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Research Article

Rural Turkish Students' Reactions to Learning Science in a Mobile Laboratory*

Mustafa Erol[1]
Bozok University & University of Georgia

Ugur Buyuk[2]
Erciyes University

Nagihan Tanik Onal[3]
Erciyes University

Abstract

The inadequacy of experimental activities (or lack of equipment) in science courses in rural parts of Turkey negatively effects students' acquisition of scientific thinking and inquiry skills. The fact that success rates are notably low in international assessments demonstrates the necessity to adopt "different" approaches apart from the existing learning and teaching methods. From this point of view, a mobile science laboratory (MSL) was constructed to deliver outreach activities in the rural outskirts of a city in Turkey. Experimental activities were carried out in this laboratory for six months with 324 middle school students who responded to survey questions. The research was designed with multimethod: A combination of quantitative and qualitative data-collection strategies was used. The first part has 25 five-point closed-ended Likert-scale items, and the second part has two open-ended questions. The results of the study show that the students in the rural areas were pleased with the activities; they enjoyed learning science in the MSL, and their interest and curiosity for science contents increased. It will be suggested that the MSLs should be used in order to support the science literacy of students in the rural areas of Turkey.

Keywords

Mobile science laboratory • Experiment-based • Rural • Middle school • Turkey

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1 **Correspondence to:** Mustafa Erol (PhD), Department of Science Education, Faculty of Education, Bozok University, Yozgat 66200 Turkey.
Department of Science and Mathematics Education, College of Education, University of Georgia, 30602 Athens, GA, USA. Email: mustafa.erol@bozok.edu.tr

2 Department of Science Education, Erciyes University, Kayseri Turkey. Email: buyuk@erciyes.edu.tr

3 Department of Science Education, Erciyes University, Kayseri Turkey. Email: nagihanta@gmail.com

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In 1985, Peter J. Fensham stated in his seminal paper, *Science for All*, that learning opportunities should be provided to students who have different interests and abilities. Although thirty years have passed since the first usage of the phrase, "science for all," unfortunately, many students still do not have access to high-quality science education. Engaging in science investigations is one way to learn how to assess, produce and use knowledge. Experiencing science is important for children in rural locations, helping them to contemplate the knowledge they encounter, produce knowledge to share with others, and use knowledge in ways that benefit society. Additionally, individuals need to learn scientific thinking, which includes understanding the limits of the information encountered.

In this age, there is a need for individuals who search, question, produce knowledge, use knowledge and think scientifically. It is clear that science education has an important role in order to train individuals who have the mentioned qualifications. In this sense, some reforms were made in Turkey and a curriculum based on constructivist paradigm was developed in 2004. In this curriculum, the vision of science courses' program is to train individuals who have scientific literacy (Ministry of National Education [MONE], 2005). Scientific literacy has an important role in science programs of the countries. While it is a new term in Turkey, scientific literacy was first introduced by Paul deHart Hurd (1958) and since then it is a phenomenon that draws attention (as cited in De Boer, 2000). According to Bybee (1999), scientific literacy supports and develops individuals' understanding of science and technology.

An important goal of science instruction is to create scientifically literate citizens. Paul deHart Hurd, who introduced science literacy, regarded it as crucial for understanding social experience. He argued that science is so important that political, social, economic and personal matters should not be considered without reference to it (Hurd, 1958). Scientific literacy is defined in the National Science Education Standards (NSES) as "the knowledge and understanding of scientific concepts and processes required for personal decision making, participation in civic and cultural affairs, and economic productivity. It allows a citizen to understand general scientific principles and issues that are addressed in various forms of media, healthcare, politics etc." (NSES, 1996). More recently, Bybee (1997) stated that "a unique perspective that gives direction to those responsible for curriculum, assessment, research, professional development, and teaching science to a broad range of students' and proposed a hierarchical framework for scientific literacy consisting of nominal, functional, conceptual and multidimensional literacies" (Bybee, 1997). According to Bybee (1999), scientific literacy supports and develops individuals' understanding of science and technology. DeBoer (2000) asserts that "scientific literacy is, and always has been, the intrinsic goal of science education."

From a global perspective, not all students have access to science education or the opportunity to be scientifically literate. The United Nations Educational, Scientific and Cultural Organization (UNESCO) focuses on the need to promote a "world community of scientifically and technologically literate citizens" (Layton, Jenkins, & Donnelly, 1994). The Organisation for Economic Cooperation and Development (OECD) tries to measure student learning in regard to three dimensions of scientific literacy – scientific concepts, scientific processes and scientific situations – through the Programme for International Student Assessment (PISA) instrument. The scientific situations are selected mainly from people's everyday lives, rather than from the practice of science in a school classroom or laboratory, or from professional practice (OECD, 2006). The results show that Turkish students have low science scores in PISA examinations (Şirin & Vatanartıran, 2014).

Students in rural communities are very likely to have inadequate experiences in science. This is because, as Taneri and Demir (2011) concluded, access to quality education in rural areas is still problematic in Turkey. Moreover, there is wide variation in the allocation of both physical and human resources, as well as in the distribution of educational materials among the schools in different regions of Turkey (World Bank, 2005).

Under these circumstances, in addition to the current activities, it can be said that there is a need for different instructional approaches which will help students to learn science and develop scientific literacy. The use of mobile science laboratories (MSLs) may be a practical and promising approach that could bring a higher quality of science education to the rural areas of Turkey and to other areas that do not yet have access to such educational resources.

This study aims to investigate the opinions of students in a rural area of Turkey regarding learning science in an MSL via an innovative approach. Using the MSL, experiment-based science learning opportunities were arranged in order to motivate and facilitate the learning of students. This laboratory was equipped with projectors, computers and internet, and with course fixtures such as tables, boards, signboards, flashcards, etc. More importantly, it provided students with opportunities to engage in science investigations. The following questions were examined in this study:

- What are the students' thoughts about the use of the MSL?

- What did they like most in the MSL?

- What are their suggestions for improving the MSL?

Background

With funding from the Leonardo da Vinci initiative of the Center for European Union Education and Youth Programmes, a lorry was converted into an MSL in Turkey. The lorry was modified to provide a space to prepare and perform experiments for a maximum of 12 students at a time. There are three divisions in the lorry: a main laboratory (14.3 m^2), a room where experiments are prepared (9.9 m^2) and a staff lounge (11.2 m^2). Electricity, heating, lighting, ventilation, and water systems were also installed in the vehicle. It contained technological equipment such as projectors, computers and internet and the course fixtures such as tables, board, signboards, and flashcards were arranged in order to

Figure 1. The experience of using the MSL in a rural area (Yozgat) of Turkey.

motivate and facilitate the learning and teaching attendants. Contemporary experimental equipment were prepared to engage the students in investigations.

The vehicle was owned by Bozok University and visited 10 schools each semester. When the MSL reached a town, it was kept in front of the school for one week. The laboratory got its electricity power from the school, through agreements made prior to the MSL's arrival. A week-long experimental education program was prepared for the participants. The academic staff of Bozok University led the teaching experiments. Some photographs of the MSL are shown in Figure 1.

Relevant Literature

Students Learning Through Investigations

It is hard to imagine learning science without doing any laboratory activities or field work. Experimentation underlies all scientific knowledge. Laboratories are wonderful settings for teaching and learning science. They provide students with opportunities to contemplate, discuss, and solve real problems. Developing and teaching in an effective laboratory requires as much skill, creativity, and hard work as proposing and executing a first-rate research project (NCR, 1997). In science education, laboratories supply learning opportunities for abstract subjects (Nakhleh, 1994), improve problem solving abilities and psychomotor skills (Hofstein, 2004; Singer, Hilton, & Schweingruber, 2005), and increase the classroom motivation (Telli, Yıldırım, Şensoy, & Yalçın, 2004). According to Çepni, Akdeniz, and Ayas (1995), laboratory activities improve reasoning and critical thinking abilities in science and provide opportunities to understand the nature of science. Klemm and Plourde (2003) state that experiments help students to develop various skills related to science learning.

The use of hands-on activities is one of the experimental learning approaches involving practices that can be carried out by using inexpensive equipment. These activities are quite suitable for students in the rural outskirts of cities and provide equity between students in different economic settings, because they can be implemented with simple and cheaper materials (Uysal & Eryılmaz, 2002). Hands-on experiments improve students' academic success, allow them to develop positive attitudes towards science (Bredderman, 1983; Shymansky, Kyle, & Alport, 1983; Shymansky, Hedges, & Woodworth, 1990; Turpin, 2000; Yu & Bethel, 1991), and facilitate students' learning of science concepts. These experiments also help them to acquire problem solving and scientific thinking skills (Leung, 2008). These activities develop science process skills and an understanding of the nature of science (Başdaş, 2007).

Lorries as Science Laboratories

In recent years, countries which aim to increase the quality of their science education in rural areas have begun to carry out MSL practices. Such laboratories may contribute to the achievements of students and arouse their interest and curiosity about science, providing them with opportunities to become scientifically literate. “These labs-on-wheels have different sizes and configurations, some are offered as a service, some are off-the-shelf versions, while others are heavily customized” (Studt, 2006). In particular, the US and the UK have been using these laboratories regularly in recent years. “Lab in a Lorry,” “Elsdale II,” “GB4FUN,” “SCI-FUN,” “CityLab,” “BioBus” and “Science on the Move” are examples of mobile laboratory programs in the US and the UK. Some of these mobile laboratory programs have been used in recent research on the attitudes of students towards the mobile laboratories (Barmby, Kind, Jones, & Bush, 2005; Kind, Jones, & Barmby, 2007) and the attitudes of the students towards science (Barmby, Jones, & Barmby, 2008). An outreach case study of “Jersey Science Week” about the investigation of hands-on activities using mobile laboratory was also carried out (Harrison, Hughes, & Shallcross, 2008).

Methodology

A combination of quantitative and qualitative data-collection strategies was used for this research. The goal of using multimethod, data sources, and theoretical approaches was in the service of triangulating their results in order increase the overall validity of their measures and overall findings (Hesse-Biber & Johnson, 2015). For quantitative dimension of the research, a five-point-Likert-scale that consists 25 items was implemented to test the impact of a mobile laboratory on student attitudes towards learning science. Qualitative data were collected with two open-ended questions.

Participants

The subjects of this study were students from 10 different rural towns in Yozgat, Turkey. The research was carried out with 324 students consisting of 177 girls (54.6%) and 147 boys (45.4%) 111 students (34.3%) were sixth graders (age 12), 108 students (33.3%) were seventh graders (age 13) and 105 students (32.4%) were eighth graders (age 14). The mean age of all the participants was 13.08 years old (range = 11-15). All were full-time students and enrolled in general science classes.

The population of this study was all of the students in the middle schools in Yozgat city and some towns in its rural outskirts (Yozgat city, Sorgun, Akdağmadeni, Saraykent, Kadışehri, Çekerek, Sarıkaya, Boğazlıyan, Yerköy, Şefaatli), all of which are in the central part of Anatolia, Turkey. The area covers approximately 14,000 square kilometers. In order to improve their living conditions, people living in Yozgat tend to move to other cities or immigrate to other countries. Therefore, the population of Yozgat is decreasing at a rate of 22 for every 1,000 people each year, which was the 5th highest rate among the 81 cities in Turkey in 2013 (Türkiye İstatistik Kurumu [TÜİK], 2014). Pertaining to this area (Yozgat city and its rural outskirts), 2013 statistics showed that 19,819 out of the population of 401,743 individuals over the age of 6 were illiterate, and it is not surprising for this area that 16,054 of them were female. Additionally, 32.62% of the individuals over age 15 had only graduated from elementary school. The percentage of the students who attended high school was 72.92%, which was below the national average of 76.65% (TÜİK, 2014). According to research showing the development indexes of the cities in Turkey in 2012, Yozgat ranked 69th out of 81 cities (Gül & Çevik, 2014). In this area, there are many families with low incomes, with the average being $6,675 per year, which is among the lowest yearly incomes in Turkey (2011 statistics). 64,921 families living in poverty are receiving government aid in cash or in kind. Thus, most of the students there typically have less opportunity to access educational resources.

Intervention

In the first-day event of the MSL, there were demonstrations of thirty 'science is fun' hands-on experimental sets, titled as following: balance on a beak, a gyroscope, Magdeburg hemispheres, Euler-disc, resonance of a wire, radiometer, phonology with laser, Newton balls, Van de Graff generator, helix, heartbeats by a hearth drum, plasm-sphere, anamorphic mirrors, hearing test, electromotor, Peltier effect, piggy hologram, etc. The science programs of the schools did not include any of these activities in their curricula; however, they were performed in order to arouse students' interest in science.

During the following three days, 25 physics, 27 chemistry and 18 biology experiments that were taken from the nation-wide science curricula were conducted, and the data collection tool was administered to students on the fifth day. Students learned some facts and concepts in these science experiments, and also they learned how to think scientifically.

Biology experiments started with studying how to use a light microscope. Human cheek epithelial cells and onion cells were examined under the microscope. The parts of a flower and the germination process were taught. Bone and muscle structures were investigated. Each student learned how to determine blood cell types and checked someone's pulse. Students dissected at the heart of a recently slaughtered cow or sheep, and examined its structure. Some kidney, brain and eye examinations were also among the activities. Specifications of food, chlorophyll extraction, fermentation, cellular respiration and the importance of light in photosynthesis were investigated as well.

On chemistry day, the following experiments were performed: identification of element types, physical and chemical properties of matter, conservation of mass, condensation, melting and vaporization, sublimation, decomposition of mixtures by a magnet, distillation, precipitation, titration, crystallization, atomic and molecular structure, Le Chatelier's principle, electrolysis of water, solubility, decomposition of gases and liquids, reaction rate and identification of acids, and bases determination.

The physics experiments involved the following concepts: speed, force, mass and weight, conduction of electricity and heat, brightness of a bulb, colors, reflection and refraction of light, lenses, kinetic and potential energies, static electricity, series and parallel connections of conductors, measurements of current and voltage, and magnets and magnetic field.

Data Collection

The evaluation form had two parts, having both closed-ended and open-ended items. The first part, "Lab in a Lorry Questionnaire," which was developed by Barmby et al. (2005) and translated into Turkish by the researchers, was used as a data collection tool. In this part, there were 25 five-point Likert-type items, and they were rated as "Strongly Agree," "Agree," "Neither Agree nor Disagree," "Disagree," and "Strongly Disagree." The recommended translation method, "back-translation" (Behling & Law, 2000), was applied to the development of the instrument. The instrument was translated from English into Turkish; a different translator translated that version back into English, and then an English speaker compared the original instrument with the back-translation. Before the analysis, the negative items were recorded. The alpha reliability coefficient of the first part was found to be greater than .70 for each dimension by the researchers who developed this form. In this study, the alpha was found to be .85, which was ≥ .7, meaning that the scale was reliable (De Vellis, 2003). This instrument is appended to this article.

In the second part, the participants were asked two open-ended questions to obtain their feedback about the mobile laboratory practice. They were asked about whether they liked the MSL and prompted to give suggestions for improving the implementation of the MSL.

Validity and Reliability

In order for the validity and reliability of the open-ended questions, the opinions of the experts in the departments of science education and educational sciences were taken in every stage of the process. Qualitative data collection tools were used in this study to reveal an existing situation in detail. The main goal in qualitative studies must be to represent the subject properly and neutrally as far as possible in order to provide validity and reliability. Moreover, the researcher may ask the other researchers' opinions, who study in the same field, about the accuracy of the results.

This will help the researcher both with supporting the findings and with providing alternative explanations about those findings (Merriam, 1998).

It is believed that data collection instrument must observe the phenomenon as it exists and neutrally to provide the validity (Yıldırım & Şimşek, 2008). Besides, reporting the data in detail and explaining the process how the researcher came through those results are among the important criteria of validity of a qualitative study. For instance, it is important in a descriptive study to include direct quotes from the participants and explain the results based on these quotes (Yıldırım & Şimşek, 2008). Content analysis was used in this study and direct quotes from the participants were also given. The findings of the study were figured out as a result of the interpretation of raw data.

The reliability of a study is its possibility to give same or similar results when that study is repeated by another researcher in the same way. In order to increase reliability in qualitative studies, the researcher must define the processes followed during the research clearly, support it with related documents, develop the study gradually in a systematic way and present it. Besides, a database which can be used by other researchers should be constituted to reproduce the study (Yin, 2003).

In this study, open-ended questions, which were developed with the opinions of field experts, were directed to the participants and the data gathered from them were kept to analyze properly. Then, the data were coded by two researchers independently. To determine the consistency of the two researchers' coding, answers of the each question were dealed one by one and compared until reaching 100 % agreement. Five steps given below were followed during this coding and comparing process:

1. The data were sent to the other researcher after they were read and the necessary corrections were made by the first researcher.

2. Other researcher coded the raw data without seeing the codes and themes of the first researcher.

3. The researcher coded the data superficially firstly. The aim here was reviewing the whole data and having a holistic view. In the second reading, the researcher determined the possible codes, gathered the similar codes under one code in the third reading, determined the themes in the fourth one and reviewed the accordance of the codes and themes in the fifth reading and specified the final state of each category. Then he constituted the draft form by counting the codes in each category.

4. After receiving the feedback from the second researcher, the first researcher specified the number of the codes of the second researcher and added them into the draft form in order to compare his own number of codes. Then he determined the common, similar and different codes.

5. Finally, the two researchers came together, discussed the similar and different codes. Similar codes were put under a code that was accepted by both of the researchers. For the different codes, some of them were either changed totally, or they were included in a code that was agreed by both of the researchers.

Data Analysis

The quantitative instrument was tagged with variables and analyzed with SPSS 17.0 in order to understand the research question. The open-ended section of the instrument was analyzed with descriptive statistics. Descriptive analysis consisted of the summary of the data according to prespecified categories. Direct quotations are frequently made in this method (Elliott & Timulak, 2005). In this context, the thoughts and suggestions of the participants were examined and categorized according to similar features. The criterion of the category determination process was that there should be at least ten participants who expressed similar thoughts.

Findings

Question 1. The first research question was about the students' thoughts regarding the MSL practice. Data were collected with 25 five-point close-ended Likert-type items, and the results are given in the Appendix. The appendix shows that the students who participated in the activities were generally pleased with the practice, and they thought that a mobile laboratory was a useful tool in science education.

When some distinctive items were analyzed in detail, it was seen that a mobile laboratory visit aroused more motivation in rural Turkish students to take part in scientific research (89.8%) and increased their interest in science (94.5%) and in doing scientific discovery (86.7%). Additionally, 84.9% of the students stated that instructors in the MSL were very enthusiastic about science, and 94.7% stated that they were good at science. When the opinions of the students about the experiments in the mobile laboratory were examined, it was found that the experiments were not boring (93.2%), but exciting (94.5%), enjoyable (92.7%), interesting (97.2%) and comprehensible (81.8%), and the students thought that the instructors explained the experiments well (92.6%) and were pleased with the instructors' manner of talking (92.9%). In addition, 94.7% of the students stated that a mobile laboratory was one of the best ways of learning science; 92.3% stated that a mobile laboratory would help them with their science classes; 91.7% said that this visit provided them with much information about science; and 96.6% stated that they enjoyed visiting the laboratory very much. Moreover, rural Turkish students' responses showed the following findings: they preferred to learn science in the mobile laboratory rather than in the classroom (77.2%); they requested for the mobile laboratory to visit them more often (94.6%); the mobile laboratory made them familiar with science (92.3%); they would recommend the mobile laboratory to their friends (98.5%); and they wanted the mobile laboratory to visit them again (97.2%). In addition, 91.0% of the students thought that the mobile laboratory should visit more schools, and 62.0% thought that the mobile laboratory had made them want to become scientists in the future.

Question 2. The participants were asked two open-ended questions in order to determine what they liked most in the MSL. The qualitative data were coded and analyzed. The most popular hands-on demonstrations were (the number in parentheses indicates how many participants chose this item as their favorite): heartbeat (102), plasma sphere (98), blood test (25), optics demonstrations (21), piggy hologram (17), chemistry experiments (13) and Newton balls (12). It can be concluded from their other statements that 48 participants enjoyed all of the experiments, 21 participants enjoyed all activities in the MSL, 18 participants found the MSL to be entertaining, exciting or interesting, and 17 participants commented on the high level of knowledge of the instructors.

The statements of the students showed that they enjoyed and appreciated the heartbeat and plasma sphere demonstrations the most. For instance, two of the students who enjoyed them the most stated, "I really liked the drum in heartbeat demonstration," and "the sound of the drum for demonstrating heartbeat was really interesting, I liked it." Similarly, one student stated that the "plasma sphere demonstration was the one I liked most in the mobile laboratory." Moreover, the statements of the students who stated that they liked all the demonstrations in the mobile laboratory were as follows: "As the demonstrations were visual, I liked them all," and "I really liked all the demonstrations; they were informative." These results are parallel with the results of the quantitative findings of this study.

Question 3. The ideas of the participating students to improve the MSL unit were also solicited by asking an open-ended question. Some frequent responses were about the need to improve the physical conditions and equipment. The suggestions pertained to the following concerns: bigger or more rooms (117), improving the experiments (115), increasing the number of experiments (94), more time for the experiments (69), more visits of the MSL (45), more durable equipment (45), making students more active (32), increasing the number of tables and chairs (26), more technology-based experiments (12) and a more quiet environment (10). It can be concluded that the students believed that the laboratory area in the mobile vehicle should be enlarged, some experiments needs some improvements, the number of the experiments as well as the number of tables should be increased, and the laboratory should visit more schools. Two students stated, "I think this is good but the lorry could be bigger," and "I want you perform more impressive experiments." These suggestions can be used to advance the system and to increase the efficiency and effectiveness of the MSL. Moreover, a remarkable finding is that a great number of the students (N = 115) were totally pleased with the mobile laboratory, and they said that there was nothing missing in the mobile laboratory. The statements of these students were such as follows: "There is no need for extra things. Everything is perfect." "What more could I ask for?"

It can be said that the participants were pleased with the mobile laboratory, they perceived this mobile laboratory as useful and efficient, and they learned and had fun at the same time. However, the students suggested that the mobile laboratory should be bigger, the physical conditions of the laboratory such as the number of tables, chairs and equipment should be increased, and the mobile laboratory should visit more schools.

Discussion

Today, educating scientifically literate individuals is a necessity for countries in order to keep pace with the developments in science and technology. However, considering that students think science courses are difficult and boring in general (Bennett, 2001), and Turkey has ranked poorly in international examinations (such as PISA in particular). This indicates that new or alternative methods should be used especially in rural parts of the country to teach and learn science.

Mobile science laboratory (MSL) idea is an innovative approach for rural parts of Turkey. The flexibility and accessibility of these laboratories provide opportunities to support teachers working in rural areas and raise their content knowledge pedagogical skills. Consequently, MSL practices may contribute to the learning science of students in rural areas and may arouse their interest and curiosity as well as their scientific literacy.

The "MOBILIM" project was a MSL project supported by European Union (see Acknowledgement) and provided equal opportunities to the teachers and students in rural areas. The idea came up to decrease the inadequacy of experimental activities in science courses thought in rural parts of Turkey. To sustain similar experiments carried out by teachers during their lectures in rural and low-income areas, most of the experiments were performed with simple hands-on equipment.

Consequently, it is thought that MSL practices may contribute to the learning of science by students in rural areas and may arouse their interest and curiosity, as well as their scientific literacy. In order to sustain similar experiments carried out by teachers in rural and low-income areas, most of the experiments were performed with simple hands-on equipment.

The findings of the research show that the students who participated in the MSL activities were quite pleased with the practices. They learned while having fun, their interest in science and learning was raised, they described the practices as fruitful, and they thought these kinds of practices should be carried out more often and widely.

These results were parallel with the findings of "Lab in a Lorry," which was based on MSL practices and was carried out in the UK in 2005 with 500 students (Barmby et al., 2005). Moreover, students suggested that the mobile laboratory should visit more schools, that longer time periods should be provided for the experiments, and that new experiments should be developed. It can be concluded that the mobile laboratory is a practical method to increase students' interest in science, as well as their academic achievement. The mobile laboratory also promoted positive attitudes towards science and provided an enjoyable learning experience. It can be stated that the students were pleased with participating in.

Suggestions

Consequently, it is suggested that the number of MSLs should be increased. These laboratories may be assigned for all cities and they may circulate all of the rural villages/towns of that city. The impact of these practices on the students and teachers ought to be studied in different fields and grade levels by using contemporary methods. The effects on different variables such as motivation, attitudes, understanding, problem solving skills and scientific process skills of the students and views, beliefs and perceptions of the teachers should be studied. The results of further studies are to be published to provide the needed contributions to experimental science education and to take advantage of the broad range of benefits of these mobile laboratories offer, not only to students, but also to educators and policy makers. It is believed that these kind of studies will increase the quality of science teaching and learning in rural areas.

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Appendix

Students' Responses about the MSL and Descriptive Analysis of Them

	Strongly Agree (1)		Agree (2)		Neither Agree or Disagree (3)		Disagree (4)		Strongly Disagree (5)				Minimum	Maximum
	N	%	N	%	N	%	N	%	N	%	X	SD		
1- Visiting the mobile laboratory has made me want to study more science in the future	200	61.7	91	28.1	25	7.7	3	0.9	5	1.5	1.52	0.804	1	5
2- Visiting the mobile laboratory has made me more interested in science	241	74.4	65	20.1	16	4.9	2	0.6	-	-	1.32	0.595	1	4
3- Thanks to the mobile laboratory, I want to find out more about science	174	53.7	107	33.0	34	10.5	7	2.2	2	0.6	1.63	0.805	1	5
4- The people on the mobile laboratory were very enthusiastic about science	203	62.7	72	22.2	32	9.9	10	3.1	7	2.2	1.60	0.941	1	5
5- Mobile laboratory is a really good way of learning science	244	75.3	63	19.4	10	3.1	3	0.9	4	1.2	1.33	0.699	1	5
6- I thought the experiments on the mobile laboratory were boring	4	1.2	9	2.8	9	2.8	33	10.2	269	83.0	4.71	0.760	1	5
7- The experiments on the mobile laboratory were exciting	253	78.1	53	16.4	14	4.3	4	1.2	-	-	1.29	0.605	1	4
8- Mobile laboratory has helped me with my science lessons	226	69.8	73	22.5	21	6.5	3	0.9	1	0.3	1.40	0.680	1	5
9- I thought the experiments on the mobile laboratory were really interesting	265	81.8	50	15.4	8	2.5	-	-	1	0.3	1.22	0.507	1	5
10- I learnt a lot about science when I visited mobile laboratory	183	56.5	114	35.2	18	5.6	7	2.2	2	0.6	1.55	0.751	1	5
11- I really enjoyed visiting mobile laboratory	270	83.3	43	13.3	7	2.2	4	1.2	-	-	1.21	0.535	1	4
12- I prefer to learn science on the mobile laboratory than in the classroom	180	55.6	70	21.6	50	15.4	13	4.0	11	3.4	1.78	1.064	1	5

	Strongly Agree (1)		Agree (2)		Neither Agree or Disagree (3)		Disagree (4)		Strongly Disagree (5)				Minimum	Maximum
	N	%	N	%	N	%	N	%	N	%	X	SD		
13- I think mobile laboratory should visit a lot more often	272	84.4	33	10.2	8	2.5	6	1.9	5	1.5	1.27	0.737	1	5
14- I would recommend mobile laboratory to my friends	269	83.0	47	15.5	7	2.2	1	0.3	-	-	1.20	0.470	1	4
15- Mobile laboratory has put me off science	12	3.7	7	2.2	6	1.9	32	9.9	267	82.4	4.65	0.917	1	5
16- I would really like to visit mobile laboratory again	288	88.9	27	8.3	7	2.2	2	0.6	-	-	1.15	0.453	1	4
17- The people on the mobile laboratory were good at explaining science	246	75.9	54	16.7	17	5.2	5	1.5	2	0.6	1.34	0.706	1	5
18- I found it difficult to understand what the people on the mobile laboratory were saying	17	5.2	12	3.7	19	5.9	51	15.7	225	69.4	4.40	1.102	1	5
19- I really enjoyed the experiments on the mobile laboratory	276	85.2	41	12.7	4	1.2	1	0.3	2	0.6	1.19	0.519	1	5
20- The experiments on the mobile laboratory were difficult to understand	15	4.6	21	6.5	23	7.1	70	21.6	195	60.2	4.26	1.133	1	5
21- I liked the way that the people on the mobile laboratory talked	239	73.8	62	19.1	16	4.9	3	0.9	4	1.2	1.37	0.732	1	5
22- I think mobile laboratory should visit more schools	258	79.6	37	11.4	17	5.2	6	1.9	6	1.9	1.35	0.817	1	5
23- Visiting mobile laboratory has made me want to become a scientist in the future	104	32.1	97	29.9	87	26.9	21	6.5	15	4.6	2.22	1.106	1	5
24- The people on the mobile laboratory knew a lot about science	244	75.3	52	16.0	16	4.9	7	2.2	5	1.5	1.39	0.808	1	5
25- I think it is better to learn science in class than visiting the mobile laboratory	42	13.0	24	7.4	47	14.5	49	15.1	162	50.0	3.82	1.443	1	5