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The Effect of Teaching and Learning in Native and Foreign
Language on Students' Conceptual Understanding in Science in
a Lebanese Context

By

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Dedication Page

To my loving parents

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The Effect of Teaching and Learning in Native and Foreign Language on Students’
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Hiba Jawad Bayloun

ABSTRACT

The effect of teaching and learning science in native and/or foreign language has been explored by various literature studies. Studies have shown different results, however, minimal research investigation has been conducted in Lebanon. The purpose of this study is to explore the effect of language on Lebanese students’ conceptual understanding of science. The research design that was used in this study is a causal comparative design. It was considered to study differences among Lebanese students who learn science in native and foreign language. The results have shown that Lebanese students who learned the science unit “Light” in their native language, Arabic, had less misconceptions than the other Lebanese students who learned the unit in the foreign language, English. The outcome suggest that learning science in a foreign language can influence students conceptual understanding and hence student’s performance.

Keywords: Language, Science, Conceptual Understanding, Language Proficiency, Native Language, Foreign Language, MEHE.

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List of Abbreviations

MSA	Modern Standard Arabic
SA	Students studying in Arabic
SE	Students studying in English
LEP	Limited English Proficiency
MEHE	Ministry of Higher Education
CERD	Center for Educational Research & Development

Chapter One

Introduction

1.1 Overview

Lebanon is a country along the eastern shore of the Mediterranean Sea and is well known for its diversity and openness among its population and toward external cultures. While Lebanon is a polyglossic country, Arabic is the official language. Although there is no known statistical evidence, anecdotal evidence suggests that the majority of the Lebanese people acquire the ability to speak English, French, or both by the time they are adults. The Lebanese educational system does not depend on, nor implement the same standards in all its educational institutions; in fact, the Lebanese educational structure contains various educational systems that are based on foreign educational systems such as the American, French, British, German systems, among others. The highly ranked universities in Lebanon are in fact, the French or English universities (World Web Ranking, 2015). It is for this reason that there is a need to explore the effect of the native language versus the foreign language when teaching and learning science.

According to Wellington and Osborne (2001), “almost all teaching and learning takes place using the medium of language, verbal and non-verbal.” (p.98). The implication here is that language is associated with the individual’s conceptual understanding of a concept within a specific content area. In order to acquire a language,

the individual needs to learn all the skills of the language: the oral language including listening, speaking, and reading, and the written language. In multilingual societies, as in the case of Lebanon, children follow a curriculum that focuses on three languages: English, Arabic and French. According to Bhattacharya and Suaalii (2008), “Learning through a foreign language compels the students to concentrate on cramming instead of mastering the subject matter.”(p. 112). Hence, the student will have difficulty in conceptually understanding the concepts learned if instructions are given in a foreign language.

Multiple studies have examined the effect of language on students’ conceptual understanding in science. For example, according to Johnstone and Selepeng (2001), “students struggling to learn science in a foreign language lose at least 20% of their capacity to reason and understand in the process” (as cited in Kocakulah, Ustunluoglu & Kocakulah, 2005, p.5). Similarly, Short and Spanos (1989) highlight “basic proficiency is not adequate to perform the more demanding tasks required in academic courses since students do not have exposure to, or lack an understanding of the vocabulary and context-specific language” (as cited in Kocakulah, et al, 2005, p 2). In other words, students will not be able to conceptually understand science concepts because of the foreign language demands.

Furthermore, Wellington and Osborne also discussed the importance of language in science education. They highlighted that “every science lesson is a language lesson.” (2001, p. 2). In addition, according to the National Curriculum of England (1999) students should be taught the technical and specialist vocabulary of subjects and how to use and spell these words. They should also be taught to use the patterns of language

vital to understanding and expression in different subjects. These include the construction of sentences, paragraphs and texts that are often used in a subject (for example, language to express causality, chronology, logic, exploration, hypothesis, comparison, and how to ask questions and develop arguments). (as cited in Wellington & Osborne 2001, p.69). With the above in mind, it is evident that the learning and teaching of subjects like mathematics and science has moved into understanding the language of scientific concepts and transformed from the factual memorization into wider analysis and interpretation of words rather than concepts.

Besides, according to BouJaoude and Sayah (2000), it is significant for children to learn science in their native language. (as cited in Amin 2009), On the other hand, BouJaoude and Sayah “resisted the implication that science education should be conducted in Arabic in the Arab region urging caution in generalizing existing research results to the region and noting that there is an absence of locally conducted research that tackles this question”(p.2). Therefore, there is a need to study whether learning in native and foreign language can affect students' conceptual understanding in science.

According to Al-Batal (1996) and Haeri (2000), the Arabic language has a distinctive feature characterized by the diglossia occurrence. According to Ferguson (1959), diglossia is defined as “the co-existence of two varieties” (p. 75). The spoken language in Lebanon is known as the colloquial Arabic or the Ammiye which comprises of French and English expressions. The other Arabic language is known as the Modern Standard Arabic (MSA) or the Fus’ha which is the formal written Arabic used in all official paperwork, television news broadcasts, and, pertinent to the current study, in the

teaching of the Arabic language. In the present study, the terms Ammiye will be used to refer to the colloquial Arabic, and MSA to refer to the Fus'ha Arabic. (Dakwar, 2005).

1.2 Significance of the Study

This research study is significant in exploring the effect of language on students' understanding of science. This study will be beneficial to teachers, instructors and educators to take into consideration the effect of language on scientific subjects when developing a curriculum. Moreover, the results can offer teachers information on how they can enhance students understanding of science taking into consideration language learning. Accordingly, this research might suggest recommendations for science teachers in Lebanon about teaching science in a foreign language.

1.3 Purpose of the Study

The purpose of this study is twofold:

- To explore the difference in the conceptual understanding of a scientific unit between the Lebanese students who study science in their native language (Arabic) and those who study science in a foreign language (English).
- To generate recommendations for more effective ways to teach in terms of language use of instruction and instruction materials.

1.4 Research Question

The present study will address the following questions:

- Are there group differences between 5-7 years old children studying science in their native language (Arabic) and those studying in a foreign language (English)?

- If there are differences, what are those differences?

1.5 Independent and Dependent Variables

- Independent variable: understanding science concepts
- Dependent variable: native and foreign languages

1.6 Definitions of Terms

Science: In this paper, the word science means “(knowledge from) the careful study of the structure and behavior of the physical world, especially by watching, measuring, and doing experiments, and the development of theories to describe the results of these activities”(Cambridge dictionaries, 2015).

Language is “the method of expressing ideas and emotions in the form of signs and symbols. These signs and symbols are used to encode and decode the information.” (Singhal, 2012, p.2.)

Native language is “the first language learned by a baby is his or her mother tongue. It is the language, which he or she listens to from his or her birth.” (Singhal, 2012, p 2)

Foreign language: foreign language is defined as “English as taught to people whose main language is not English and who live in a country where English is not the official or main language” (Cambridge dictionaries, 2015). In this paper foreign language will be used to mean “any language learned or acquired is known as the second language.” (Singhal, 2012, p.2)

Conceptual understanding: Conceptual is defined as “relating to ideas or concepts” and understanding is defined as “the power of comprehending; the power to make

experience intelligible by applying concepts and categories” (Cambridge dictionaries, 2015). In this paper conceptual understanding will be used to mean the ability to relate and make connections between ideas and concepts based on one’s understanding.

Language proficiency: Proficiency is defined as “advancement in knowledge or skill.” (Cambridge dictionaries, 2015) In this paper language proficiency will be used to mean advanced knowledge of a language.

According to the Ministry of Education and Higher Education (MEHE), preschool, cycle 1 and cycle 2 are defined as follows:

Preschool refers to grade level nursery, KG1, KG2 for students whose age ranges between 3 and 5 years old.

Cycle 1 refers to grade level 1, 2, 3 with age ranges between 6 and 8 years old.

Cycle 2 refers to grade level 4, 5, 6 with age ranges between 9 and 11 years old.

1.7 Limitation and Assumptions

“Limitations are conditions beyond control of the researcher that will place restriction on the conclusion of the study and its application.” (Best and Kahn, 1993:40 as cited in Anderson 2006).

There are two major limitations for this study. One of the main limitations is an absence of focus on teachers’ language proficiency. For instance, the teacher considered in the study can be proficient in one language over another, and yet still teach in the less proficient language. Moreover, s/he can also be comfortable and prefers one language over another, thus teaching better in one language over the other. To compensate for this

lack of research, the use of supporting data about the teachers language proficiency was gathered from the classroom observation. This secondary data will support the results for the process learning.

Another limitation for the study is related to the selection of 21 students from a selected school in central Beirut. Therefore, no generalization can be made about what language to use in Lebanon since the native language in one school and one location can be different than in another. However, such a limitation is quite acceptable because the main goal of the study is to see if language is a barrier no matter what the language is.

Chapter Two

LITERATURE REVIEW

2.1 Overview

The effect of teaching content matter in a foreign language has been widely explored in multilingual and diglossic communities. (Amin, 2009; BouJaoude & Sayah, 2000; Johnstone & Selepeng 2001; Kocakulah et al, 2005) Particularly, the Middle East is a region that has been looked into. However, the Lebanese context has not been explored. This literature review illustrates aspects of science learning in Lebanese schools.

Chapter two is organized as follows:

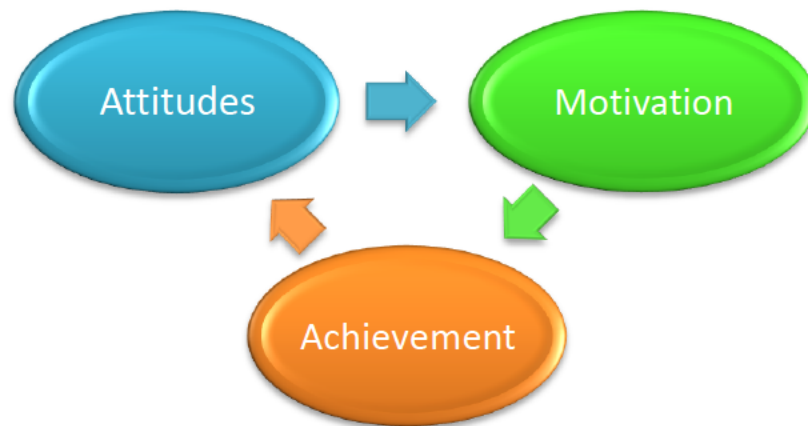
- Factors that affect student's academic performance
- The role of language in learning science
- The useful language development strategies in teaching science in english
- Lebanese education system
- The Lebanese science national curriculum
- Science in Arabic language
- Problems with Arabic fluency teaching

2.2 Factors that affect student's academic performance

Many studies reveal “attitudes and motivation are significant in determining linguistic proficiency and achievement” (Dörnyei, 1996, 1998, 2001, 2003; Gardner,

1985, 2001, 2004; Oxford, 1996; Oxford & Shearin, 1994, as cited in Sinno, 2008). Moreover, Dornyei adds that motivation is not only at an individual level but also motivation stems from a social unit and is associated to different cultures (1998,p. 130) . According to the socio-educational model represented by Gardner (1985), “attitude toward learning a second language is related to motivation and achievement.” Sinno adds that “Gardner’s socio-educational model of second language acquisition that set the groundwork for most motivation theories.” (Figure 1) (Sinno, 2008, p. 22). In other words, attitudes and motivation are related and can influence language learning and the use of language inside and outside the classroom.

Figure 1: Gardner’s Socio-Educational Model



Due to the absence of a relevant research, there is no evidence in the Lebanese context of whether students have a negative or positive attitude towards learning science in a foreign language. However, the above figure shows that there is a need to have a positive attitude and motivation towards learning a second or a foreign language.

Not only motivation and attitude affect student achievement but also the teacher’s teaching style can affect student’s performance. According to Omrod (2008),

some students are “verbal learners” and others are “visual learners.” He added that verbal learners are students who learn best when information is presented to them verbally through words whereas, visual learners are students who learn best when information are presented in “form of pictures.” (as cited in Mlambo, 2011, p. 81). Moreover, Mlambo added that some learners can also be “multimodal.” (2011). In other words, students can be visual and verbal learners at the same time.

Furthermore, Kamuche (2005) suggested that “students have different learning styles in the ways they take in and process information.” He added that some students understand information when they see and hear while others they learn and understand best when they reflect, act, memorize and/or visualize (p.35). Accordingly, this implies that teaching and learning style have an essential factor on the student’s performance and achievement.

Although motivation, attitude, and teachers teaching style can play a role in language learning as mentioned earlier, this paper will focus on the effect of language on understanding science.

2.3 Role of Language in Learning Science

Henderson and Wellington (1998) state that the quality of the language presented in the classroom is connected to the quality of learning. Furthermore, Wellington and Osborne explain that the development of language is associated with conceptual development. In other words, to think one needs language and to use language one needs to think. This explanation illustrates that when the learner is using words (language), he or she is developing concepts.

Osborne and Wellington (2001) suggests that the language in all its forms matter to science education. Particularly, it is not about the used language in the educating process, but it is about how the educators are using it within their classrooms.

This question of “what are educators doing with the language?” has been shown to impact how the learner uses the language, which, as previously mentioned, is fundamental to the science learning. Thus, when referring to language while learning science, Wellington and Osborne (2001) highlighted the importance of language in science education. They explained that one of the most significant characteristic of science “is the richness of the words and terms it uses; students need to at some point to be able to advance into “abstract” thought with the use of language, if they are to master key scientific concepts” (as cited in Kim, 2007, p.48).

Henderson and Wellington (1998) pointed out that language is the utmost obstacle to learning science. (p.35). One of the most important reasons to why students with Limited English Proficiency (LEP) have language as a barrier is that the technical and non-technical scientific terms is not common and is rarely used in English or any other contexts. Jarret (1999) argues that the language used socially is more concrete than language used in academic contexts. In science education, common terms can have special contextualized meaning. Furthermore, one of the challenges LEP students encounter while learning science is the expectation for learning a new language while understanding scientific abstract concepts all at once. Therefore, it is expected from LEP students to struggle when scientific concepts become more abstract because they experience difficulties in the language used.

In addition to learning the scientific language in science education, scientific experience and explorations play a major role to learning science. Osborne and Wellington (2001) state that “experience would suggest that science teachers often consider it to of marginal relevance to the learning of science.” (p.1). Moreover, Osborne and Wellington suggest that in general, while teachers focus on content, they do not identify language learning opportunities (2001). Therefore, there should be an exerted effort in developing the scientific language combined with the development of scientific concepts and not language development as a separate entity.

2.4 The Useful Language Development Strategies in Teaching Science in English

The development of language includes the development of speaking, listening, writing, and reading skills. Shaw (2002) suggests that the science teacher is required to identify the language requirements to help learners understand science. He adds that the science teacher can develop language demands in science teaching through simple graphic organizers, worksheets.

According to Crawford (1995) “students learn new terminology and word meanings best when they encounter them during purposeful activities and investigations. Therefore, teachers will want to teach vocabulary as part of their core instruction and not as a separate activity.” (p. 16). Henderson and Wellington (1998) further explains that “directed activities related to texts (DARTS)” can be helpful and essential in supporting students understanding of context. DARTS can either be used in activities with modified texts or finding essential targets in the text. Moreover, they added that “word games” is a purposeful activity that can actively engage students in the texts. Word games might

require more planning and preparation from the teacher; however, it definitely supports students understanding of the text. In order to understand more how such language development strategies may be implemented, the next section turns to a description of the Lebanese Education System.

2.5 Lebanese Education System

The Lebanese Education System is made up of two sectors - the private and the public. The private schools charge students for admission, while the public schools provide their services for little to no charge. Thus the educational system is such that it can be available to all Lebanese people. The Center of Education and Research Development (CERD) in Lebanon is in the capital city, Beirut. During the 15 years Lebanese Civil War, the Lebanese Education System suffered yet survived. The Lebanese education system was at a time the exclusive responsibility of the religious communities of foreign groups to increase the number of students in the public schools (Frayha, 2009). After the civil war there was a pressure on the government to establish additional public schools to meet the increasing public demand. Thus, more private foreign schools opened and impacted the language used in teaching.

In addition, there is a marked difference in the elementary phase of the educational system between the public and private schools; in the public schools, students were not allowed to enter the school before reaching the age of 5 years. Recently, however, the ministry has opened registration for children as young as 4 years of age accepting them into preschool. In private schools, children attend a year in the nursery school, a year in KG1 and a year in KG2.

According to the Ministry of Education and Higher Education (MEHE), the languages of instructions in Lebanese public and private schools as follows: (Lebanese Association for Educational studies, 2016; Yaacoub & Badre, 2012;)

- Subjects taught in Arabic are: Arabic, geography, history, and civics
- Other subjects are taught in foreign language (English or French): physics, chemistry, biology, science, foreign language

In other words, some schools consider the native language (Arabic) as the primary language of instruction, while the foreign language (English and French) are taught as subject and not as language. Other schools use the foreign language (French or English) as languages of instruction.

2.6 The Lebanese National Science Curriculum

According to the Ministry of Education and Higher Education MEHE (1997), the Lebanese national science curriculum in cycle 1 and 2 in private and public schools are comprised of the basic concepts in science education. The curriculum also emphasizes the manual and mental skills of science, as well as life skills. The aim of the curriculum is to connect science and make it more relevant to the students' daily life. The topics of the curriculum are summarized into six themes: (MEHE, 1997)

- 1- Animals and their habitats
- 2- Plants and their habitats,
- 3- Man and his health,
- 4- Matter and energy
- 5- The earth and the universe
- 6- Man and the environment.

Moreover, cycle 1 and 2 science objectives and content were developed according to the “contemporary developments in the science technology society and the new educational development outlook in Lebanon.”(MEHE, 1997). Furthermore, the selection and the organization of the items are based on interdependence, sequence, balance, and comprehensiveness. As for the strategies, a child- centered approach is considered to develop the curriculum, tend to the needs, abilities, and the interests of the students. (MEHE, 1997)

The Lebanese science curriculum is an integration of a system of:

- Content
- Instruction
- Objectives
- Evaluation

1. The Lebanese national curriculum content is described as follows:
 - a. Structure
 - b. Content
 - c. General and specific objectives
2. The assessments items are classified according to scientific inquiry.
 1. Ask a question
 2. Research the topic
 3. Construct a hypotheses
 4. Test your hypothesis by doing an experiment
 5. Analyze your data
 6. Report result

A. The structure

The content focus for this study will be extracted from the science curriculum of the elementary level in the first year. The following is the content represented in the curriculum:

- ✓ Matter and energy
- ✓ Importance of the sun for the earth
- ✓ Effect of clouds on sunlight
- ✓ Role of air in moving objects
- ✓ Role of water in moving objects

B. Objectives:

The objectives of the science curriculum that are related to the topic can be summarized as follows (MEHE, 1997):

- ✓ communicate orally, in writing, and by symbols
- ✓ name the sources of heat, relating the changes of state to heat, and inferring the effect of force on objects
- ✓ measure length, temperature, and time through the usage of suitable devices
- ✓ carry out guided simple experiments and practice problem solving within the context of what is studied
- ✓ develop of self-confidence through individual activities, exploring environment, and beginning to understand the organization of human body
- ✓ develop cooperation, respect, and positive interaction with others through learning

- ✓ develop orientation of the inherent curiosity into interesting science activities

2.7 Science in Arabic Language

The teaching of science in the Arabic language is implemented in several Lebanese private and public schools in cycle 1 and 2. As previously mentioned, science education and language are interconnected. Science lessons are rich with scientific words and terms. When looking into the Arabic national text book, it is a *translated* version from English language into the native language, Arabic (See Appendix A). The book includes scientific words used in the foreign languages that are considered hard for the students to grasp in their native language.

Furthermore, schools who teach science in Arabic in cycle switch into the foreign language, English or French, when reaching cycle 2. With this sudden switch, students will face difficulty when learning science in the foreign language.

2.8 Problems with Arabic Fluency Teaching

Although most private schools have English or French as their primary language, some schools still give the scientific subjects , math and science, in Arabic. However, students who learn science in Arabic and not in the foreign language could potentially face several challenges.

The first challenge is the sudden switch to a foreign language. When students reach grade six, they switch into the non-native language, which is English and/or French. Academically this could potentially lead to failure, and give them difficulties they might face in understanding new scientific concepts in the non-native language and even making connections with previously learnt concepts. On the other hand, teachers in

the higher grade levels might face challenges when transferring the curriculum into the non-native language; as previously mentioned, the curriculum at the higher grade levels are taught in that non-native language. At this point, students coming from the first cycle are used to the Arabic language, the native language, and this already poses major challenges in ensuring continuity in the children's learning.

As a result, a child might build a weak basis/foundation as s/he progresses from one grade level to the next. Those students that started learning science in the Arabic language might encounter difficulties. The learning of science is comprised of several scientific terms, which are typically taught as the translated version of the foreign language into Arabic. Those expressions tend to be difficult to pronounce, understand and learn in Arabic.

Most of accredited universities in Lebanon teach science education in a foreign language. Mostly, teachers in Lebanon receive their education degrees with an emphasis in science through French or English program. Therefore, there is limited availability of teachers who teach science in Arabic. So, even if science is taught in the students' native language (Arabic) the question arises here: Are teachers qualified to teach it in Arabic since most accredited universities have their BA in science education in a foreign language (English or French)?

Chapter Three

METHODOLOGY

In spite of the large number of studies that discuss the influence of language on students' academic performance, there are relatively few investigations on the effect of language on scientific topics like mathematics and science. The purpose of this paper is to study the effect of language on students' conceptual understanding of science when taught in native and foreign languages. It will examine the relationship between two significant factors: Language proficiency, acquisition and understanding of scientific concepts.

3.1 Design and Procedures

The research methodology used in this study is a causal comparative design. It is a combination of a quantitative and qualitative research. It was chosen because limiting the research to quantitative research will only allow comparison among group of respondents based only on mean values. The aim of this design is to determine the effect of language on students' conceptual understanding of science. According to Kravitz, (1994), "causal-comparative research attempts to identify a cause-effect relationship between two or more groups." (p.4). Thus this design was considered to study group comparison between students taught in native and foreign languages. All required permissions to carry out the study were attained prior to data collection through the IRB. The study was conducted over 3 weeks.

3.2 Sample

The sample was selected from a middle class private school. One section from grade level two was chosen; this grade level was chosen because students at that age, in private Lebanese schools, are already in the process of developing the basic skills of the second language.

The sample consists of twenty-seven second grade students whose age ranges from 6 to 8 years old. The class's science teacher was chosen to teach both group of students, the SA and the SE. the same teacher was selected to teach both groups to ensure similarity in teaching approaches. The science teacher is a university graduate with a Masters Degree in Science Education. According to the school's teaching philosophy, teachers should use the student- centered approach with hands- on activities to explain their lessons. Throughout the data collection, the researcher observed the teacher in class to monitor the teaching process and to make sure that the teaching strategy matched the criteria defined.

3.3 Instruments:

For the purpose of the study, a parents' questionnaire, a conceptual understanding pre- and post-assessment tool, a classroom observation form and a science text book evaluation is used. The questionnaire's results were used to study students' background language. (Appendix B). Once the questionnaire was administered, the students were categorized in two groups either, the English-speaking or the Arabic speaking group. Then, a pre- and post- assessment followed. Every group received a pre- assessment according to their assigned group. The pre- assessment tested

students' prior knowledge about a science topic. Then, the science teacher started the science while the researcher conducted classroom observation was conducted. Later, a post- assessment was administered. The post- assessment determined student's conceptual understanding level about the science topic. After the pre- and post-assessment, a book evaluation will be conducted according to a certain criteria. (See Appendix F)

3.4 Framework for Analyzing Data

The qualitative research method reflects more on the how and why of the decision making process through studying the background of children's language and its effect on their learning. The procedure is a multi-focal method in its questioning, answering, and exploring. The process is extremely useful in the construction of scientific experiments. The methods of the qualitative research are based on recordings, and students' answers and explanations.

3.4.1 Questionnaire

A consent form was distributed with the questionnaire. (See Appendix D). It assured the parents about the confidentiality of the information provided. It mentioned that names of the students will not be shared and only the researcher will have access to the data. The questions were directed for all members in the household. The questionnaire developed was influenced by the "Home Language Questionnaire HLQ" (NYSED, 1997) that assesses the child's spoken language at home. The questionnaire was also developed based on that questionnaire in addition to the seven guidelines for designing a useful questionnaire offered by Leary (1995).The seven guidelines for designing a useful questionnaire offered by Leary (1995) that will help us are as follows:

1. The usage of precise terminology in the questions phrasing:
 - a. “What language/s does the mother speak at home?” in this example we can detect the suitable terminology in asking the question which is characterized by its clear phrasing, simplicity, and being straight to the point.
2. Questions should be written in the simplest possible way, while the designer should avoid the usage of unnecessary jargon, cumbersome phrases, and difficult words:
 - a. “What language/s does the father speak at home?” in this example we can notice that the question is designed with the minimum needed words without adding any complex phrases or difficult words.
3. Avoiding the making of unwarranted assumptions regarding the respondents:
 - a. “What language/s does the helper/maid speak at home?” in this example we can notice that in the question there is no way for unwarranted assumptions regarding the respondents when the question is direct and related to one point, and the answer is confined in two or three options.
4. The key idea of the question should be preceded by the conditional information:
 - a. “What language did your child first learn?” in this example we can notice the questions were designed to provide conditional information before the idea of the question, in this example the conditional information is the first learned language.
5. Avoiding the usage of double-barreled questions which means asking several questions in one question with the opportunity of one response:

a. “What language was used in your child’s daycare?” in this example and in the above examples we can notice that each question has one answer, and the question are waiting one response. The questions are holding one question only.

6. Choosing a suitable format of response:

a. “What language does your child usually speak?” in this example and the other examples we can observe that the needed response is to choose between given answers.

3.4.2 Pre and Post assessments:

According to Barge (2007), “pre-and post-assessment was used to take the element of guessing at answers to test questions.” The pre- assessment was used to assess students’ background knowledge about the topic. The post- assessment was to evaluate the students understanding of the topic after the class was exposed to the unit from the science curriculum. (Appendix C). Before the experiment, a planning meeting was held between the science coordinator, the science teacher, the Arabic teacher and the researcher. They discussed the planning procedure in details for both languages, English and Arabic. They decided that the teaching sessions are going to be similar in activities and investigation but differs in the language. They included the exact same activities and worksheets but in two languages. Furthermore, the science teacher and coordinator created the pre- and post- assessment items. Then, they met again with the Arabic teacher and created an Arabic version of the assessment. The experiment began and the science teacher taught both groups, the SA and the SE.

3.4.3 Teacher observation

According to the existing research, classroom observation is an effective way to evaluate teachers teaching strategies. According to Whitehurst, Chingos and Lindquist (2014), “classroom observations have the potential of providing formative feedback to teachers and this helps them improve their practice.” For the purpose of this study, the researcher observed the science teacher throughout the experiment. The classroom observation was analyzed and discussed according to certain criterion that was adopted from the teaching program at the University of Nebraska (2012).

As mentioned earlier, the science teacher met with the science coordinator and Arabic teacher to plan the entire unit. It was agreed in the planning meeting that in all sessions the teacher gives an overview about the lesson. The first lesson was an introductory lesson to the Light unit through a “know, want – to know- learned” activity. The second session focused on different light sources and was given the opportunity to explore manmade and natural light sources. The third lesson focused on the reflection of light. Student explored and discussed how light travels. They investigated the reflection of sunlight and manmade light through different surfaces. Throughout the fourth lesson, the teacher reviewed previous lessons and built on it. Moreover, students collected and examined data on how changing the distance between the object and the light source affect its reflection on the object. The final session was a wrap up session. The teacher reviewed the major ideas about the unit and checked for understanding

The classroom observation checklist ensured that students are presented with good teaching strategies that allowed them to understand and make connections. For example, the teacher started her sessions with an overview. She then used real items like

a candle, a light bulb, and/or a lighter. Moreover, she allowed student to experiment light coming from the sun outside the classroom. Moreover, she interacted well with students and built on their real life experiences. For example, one student mentioned that in his bedroom “the sun comes into the room from between the curtain shades and makes different shapes.” The teacher commented and explained that the sunlight passes through the glass but was blocked by the curtain. The lines that passed along with the blocked parts created the shapes on the floor. She also asked the student to research it and come and shares his findings the next day.

Through the interaction category in the checklist, it is evident that students are active learners. Moreover, it showed that the content knowledge as well as the presentation of that knowledge was appropriately displayed (See Appendix D). The observation occurred to reduce limitation of the study through monitoring the teacher’s teaching method and the flow of the classroom so it doesn’t interfere in the student’s understanding.

3.4.4 Comparison of English and Arabic science book for grade 2

According to Lawrence, “evaluation of textbooks is of utmost importance so that its pedagogical contribution to the teaching and learning process can be assured.” (2011, p.4). In other words, textbooks work as an essential tool and component to the teaching and learning process. Therefore, evaluating a textbook can contribute to a more effective and valuable learning and teaching. Hence a comparison of the English and Arabic science textbook for grade 2 was administered. The content of the textbooks was analyzed according to a defined criterion. (Appendix E).

<p>Name: My 2nd Science Book الاسم: كتابي الثاني في العلوم</p>	<p>Date published: 1999</p>
<p>Authors: Noha Mazaraani نهي مزراعاني (coordinator) Issam Aboulmouna عصام ابو المنى Enja Ossman إنجي عثمان</p>	<p>Copyright: NCERD (National Center for Educational Research and Development) المركز التربوي للبحوث والانماء</p>
<p>Publisher: Lebanese Publisher Company s.a.r.l. شركة الناشرين اللبنانيين ش.م.م.</p>	<p>Cost: 8,300 Lebanese pound</p>

A. Introduction

According to Richard, Tung & Ng (1992) as cited in Lawrence “it was reported that textbooks were one of the primary sources of teaching materials” (2011). Mukundan Nimehchisalem and Hajimohammadi (2011) reported that the quality of books can be determined by the choice of language and the teacher’s adequacy and proficiency in language can play an essential role on the learning and teaching process. The scientific language should scaffold and direct our higher order thinking, reasoning and imagination.

Statements were made by the National Curriculum of England on “the use of language across the curriculum.” They mention that students should learn technical and special terms and then how to use and spell these words. They should also be taught to use the patterns of language vital to understanding and expression in different subjects. These include the construction of sentences, paragraphs and texts that are often used in a

subject. (The National Curriculum for England, 1999: 69 as cited in Wellington & Osborne 2001, p.5). Such statements and objectives can be a challenge for the teachers and students. Hence, teachers are required to teach the science language so that students can develop an understanding of the concept.

The following evaluation is for the Arabic and English science textbook. They are both evaluated together because both books are identical in everything except for the language. The Arabic book is a translation of the English book. It is translated by “Hassan Al Hassan”

B. Organization of the book:

It is evident that the text book provides a useful table of contents and glossary. The layout is not consistent. Sometimes pictures are from real life and sometimes are clipart pictures. (See Appendix G). Chapters and units in the book are arranged in logical sequence. Every chapter consists of different number of lessons. It ranges between 4 lessons to 15 lessons per chapter. Lessons provide clear instructions, but lack comprehensive introductions and summaries (See Appendix H). The textbook doesn't provide references and/or bibliography. Information provided by the textbook is accurate but might not be current since the book was published 17 years ago in 1999. Size of the print is appropriate; however the font in the English version of the print should be different. When Lebanese students learn English as a foreign language, the font used to learn basic letters is the font that has the “ɑ” and not the “a.” The format of the pages has more pictures than words. Some pages have organized layout of pictures

and some have pictures scattered randomly. (See Appendix I). Pictures are basic and might not be appealing or interesting. Graphics are integrated into the text.

C. Science Content

According to the text book analysis checklist used to analyze the science textbook, the content material focuses on following instructions and a little bit of knowledge. It is appropriate to grade level but doesn't challenge them. It has real life examples and questions that is relevant to the student. Directions are written in a clear and direct way. However, the lesson should include more information and explanation about the concept or unit. Activities are developmentally appropriate but not challenging. The textbook gives the students instructions step-by step what to do and leaves no room for creativity or discovery. Lessons can be interdisciplinary if teachers worked together to form such a method. However, the book itself does not give examples or suggestions on how to make the lesson interdisciplinary. Activities apply to diverse students' learning styles. The book has visual graphic, kinesthetic and hands on activities. Activities include guiding questions and do not encourage higher order thinking skills. Males and females are featured in equal and important roles within the pictures of the textbook. The tasks presented are monotonous in every lesson .Teacher's edition does not include questioning strategies at depth of knowledge and does not demonstrate concepts in multiple ways allowing for variety of student's responses. Materials presented in the book do inadequately provide strategic use of scientific tools but not technology. (See Appendix J). Mainly ideas are focused on knowledge skills related to grade level.

D. Alignment with the Lebanese Science Curriculum

As mentioned in the literature review, the Lebanese science curriculum is composed of student learning objectives. The content of the book is aligned with the academic expectations described in the curriculum. However, the objectives of the curriculum are mainly focused on gaining knowledge and comprehension of content. It does not encourage or allow the students to analyze and synthesizes. Lack of analysis and synthesis requirements in the curriculum is evident through the action verbs used in the “Elementary First Cycle Objectives.” (See Appendix K).

3.4.5 Validity and reliability

According to Aikenhead 2005, “The quality of a research instrument or a scientific measurement is determined by both its validity and reliability.” (Anderson, 2006). The questionnaire was designed to check student’s background language. To ensure in validity and reliability, it is translated from English to Arabic then back to English. (See Appendix L). Then it was piloted with a sample with similar characteristics to the research sample.

To maximize validity of the science pre and post assessment, the researcher asked the science coordinator and two other science teachers to look into the content of the assessment. They identified concepts and objectives needed to tackle in order to answer each questions.

According to Bonate, (2000) Groth-Marnot, (2003) and Mueller (1986) “Reliability is the measure of an instrument’s ability to obtain consistent results.” (as cited in Davenport,2008). One way to establish reliability of our assessment was to ask the students the same questions. The next day the teacher asked the students to jot down on

a “Know-Want to know – Learned” worksheet what they know about the topic. (See Appendix M) The answers of the questions on the assessment were very similar to what they wrote on their worksheet. Moreover, the testing conditions of the test and retest that ensured reliability were consistent.

Chapter Four

Results

The results answers the research question and found out if there is any difference between 5-7 years old students who are learning science in native language (Arabic) to those who are learning science in the foreign language English.

1.1 Questionnaire's Result

The first part shows the results of the parents' questionnaire conducted during the school year 2014/2015. The purpose of the parents' questionnaire was to determine students' spoken language.

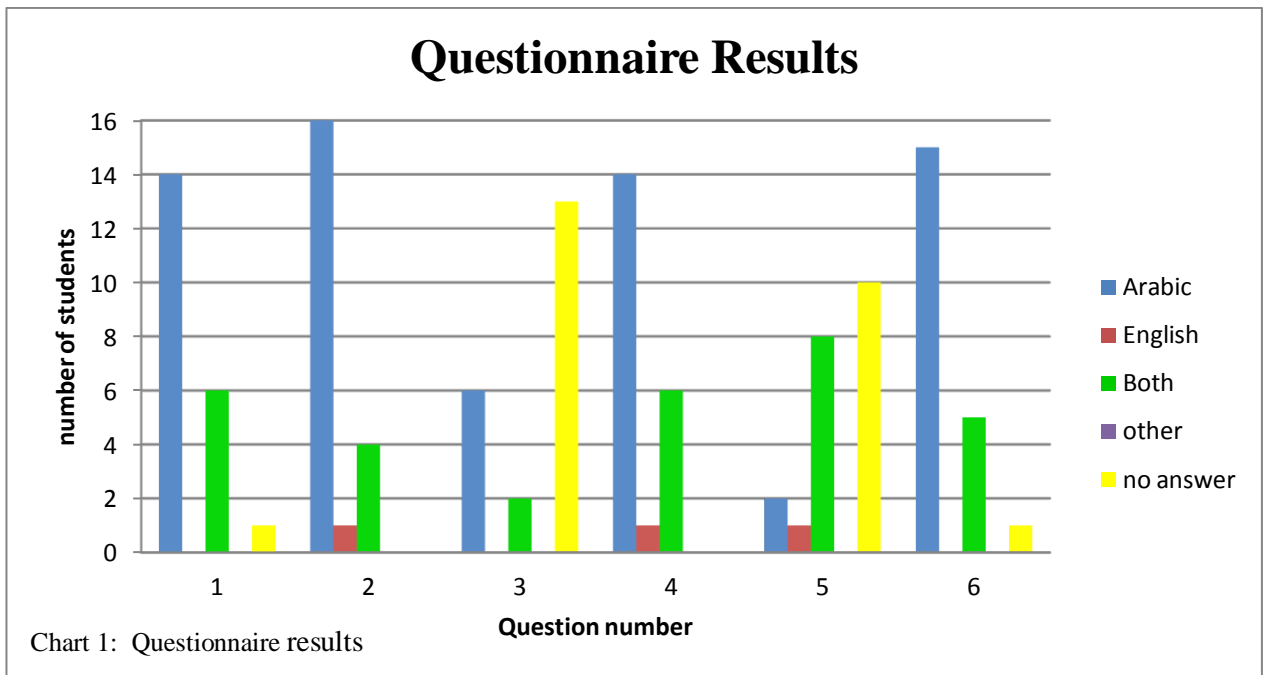
The questionnaire consisted of 6 multiple choice questions. The questions covered subjects related to the students' native language and their exposure to the foreign language, including:

- Mother's spoken language
- Father's spoken language
- Helper/maid spoken language
- Students' first spoken language
- Daycare language
- Student's usual spoken language at home

The questionnaire was sent to all grade 2 students enrolled in the school as of September 2014.

The results are as follows:

	Question 1	Questions 2	Question 3	Question 4	Question 5	Question 6
Arabic	14 students	16 students	6 students	14 students	2 student s	15 students
English		1 student s		1 student s	1 students	
Both	6 students	4 students	2 students	6 students	8 students	5 students
Other						
No answer	1 student s		13 students		10 students	1 students



What language does your child usually speak?"

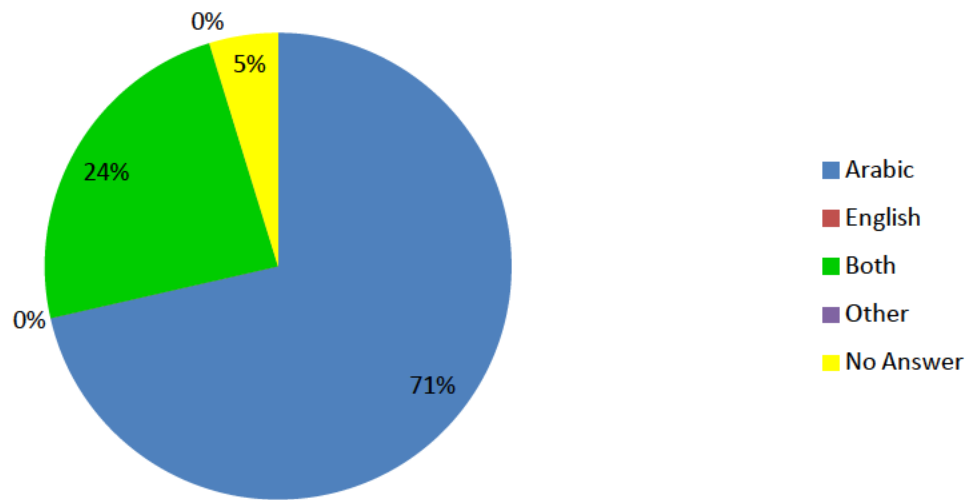


Chart 2: Question 6: "What language does your child usually speak?"

Chart 2 shows the responses for Q6 in the parent's questionnaire. Seventy-four percent of the Grade 2 students spoke Arabic in their daily lives. Twenty-one percent spoke both English and Arabic in their daily lives. Five percent % of the parents did not respond to the question. None of the students spoke English alone in their daily lives.

What language does the mother speaks at home?

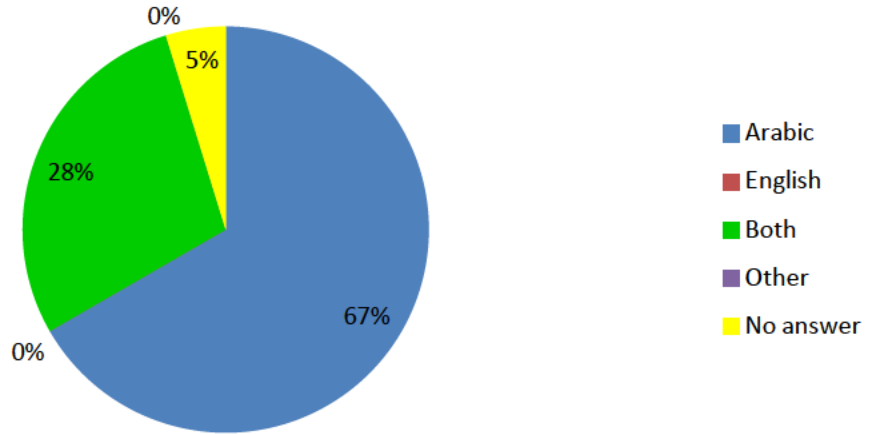


Chart 3: Questions 1: “What language does the mother speaks at home?”

What language does the father speaks at home?

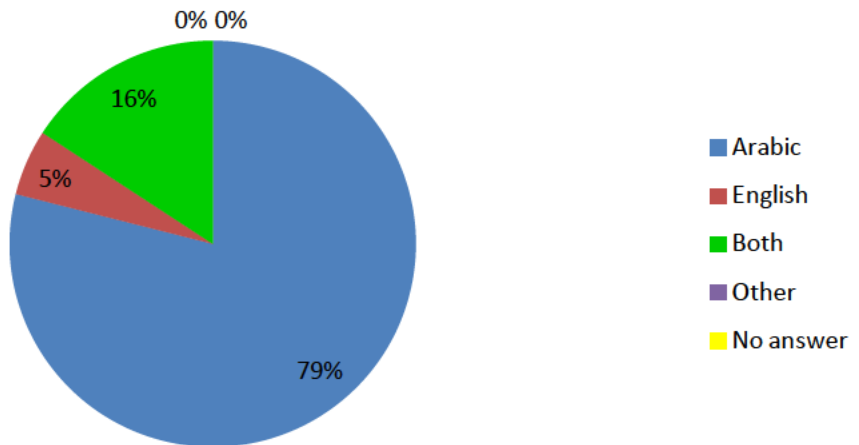


Chart 4: Questions 2: “What language does the mother speaks at home?”

Chart 3 & 4 shows the responses for the language spoken by the mother and the father separately. The majority of the students’ mother and father spoke Arabic at home.

What language did your child first learn?

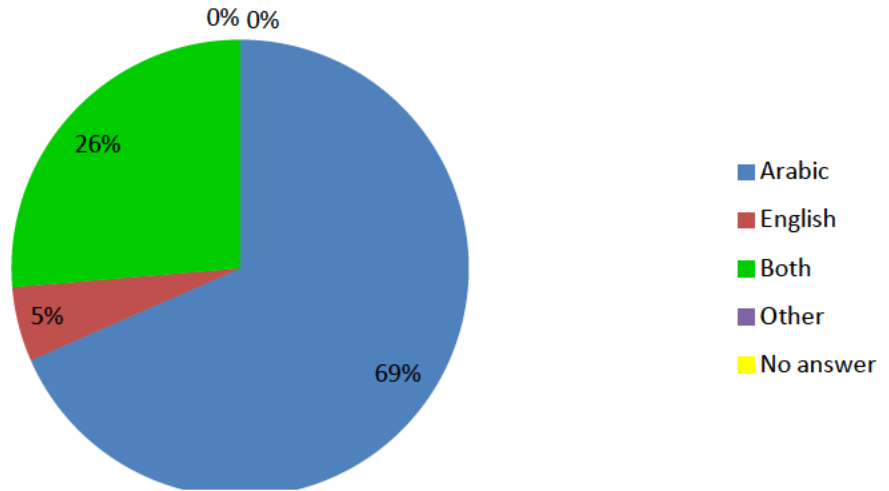


Chart 5: Questions 4: “What language does your child first learn?”

Chart 5 shows the responses for the first language the child was exposed to. Sixty-nine percent of the students learned Arabic first. Twenty-six percent of the students were exposed to both languages at the same time when they first started speaking.

What language was used in your child's day care?

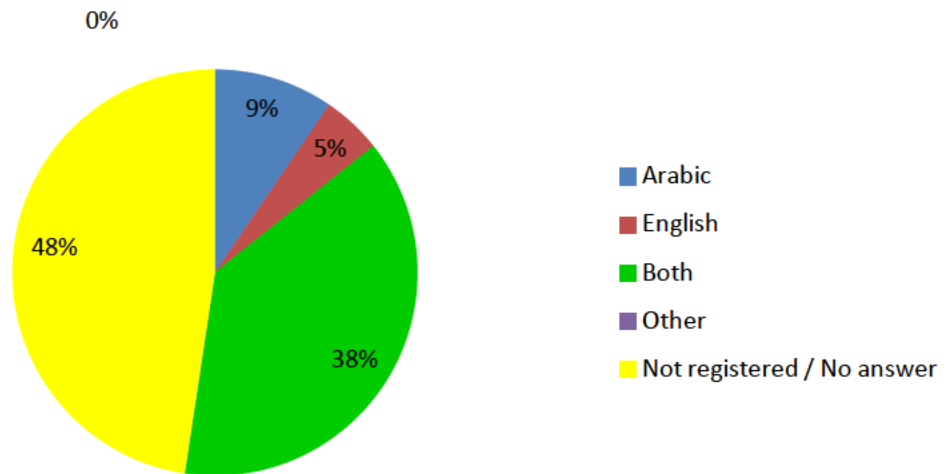


Chart 6: Questions 5: “What language was used in your child’s day care?”

Chart 6 reports a relatively high percentage of students did not register in a day care or did not answer the question. Most of the students who answered or registered in day care were exposed to both languages, English and Arabic.

1.2 Pre-Assessment and Post-Assessment Results

The Grade 2 has twenty-seven students aged between from 7-9 years old. 6 members refused to participate in the study. Therefore, the study was administered on twenty-one grade 2 students. They were divided in two groups, the Arabic group and the English group. Students who did not answer some of the pre and post assessment items were considered unknown to the student. The assessments were used by the science teacher before and after the lessons were given. Participating students used their regular classroom and tables when taking the assessment. When the learning process was taking place, the science teacher planned and organized the lessons. She used the school resources for more support. When the science teacher is giving the lesson in one

language, the second group would leave their class with the assistant teacher and take support material in other subjects.

Results of the pre and post conceptual understanding assessment are presented and analyzed qualitatively and quantitatively. In quantitative results, answers were analyzed through percentages. In qualitative results, answers were interpreted conceptually.

1.2.1 Quantitative results

Answers are examined and discussed separately.

Knowledge acquisition Questions 1&2	Analysis /making connections Questions 3 & 4	Language skills Questions 5
<p>Objective:</p> <ul style="list-style-type: none"> 1- To recall light sources 2- To identify light sources 3- Draw and label the behavior of light 	<p>Objective:</p> <ul style="list-style-type: none"> 1- To describe that light travels in a straight line 2- To interpret the reflection of light , and its source 3- To observe the behavior light reflecting off mirrors and discuss 	<p>Objective:</p> <ul style="list-style-type: none"> 1- To use scientific vocabularies to explain and describe light characteristics 2- To write description paragraph using scientific vocabulary

Table I. Distribution of students' answers in pre assessment "English Assessment"

ENGLISH	KNOWELDGE/14	% score	ANALYSIS /15	% score	LANGUAGE SKILLS/11	% score	Total / 40	% of Total
SE1	4	29%	3	20%	3	27%	10	25%
SE2	3	21%	3	20%	2	18%	8	20%
SE3	2	14%	3	20%	0	0%	5	13%
SE4	3	21%	1	7%	2	18%	6	15%
SE5	2	14%	4	27%	3	27%	9	23%
SE6	2	14%	5	33%	0	0%	7	18%
SE7	2	14%	4	27%	5	45%	11	28%
SE8	1	7%	3	20%	2	18%	6	15%
SE9	3	21%	0	0%	0	0%	3	8%
SE10	3	21%	3	20%	2	18%	8	20%
SE11	4	29%	2	13%	2	18%	8	20%
						MEAN	7.36363	18%
						SD	2.29227	

Table II. Distribution of students' answers in pre assessment "Arabic Assessment"

ARABIC	KNOWELDGE/14	% score	ANALYSIS /15	% score	LANGUAGE SKILLS/11	% score	Total / 40	% of Total	
SA1	6	43%	6	40%	5	45%	17	43%	
SA2	5	36%	7	47%	0	0%	12	30%	
SA3	7	50%	5	33%	2	18%	14	35%	
SA4	4	29%	5	33%	3	27%	12	30%	
SA5	5	36%	7	47%	3	27%	15	38%	
SA6	5	36%	4	27%	0	0%	9	23%	
SA7	6	43%	4	27%	4	36%	14	35%	
SA8	5	36%	5	33%	5	45%	15	38%	
SA9	6	43%	3	20%	1	9%	10	25%	
SA10	7	50%	9	60%	5	45%	21	53%	
							MEAN	13.9	35%
							SD	3.47850	

The English& Arabic pre assessment (See Appendix E) was to check the students' prior knowledge on the concepts concerning the sources of light, reflection, and light transfer in native and foreign language. When examining the results, the average score for the Arabic pre-assessment was 35%, ranges from 25% to 53%. The average for the English assessment was 18%, ranges from 8% to 18%.

Table III. Distribution of students' answers in post assessment "English Assessment"

ENGLISH	KNOWELDGE/14	% score	ANALYSIS /15	% score	LANGUAGE SKILLS/11	% score	Total / 40	% of Total	
SE1	13	93%	12	80%	6	55%	31	78%	
SE2	6	43%	7	47%	0	0%	13	43%	
SE3	8	57%	8	53%	1	9%	17	50%	
SE4	12	86%	4	27%	4	36%	20	53%	
SE5	7	50%	13	87%	8.5	77%	28.5	71%	
SE6	11	79%	3	20%	4	36%	18	50%	
SE7	8	57%	11	73%	9	82%	28	70%	
SE8	11	79%	15	100%	8	73%	34	85%	
SE9	7	50%	4	27%	4	36%	15	48%	
SE10	10	71%	5	33%	2	18%	17	53%	
SE11	5	36%	12	80%	5	45%	22	55%	
							MEAN	22.13636364	59%
							SD	7.092569736	

Table VI. Distribution of students' answers in post assessment "Arabic Assessment"

ARABIC	KNOWELDGE/14	% score	ANALYSIS /15	% score	LANGUAGE SKILLS/11	% score	Total / 40	% of Total
SA1	12.5	89%	11	73%	7	64%	30.5	81%
SA2	9	64%	12	80%	2	18%	23	68%
SA3	10	71%	3	20%	4.5	41%	17.5	55%
SA4	11	79%	13	87%	5	45%	29	78%
SA5	13	93%	10	67%	7	64%	30	75%
SA6	8.5	61%	13	87%	5	45%	26.5	66%
SA7	9	64%	8	53%	8	73%	25	63%
SA8	13	93%	5	33%	2	18%	20	58%
SA9	11.5	82%	13	87%	10	91%	34.5	86%
SA10	11	79%	14	93%	4	36%	29	75%
MEAN							26.5	70%
SD							5.190803834	

When exploring the post assessment, the average score for the English post assessment 59%, ranged from 43 % to 85%. The average score for the Arabic assessment was 70 %, ranged from 58% to 86%. This shows that SA students were able to gain knowledge, to analyze, to interpret, and to express idea properly and clearly about the concept of "light."

Qualitative Results

This part explores sections of misconceptions. First, answers were taken from questions that described different concepts related to the light lesson. 1- How light travels in a straight line, 2- How light is reflected, and 3- How light reflected off mirrors. Second, answers were categorized according to similar responses. The categorizing of responses helped the researcher to find the difficulties faced by students. Hence, the researcher was able to identify common misconceptions.

Table V. Common Misconceptions Categorized from Student's Answers

Common Misconceptions	Arabic Group	English Group	Difference
Anything can reflect light if it is under the sun أي شيء يمكن أن يعكس الضوء إذا كان تحت أشعة الشمس	20%	36%	16%
Light can go through water but it doesn't reflect light. يمكن للضوء أن يمر عبر المياه ولكنه المياه لا تعكس الضوء	50%	55%	5%
Only shiny surfaces reflect light فقط الأسطح اللامعة تعكس الضوء	30%	45%	15%
The moon is a natural source of light القمر هو مصدر طبيعي للضوء	40%	45%	5%
Light travels in a straight line in things that are transparent يعبر الضوء في خط مستقيم اذا كانت الأشياء شفافة	30%	45%	15%
We do not need light in a dark room since we can see a little لسنا بحاجة للضوء لكي نرى لأننا يمكن أن نرى قليلا في غرفة مظلمة	20%	36%	16%

Table V. identified that the SE had more misconceptions than the SA. Mainly, the categories that had misconceptions were questions that were related to the language skills question. Moreover, the difference in the results of the student's misconceptions regarding the "light concept" showed that SE didn't conceptually understand the concept and had difficulty in explaining their points of view. Thirty-six percent of the SE group thought that anything can reflect light if it is under the sun and only twenty percent of the SA group thought that. Compared to SA, sixteen percent more SE stated that they do not need light in the dark since they can see a little.

Chapter Five

Data Analysis & Discussion

Generally, language teachers are and should be aware of the student's language abilities however, science and math teachers usually are not. Language is significant to understanding content in different subject matters. Therefore, foreign language proficiency should not be a measure for academic intelligence.

The findings of the study show that there is a significant difference between the results of two groups.

- 1- (SA) students who studied science in Arabic, native language
- 2- (SE) students who studied science in English, Foreign language.

The results showed that SA gave more scientifically correct answers to the analysis questions than SE. In addition, SA group used more scientific language and scientific key words related to the unit more than the SE group.

A lot of scientifically unacceptable answers by SE group in the assessment questions are strictly related to relation between scientific language and conceptual understanding of the concept of Light. To sum up, the foreign language used in the science lesson became a barrier for students' understanding. Science is a subject rich in technical and non-technical terms in which experimental hands-on activities and authentic examples should be presented in class for students to gain better conceptual understanding.

5.1 Questionnaire

The results of the questionnaire show that the majority of students had Arabic as their native language. It also explains that parents speak and/or use Arabic to communicate messages with their children. Therefore, according to the results students who learned science in Arabic achieved better than students who learned in English. Since our main goal was to check the effect of language on students' understanding of science, the results proved that language can affect the understanding of a scientific concept.

5.2 Pre and post assessment

The analysis of answers to the science conceptual understanding assessment questions showed some of the student's difficulties in using such an abstract concept with a foreign language. The following discussion will focus on the following questions:

- 1) Are there group differences between 5-7 years old children studying science in their native language and those studying in their foreign language?
- 2) If there are differences, what are those differences?

All results showed that SA, students who studied the science unit about "LIGHT" in Arabic, their native language, was able to scientifically explain and show more understanding of the concept. Moreover, the SA group elaborated more in the analysis and language questions. Some student's in English group wrote some key words in Arabic in their analysis and language question (See Appendix N) this shows that students whose foreign language proficiency is not developed had more misconceptions. The findings of the study are consistent with various studies that shows that students who learn scientific subject are required to read scientific textbooks to understand deeply scientific concepts. (Shaw 2000; Wellington & Osborne (2001)).

Furthermore, SA students should be more aware to the different usage of scientific words. Scientific words can also mean differently in different contexts such as light. Light can mean “not heavy” and can also mean the agent that stimulates the sight. Therefore, students who learn content subjects, like math and science, in a foreign language requires careful reading and analyzing scientific texts to understand and to study scientific concepts.

5.3 Classroom Observation

Results of the classroom observation showed that the teacher is competent in content of science, teaching approaches and language proficient in order to teach science in the best practice. It was also derived that the teaching of science in a foreign language could be disadvantageous for the students.

Chapter Six

Conclusion and Recommendation

The purpose of this study was to explore the effect of language on student's conceptual understanding of science. A sequence of lessons and activities were considered to help students make connections, inferences, explore and investigate the science concept. Moreover, these lessons and activities gave students the opportunity to develop an understanding of the science lesson. A parent's questionnaire, pre- and post-assessment, classroom observations were administered as instruments. The study lasted two months. Twenty-seven students and a teacher participated in the study. The groups were selected according to the answers of the parents' questionnaire. It should be highlighted that students were never exposed to the lesson's content before the experiment. The lessons and activities were planned with the elementary science teacher and coordinator. After every session, the observation notes were shared with the teacher to improve the implementation of the lesson.

The results of the pre- and post-assessments showed that the language did affect the student's understanding. This effect could also be reason behind the students' misconception. The SA group achieved higher results than the SE group. Moreover, the SA group appeared to have better answers in all types of questions. The results of the research indicate that the choice of language used in instruction should be well selected. For future studies, it is recommended to conduct a study with older students and a wide range of samples.

Series of recommendations would be helpful to reduce the effect of foreign language on students' understanding:

- An integration between the foreign language lesson and science lessons.
- To expose students' to scientific topics or units in language sessions
- To allocate more time to science sessions
- To expose students to homonyms, different uses of words in different context, in English lessons.
- To use bilingualism strategies in science sessions.
- To allow students to explore ideas and investigate in a language they choose where they can express themselves with ease.

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Appendices

Appendix A

Appendix B

Appendix C

Textbook and Instructional Material Evaluation Rubric Form- English Language Arts

Instructional materials are designed for use by students and teachers as a learning resource for students to acquire essential knowledge, skills, abilities, and dispositions. This includes print and non-print materials, including comprehensive/core textbooks, supplemental materials, Web-based and electronic textbooks, and assessments.

Title: _____ Author(s): _____ Publisher(s): _____

Copyright Date: _____ Subject/Grade Level: _____

Student ISBN: _____

Teacher Edition ISBN: _____

Instructions: Use the tables below to determine if the Textbook or Instructional material meets each criteria.

Organization

Criteria	2 Meets	1 Inadequate	Comments
1. Material provides a useful table of contents, glossary, supplemental pages, and index.			
2. Layout is consistent; chapters/units are arranged logically; and allow access through multiple modalities.			
3. Teacher edition contains interesting introductions and a list of prerequisites skills for each chapter.			
4. Material contains examples, explanations, and/or online resources to the depth and breadth of the Nevada Academic Content Standards.			
5. Information is accurate, current, and research-based.			
6. Focus of academic and domain specific vocabulary is prevalent throughout reading, writing, listening, and speaking.			
7. Size and format of print is appropriate.			
8. Format is visually appealing & interesting.			
9. Material provides Smarter Balanced assessment type questions and/or performance-based tasks.			
10. Electronic and interactive format available.			
Other: _____			
Total Organization:			

English Language Arts Content

1



Criteria	2 Meets	1 Inadequate	Comments
11. Materials focus on the knowledge, skills, and abilities (KSAs) appropriate to the grade level.			
12. Material demonstrates coherence and rigor of KSAs appropriate to grade level.			
13. Real-world applications are relevant to the students.			
14. Information and directions are clearly written and explained.			
15. Tasks are aligned to the anchor standards of the Nevada Academic Content Standards.			
16. Non-text content (maps, graphs, pictures, etc.) are accurate, authentic, and well integrated into the instructional material.			
17. Lessons/tasks are interdisciplinary when appropriate.			
18. Tasks apply to the diversity of students and their abilities, interests, and learning styles.			
19. Questions and tasks encourage the development and application of higher-level thinking skills.			
20. Teacher edition includes questioning strategies and/or questions to check for understanding at all Depth of Knowledge (DOK) levels.			
21. Teacher edition includes formative assessment/evaluation tools and processes.			
22. Material adheres to the text complexity at each grade level outlined by the Nevada Academic Content Standards.			
23. Material provides access to or demonstrates concepts in multiple ways, allowing for a variety of student responses.			
24. Tasks have a purpose, aligned to a skill or concept at grade level.			
25. Range and quality of text at each grade level is addressed with a well-balanced representation of literary and informational texts.			
26. Material includes application of skills and concepts at grade level.			
27. Material makes it clear that student writing is a key task (argument, informative, response to audience and purpose, short focused research).			
28. Content includes 21 st Century skill development such as collaboration, creative thinking, and problem solving.			
Other: _____			
Total ELA Content Criteria:			

Inclusion



Criteria	2 Meets	1 Inadequate	Comments
29. Material reflects a variety of ways to differentiate instruction and model content to support all learners.			
30. Material reflects sensitivity with regard to gender, race/ethnicity, religion, socio-economic status, intellectual, and physical abilities.			
31. Material includes access to a multilingual glossary.			
32. Material provides resources for students with disabilities and English Language Learners aligned to grade level content.			
33. Material is available for students with visual impairments via a NIMAS file on the NIMAC system.			
Other: _____			
Total Inclusion Criteria:			

Alignment

Criteria	2 Meets	1 Inadequate	Comments
34. Material content aligns to district/organization curriculum.			
35. Material content aligns with college and career readiness skills (Nevada Academic Content Standards).			
36. Material is a useful resource in preparing students to meet the requirements of the Nevada Academic Content Standards and statewide assessments.			
Other: _____			
Total Alignment Criteria:			

Total Score for ELA Textbook or Instructional Material: _____



Appendix D

Parental Consent Form

Dear Parents,

You are invited to participate in the phase 1 of a research project entitled "The Effect of Teaching and Learning in Native and Foreign Language on Students' Conceptual Understanding in Science in a Lebanese Context." In phase 1 you will be asked to complete a short questionnaire.

This questionnaire aims to gather data on the students' first language and their exposure to a second language.

Your answers will not be released to anyone and your identity will remain anonymous. Your name will not be written on the questionnaire or be kept in any other records. All responses you provide for this study will remain confidential. **When the results of the study are reported, you will not be identified by name or any other information that could be used to infer your identity.** Only researchers will have access to view any data collected during this research. Your participation is voluntary and you may withdraw from this research any time you wish or skip any question you don't feel like answering. Your refusal to participate will not result in any penalty or loss of benefits to which you are otherwise entitled to.

The research intends to abide by all commonly acknowledged ethical codes. You agree to participate in this research project by filling the following questionnaire. If you have any questions, please ask the research team listed at the end of this questionnaire. Thank you for your time.

Thank you for taking the time for the questionnaire. This survey should take you about 5 – 7 minutes to complete.

I _____ have read and understood the above information.

Signature

Date

If you have any questions, you may contact

Name (PI):
Hiba Bayloun

Phone number:
70816283

Email address:
Hibabayoun@yahoo.com

If you have any questions about your rights as a participant in this study, or you want to talk to someone outside the research, please contact the:

IRB Office,
Lebanese American University
3rd Floor, Dorm A, Byblos Campus
Tel: 00 961 1 786456 ext. (2332)



وانف علي
[Handwritten signature]

استبيان الأهل

الى الأهل الكرام،

انتم مدعون للمشاركة في المرحلة الاولى من دراسة بحثية بعنوان :

“The Effect of Teaching and Learning in Native and Foreign Language on Students’ Conceptual Understanding in Science in a Lebanese Context”

هذا مشروع بحثي وللتقيام بهذا المشروع سوف يطلب منك ملء استبيان قصير. يهدف هذا الاستبيان إلى جمع البيانات عن لغة الأم للأولادكم ومدى تعرضهم للغة ثانية.

إن يتم التصريح أو الإفراج عن أبحاثك إلى أي شخص ، وسوف تبقى هويتك مجهولة. إن يكتب اسمك على الاستبيان وإن يحفظ في أي سجلات أخرى . جميع أبحاثك التي تقدمها لهذه الدراسة سوف تظل سرية . عندما يتم تقديم نتائج الدراسة ، لن يتم التعرف اليك بالاسم أو أي معلومات أخرى يمكن أن تستخدم للاستدلال إلى هويتك. الباحثون فقط لديهم الحق في الاستطلاع على البيانات التي تم جمعها خلال هذا البحث. مشاركتك طوعية ويمكنك الانسحاب من هذا البحث في أي وقت تشاء أو تغطي أي سؤال لا تشعر بالتردد عليه .

يعتزم البحث على الالتزام بجميع القوانين الأخلاقية المعترف بها . أنت توافق على المشاركة في هذا المشروع البحثي عن طريق ملء الاستبيان التالي . إذا كان لديك أي أسئلة، يرجى طرحها على فريق البحث المدرجة اسمائهم في هذا الاستبيان . شكرا لك على وقتك وموافقة المشاركة:

أنا _____ لقد اطلعت على اسماصة الموافقة وأدركت مضمونها .

الأسماء

التاريخ

نشكركم على أخذ الوقت لملء الاستبيان. هذا الاستطلاع ينبغي أن يأخذ حوالي 5-7 دقائق لإتمامه.

إذا كان لديك أي أسئلة يمكنك الاتصال:

الإسم رقم الهاتف البريد الإلكتروني

هبة بيلون 70816283 hibabayloun@yahoo.com

إذا كان لديك أي أسئلة حول حقوقك كمشارك في هذه الدراسة ، أو كنت تريد التحدث إلى شخص خارج البحث ، يرجى الاتصال :

مكتب اللجنة الأخلاقية،
الجامعة اللبنانية الأميركية



موافقة عليه

IRB Office,
Lebanese American University
3rd Floor, Dorm A, Byblos Campus
Tel: 00 961 1 786456 ext. (2332)

Appendix E

Appendix F

Classroom Observation Checklist

Teaching Assistant: Grade 2 science Observation Number 1 2 3 4
 Faculty Supervisor: Hiba Bayloun Date: May 25 / 2015

Respond to each statement using the following scale:

1=Not observed 2=More emphasis recommended 3=Accomplished very well

Organization

Presented overview of lesson.	1	2	3
Paced lesson appropriately.	1	2	3
Presented topics in logical sequence.	1	2	3
Related today's lesson to previous/future lessons.	1	2	3
Summarized major points of the lesson.	1	2	3

Presentation

Explained major/minor points with clarity.	1	2	3
Defined unfamiliar terms, concepts, and principles.	1	2	3
Used good examples to clarify points.	1	2	3
Shown all the steps in solutions to homework problems.	1	2	3 - NA
Varied explanations for complex or difficult material.	1	2	3
Emphasized important points.	1	2	3
Writes key terms on blackboard or overhead screen.	1	2	3
Integrates materials (examples, cases, simulations) from "real world".	1	2	3
Active, collaborative, and cooperative learning favored over passive learning.	1	2	3

Interaction

Actively encouraged student questions.	1	2	3
Asked questions to monitor student understanding.	1	2	3
Waited sufficient time for students to answer questions.	1	2	3
Listened carefully to student questions.	1	2	3
Responded appropriately to student questions.	1	2	3
Restated questions and answers when necessary.	1	2	3
Demonstrates respect for diversity and requires similar respect in classroom.	1	2	3

Content Knowledge and Relevance

Presented material at an appropriate level for students.	1	2	3
Presented material appropriate to the purpose of the course.	1	2	3
Demonstrated command of the subject matter.	1	2	3

Summary Comments

21. What were the instructor's major strengths as demonstrated in the observation?
Integrated materials from "real world" and gave a lot of real life examples.
22. What suggestions do you have for improving the instructor's skills or methodology?
The teacher should maintain a slower pace while speaking.
23. If this was a repeat observation, what progress did you discern in the instructor's skills?
NA

Classroom Observation Checklist

Teaching Assistant: Science Grade 2 Observation Number 1 (2) 3 4

Faculty Supervisor: Hiba Bayloun Date: May 27 / 2015

Respond to each statement using the following scale:

1=Not observed 2=More emphasis recommended 3=Accomplished very well

Organization			
Presented overview of lesson.	1	2	
Paced lesson appropriately.	1	2	
Presented topics in logical sequence.	1	2	
Related today's lesson to previous/future lessons.	1	2	
Summarized major points of the lesson.	1	2	
Presentation			
Explained major/minor points with clarity.	1	2	
Defined unfamiliar terms, concepts, and principles.	1	2	
Used good examples to clarify points.	1	2	
Showed all the steps in solutions to homework problems.	1	2	
Varied explanations for complex or difficult material.	1	2	
Emphasized important points.	1	2	
Writes key terms on blackboard or overhead screen.	1	2	
Integrates materials (examples, cases, simulations) from 'real world'.	1	2	
Active, collaborative, and cooperative learning favored over passive learning.	1	2	
Interaction			
Actively encouraged student questions.	1	2	
Asked questions to monitor student understanding.	1	2	
Waited sufficient time for students to answer questions.	1	2	
Listened carefully to student questions.	1	2	
Responded appropriately to student questions.	1	2	
Restated questions and answers when necessary.	1	2	
Demonstrates respect for diversity and requires similar respect in classroom.	1	2	
Content Knowledge and Relevance			
Presented material at an appropriate level for students.	1	2	
Presented material appropriate to the purpose of the course.	1	2	
Demonstrated command of the subject matter.	1	2	

Summary Comments

21. What were the instructor's major strengths as demonstrated in the observation?
Questions the teacher's major strength in this session was the questions that scaffolded inquiry in class.
22. What suggestions do you have for improving the instructor's skills or methodology?
The teacher should use more manipulatives or concrete material to demonstrate learning.
23. If this was a repeat observation, what progress did you discern in the instructor's skills?
NA

Classroom Observation Checklist

Teaching Assistant: Science Grades Observation Number 1 2 **3** 4

Faculty Supervisor: Hiba Bayloun Date: May 29 / 2015

Respond to each statement using the following scale:

1=Not observed 2=More emphasis recommended 3=Accomplished very well

Organization

Presented overview of lesson.	1	2	3
Paced lesson appropriately.	1	2	3
Presented topics in logical sequence.	1	2	3
Related today's lesson to previous/future lessons.	1	2	3
Summarized major points of the lesson.	1	2	3

Presentation

Explained major/minor points with clarity.	1	2	3
Defined unfamiliar terms, concepts, and principles.	1	2	3
Used good examples to clarify points.	1	2	3
Showed all the steps in solutions to homework problems.	1	2	3
Varied explanations for complex or difficult material.	1	2	3
Emphasized important points.	1	2	3
Writes key terms on blackboard or overhead screen.	1	2	3
Integrates materials (examples, cases, simulations) from "real world".	1	2	3
Active, collaborative, and cooperative learning favored over passive learning.	1	2	3

Interaction

Actively encouraged student questions.	1	2	3
Asked questions to monitor student understanding.	1	2	3
Waited sufficient time for students to answer questions.	1	2	3
Listened carefully to student questions.	1	2	3
Responded appropriately to student questions.	1	2	3
Restated questions and answers when necessary.	1	2	3
Demonstrates respect for diversity and requires similar respect in classroom.	1	2	3

Content Knowledge and Relevance

Presented material at an appropriate level for students.	1	2	3
Presented material appropriate to the purpose of the course.	1	2	3
Demonstrated command of the subject matter.	1	2	3

Summary Comments

21. What were the instructor's major strengths as demonstrated in the observation?
The teacher used concrete material to explain the concept.
22. What suggestions do you have for improving the instructor's skills or methodology?
Should improve her handwriting on the board.
23. If this was a repeat observation, what progress did you discern in the instructor's skills?
NA.

Classroom Observation Checklist

Teaching Assistant: Sienna Grade 2 Observation Number 1 2 3 **4**

Faculty Supervisor: Hiba Bayloun Date: June 3/2015

Respond to each statement using the following scale:

1=Not observed 2=More emphasis recommended 3=Accomplished very well

	1	2	3
Organization			
Presented overview of lesson.	1	2	3
Paced lesson appropriately.	1	2	3
Presented topics in logical sequence.	1	2	3
Related today's lesson to previous/future lessons.	1	2	3
Summarized major points of the lesson.	1	2	3
Presentation			
Explained major/minor points with clarity.	1	2	3
Defined unfamiliar terms, concepts, and principles.	1	2	3
Used good examples to clarify points.	1	2	3
Showed all the steps in solutions to homework problems.	1	2	3
Varied explanations for complex or difficult material.	1	2	3
Emphasized important points.	1	2	3
Writes key terms on blackboard or overhead screen.	1	2	3
Integrates materials (examples, cases, simulations) from 'real world'.	1	2	3
Active, collaborative, and cooperative learning favored over passive learning.	1	2	3
Interaction			
Actively encouraged student questions.	1	2	3
Asked questions to monitor student understanding.	1	2	3
Waited sufficient time for students to answer questions.	1	2	3
Listened carefully to student questions.	1	2	3
Responded appropriately to student questions.	1	2	3
Restated questions and answers when necessary.	1	2	3
Demonstrates respect for diversity and requires similar respect in classroom.	1	2	3
Content Knowledge and Relevance			
Presented material at an appropriate level for students.	1	2	3
Presented material appropriate to the purpose of the course.	1	2	3
Demonstrated command of the subject matter.	1	2	3

Summary Comments

21. What were the instructor's major strengths as demonstrated in the observation?

The teacher stressed/emphasized on key points and asked a lot of questions to monitor understanding

22. What suggestions do you have for improving the instructor's skills or methodology?

The teacher should work on her handwriting when writing on the board

23. If this was a repeat observation, what progress did you discern in the instructor's skills?

NA.

Classroom Observation Checklist

Teaching Assistant: Science Grade 2 Observation Number 1 2 3 4 **5**
 Faculty Supervisor: Hiba Bayloun Date: June 5 / 2015

Respond to each statement using the following scale:

1=Not observed 2=More emphasis recommended 3=Accomplished very well

Organization

Presented overview of lesson.	1	2	
Paced lesson appropriately.	1	2	
Presented topics in logical sequence.	1	2	
Related today's lesson to previous/future lessons.	1	2	
Summarized major points of the lesson.	1	2	

Presentation

Explained major/minor points with clarity.	1	2	
Defined unfamiliar terms, concepts, and principles.	1	2	
Used good examples to clarify points.	1	2	
Showed all the steps in solutions to homework problems.	1	2	
Varied explanations for complex or difficult material.	1	2	
Emphasized important points.	1	2	
Writes key terms on blackboard or overhead screen.	1	2	
Integrates materials (examples, cases, simulations) from "real world".	1	2	
Active, collaborative, and cooperative learning favored over passive learning.	1	2	

Interaction

Actively encouraged student questions.	1	2	
Asked questions to monitor student understanding.	1	2	
Waited sufficient time for students to answer questions.	1	2	
Listened carefully to student questions.	1	2	
Responded appropriately to student questions.	1	2	
Restated questions and answers when necessary.	1	2	
Demonstrates respect for diversity and requires similar respect in classroom.	1	2	

Content Knowledge and Relevance

Presented material at an appropriate level for students.	1	2	
Presented material appropriate to the purpose of the course.	1	2	
Demonstrated command of the subject matter.	1	2	

Summary Comments

21. What were the instructor's major strengths as demonstrated in the observation?
 * She reviewed and previous session to and related it to the current lesson. Explained major points with clarity
22. What suggestions do you have for improving the instructor's skills or methodology?
 Her tone of voice was low / should be higher
23. If this was a repeat observation, what progress did you discern in the instructor's skills?
 NA.

Appendix G

Appendix H

2. G
ts



Appendix I

Organization of pictures and scattered pictures



Appendix J

L



Appendix K

Appendix L

Appendix M

Appendix M

Name:

Date:

<u>Know</u> What I <i>think</i> I know	<u>Wonder</u> What I want to know	<u>Learn</u> What I <i>learned</i>

Appendix N

