</li> <li>• Distinguish the wastes and recycled materials.</li> <li>• Describe the recycling process.</li> <li>• Recognize recyclable materials and objects.</li> <li>• Know the methods of preventing waste.</li> </ul>	<ul style="list-style-type: none"> <li>• Separation of the garbage.</li> <li>• Introducing and describing the recycling.</li> <li>• Keeping a garbage list.</li> <li>• Generating clear solutions for the prevention of waste.</li> </ul>

The skills of the students to have basic information about the transportation of waste are in Table 4. In the Sachunterricht program, it is emphasized on the recycling in recent days when the sources are becoming extinct.

Students know the significance of leaving the litter and have a garbage list. The problem solving skills of the students who produce alternative solutions for the prevention of waste are also developed. Furthermore, students can distinguish between renewables and renewable energy and pay attention to the use of energy accordingly.

Corresponding to "Students have information about the transport and disposal of the regional waste." and "Students distinguish the wastes and recycled materials." statements in the Sachunterricht program which emphasizes the waste and recycling, the Life sciences program has "1.6.7. Students recognize the items that can be recycled." and "2.6.10. Students contribute to recycling of consumed substances." acquisitions. In the Life sciences program, there is no mention of a goal of identifying recycled substances while mentioning the recycling of substances. When we look at the Sachunterricht "Students recognize recyclable materials and objects." and "Students know the ways to prevent waste." in the Sachunterricht, it seems that it is largely similar to the lesson of Life sciences. In addition, it is focused on the destruction of forests, erosion and environmental pollution with the acquisition of "2.6.8. Students give examples of adverse effects on the environment of people." in Life sciences.

**Table 5.** *Students describe the technical function by removing and assembling a sample from their daily lives.*

Knowledge and skills	Possible tasks
Students; <ul style="list-style-type: none"> <li>• Describes the structure, function, and function of basic components of simple devices</li> <li>• Recognizes power and electricity distribution possibilities.</li> <li>• Prepares pre-conceived and planned models.</li> </ul>	<ul style="list-style-type: none"> <li>• Making a model according to the criteria previously given.</li> <li>• Introducing the model/piece by drawing.</li> <li>• Explaining the basic components and their functions.</li> </ul>

The skills of the students to describe the technical function by removing and assembling a sample of their daily lives are given place to in Table 5. In the Sachunterricht program, which is significant for students to acquire technical information, students can make models according to the pre-issued criteria and recognize the basic components and functions of the machine. In addition, students can promote the machine by drawing.

The Sachunterricht program has technical information that can be used in a daily life. In response to "Describes the structure, function, and function of basic components of simple devices. (Chain-operated bicycle, Weighbridge, bottle opener)" and "recognizes power and electricity distribution possibilities. (Threaded arm, cylinder)" statements, Life sciences program has the acquisitions of "3.2.2. The tools and technological products used at home are exemplified by their contribution to our lives.," "3.2.3. Students do the simple work at home." and "2.0. Students know the basic rules to ensure safe use of electrical appliances and other tools used at home."

**Table 6.** *Students can develop a sample; understand the change and results of technical inventions by the time.*

Knowledge and skills	Possible tasks
<ul style="list-style-type: none"> <li>• Students explain important technical discoveries and their development with examples.</li> <li>• Students tell the importance and impact of a technical invention for people and environment with examples</li> </ul>	<ul style="list-style-type: none"> <li>• Drawing of simple development principles.</li> <li>• Demonstrating the technical development of basic components.</li> <li>• Establishing a connection between inventor and invention.</li> <li>• Explaining the development of technical inventions.</li> <li>• Recognizing the technical names of the basic components.</li> <li>• The comparison of the advantages and disadvantages of the invention.</li> </ul>

The skills of students to develop a sample and understand the change and outcomes of technical inventions in time are included in Table 6. As a part of the Sachunterricht program, students can demonstrate the working principles of vehicles/machines by drawing in addition to introducing the models by drawing. Moreover, students can establish the connection between the inventor and the invention, know the development of technical inventions, and make a comparison of the advantage and disadvantage of an invention.

Sachunterricht program gives importance on technical inventions and focuses on the change and results of the inventions. In this case, when we compare the "Students explain important technical inventions and their development with examples." and "Describes the importance and impact of a technical invention for the people and the environment with examples." expressions with the "3.2.2. The tools and technological products used at home are exemplified by the contribution of our lives." statement from the Life sciences program, it is observed that the acquisitions in German and Turkish programs are similar. The Sachunterricht program mentions the development of technical inventions, whereas Life sciences program mentions the contributions to the daily life.

**Table 7.** *Students have the basic knowledge of supply and waste transportation in the field of energy and water supply.*

Knowledge and skills	Possible tasks
Students; <ul style="list-style-type: none"> <li>• Know the importance of a regular water source.</li> <li>• Know ways to produce drinking water.</li> <li>• know and implements simple methods of water purification.</li> <li>• Know alternative energy production methods.</li> <li>• Distinguish renewables and renewable energy.</li> </ul>	<ul style="list-style-type: none"> <li>• Explaining the ways of producing drinking water with a drawing or a model of earth stratum</li> <li>• Explaining the basic function of the graphic and sewage plant</li> <li>• Screening, analysis and disclosure of filtration experiments</li> <li>• Explaining the reason for the presence of foreign substances in water and the learning of cleaning methods.</li> <li>• Telling the directions of renewable and renewables.</li> </ul>

The skills of students having basic knowledge of supply and waste transportation in the field of energy and water supply are mentioned in table 7. As part of the Sachunterricht program, students can describe ways to produce drinking water with a sketch or a machine and explain the function of the graphics and sewage plant. Students can explain the reason for the presence of foreign substances in water and learn the methods of cleaning. In connection with this, they can perform filtration experiments, analyze, and explain these experiments. Students also know the importance of energy resources and pay attention to the use of depleted energy sources.

Corresponding to "Students know the importance of a regular water source", there are "1.2.5. Students use resources efficiently and appropriately." and "2.1.5. Students use resources and belongings attentively." statements in Life sciences program. When it comes to the acquisitions of Life sciences, it focuses on to be careful about the saving of the use of electricity, water and cleaning materials, various items, and course tools and tools. In the acquisition of Sachunterricht program, knowing the importance of resource usage is only limited to the water supply.

Germany's Sachunterricht program also refers to water supply. In this regard, "Students know the ways to produce drinking water." and "Knows and implements the simple methods of water purification." statements are included in the Sachunterricht program. In the course of Life sciences, students do not have an acquisition of drinking water purification and production. The Sachunterricht program has "Knows alternative energy production methods." and "Distinguishing/renewable energies" statements and Life sciences program has "3.6.6. Students take responsibility for protecting nature and the environment." and "3.6.7. Students know how to contribute to recycling individually." acquisitions. In the 3.6.6. numbered acquisition, it is emphasized on the keeping clean and the proper use of resources such as water, air, soil, natural resources, and the importance of planting trees. In addition, non-governmental organizations that are interested in the subject are examined at a fundamental level.

Germany's Sachunterricht program has no statement in response of the statements of "1.2.4. Students become willing to conserve health and use time efficiently while taking advantage of mass communication tools at home", "1.4.1. Students obey the security rules", "1.4.5. Students know how to behave in the vicinity of people who recognize or do not recognize", "2.4.3. Students know what to look for when communicating with people he or she does not recognize" and "2.4.6. In addition to the institutions where s/he can get help in emergencies, s/he knows the people to receive help in the immediate vicinity" in Turkey's Life sciences (Life sciences) program. At the 1.4.1 numbered acquisition, there are issues such as electrical outlets, cables, and water left open. 1.4.5 is focused on what information is not safe to share in the virtual environment. The acquisition of Sachunterricht does not include any statements in these matters.

## CONCLUSION AND DISCUSSION

In the study of life sciences programs in Turkey and Germany, the acquisition groups in Germany focuses on technical perception and solving of the problems, describing the use of simple materials, having basic knowledge about transportation of wastes, having knowledge about the assembly, being well-informed about the effects of the technical inventions, and becoming familiar with the energy and water supply. When the related acquisitions were examined, the ones in the production area were observed to remain superficial in the Life sciences program in line with the Sachunterricht program. The students in the Life sciences program only have a role to observe the production, whereas the students are performing production itself in the Sachunterricht program. Moreover, there is no acquisitions in Life sciences program compared to some acquisitions in the Sachunterricht program. For example, in the use of simple tools, Life sciences program does not have any similar acquisitions while the Sachunterricht program asks students to describe the simple tools and vehicles by drawing. Similarly, while "Knows the ways to produce drinking water." and "Knows and implements the simple methods of water

purification." statements are included in the Sachunterricht program, there is no acquisition about the student's drinking water purification and production in Life Sciences program.

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