Analysis of Secondary School Students' Perceptions about Information Technologies through a Word Association Test

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***Abstract*—**The aim of this study is to discover secondary school students' perceptions related to information technologies and the connections between concepts in their cognitive structures. A word association test consisting of six concepts related to information technologies is used to collect data from 244 secondary school students. Concept maps that present students' cognitive structures are drawn with the help of frequency data. Data are analyzed and interpreted according to the connections obtained as a result of the concept maps. It is determined students associate most with these concepts—computer, Internet, and communication of the given concepts, and associate least with these concepts—computer-assisted education and information technologies. These results show the concepts, Internet, communication, and computer, are an important part of students' cognitive structures. In addition, students mostly answer computer, phone, game, Internet and Facebook as the key concepts. These answers show students regard information technologies as a means for entertainment and free time activity, not as a means for education.

***Keywords*—**Word association test, cognitive structure, information technology, secondary school.

I. Introduction

AT the same time while continuing to advance rapidly today, technology has an increasing effect in every area of life. It is possible to observe these effects also in education. Information technologies, defined as technologies that maintain the accumulation, processing, storage, and transfer of information anywhere when needed and enable access to this information [7], [12], have an effect, particularly in education. Information technologies have caused significant changes and developments, primarily in educational materials and tools. Digital smart boards, televisions that support visual quality, projectors, the Internet, computers with multimedia support, simulation technologies, and other advanced technology products have reshaped education and led to the development of alternative teaching methods, such as computer-assisted instruction, distance education, and e-learning [19].

One of the goals of education is to educate individuals in accordance with the needs of society [29]. The rapid developments taking place today affect all social structures, including the education system [29]. Learning how to use technology is among the most basic needs of the modern individual. For this reason, one of the issues that should be highly emphasized in the 21st century is the effective use of technology [23].

When determining their educational policies, several countries take certain decisions to prepare its students for a social environment dominated by technology. However, in most of these countries, the use of computers in education is viewed as the initial phase of a period that will last for years [20]. For this reason, as in many countries, there are recent efforts in Turkey to integrate information technologies into education. In this context, elective computer classes were first utilized in elementary schools in 1998. Afterwards, the curriculum developed for this course was improved and approved for gradual implementation from an offer of the General Directorate of Elementary Education, August 10, 2006 [11].

A. The Importance of Study

Word association tests are among the oldest and the most commonly used methods to analyze the cognitive constructs [3]. Educators have used several methods to find an answer to these questions: How can we unfold the cognitive structure of the student and the connections among the concepts, that is, the information network that exists within this structure? How can we determine whether the relationships among the concepts in the long-term memory of the students are sufficient or meaningful?

A number of studies have been conducted on word association [1]-[3], [6], [8]-[10], [13]-[16], [21], [24], [25]. A review of the literature shows studies on word association were generally conducted before 1990. There were no studies in the literature on word association conducted during the 1990s [3]. However, studies regained momentum at the end of the 1990s [1].

Word association tests were used for various purposes in the literature. Word association tests specific to different learning domains were used to expose students' cognitive structures, identify their misconceptions, and determine conceptual changes. However, most of these studies were conducted in the field of science education. Few studies are conducted in

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other fields [14]. This technique can be used not only to determine whether concepts are understood correctly, but also to understand sciences, situations, and even people [8].

B. The Aim of the Study

The present study was conducted using phenomenology, which is a qualitative research design. Phenomenology design provides a suitable basis for studies aiming to investigate the phenomena, which we are aware but cannot completely understand [30]. In this study, phenomenology was used to investigate the phenomena, which elementary education students pointed out regarding information technologies.

II. Methodology

A. Participant

The participants for this study were 244 secondary stage students taking the elective Information Technologies course in the academic year of 2011-2012 in an elementary school in the Beysehir district of Konya province. Additionally, students, who participated in this study, were taking the elective Information Technologies course from an Information Technologies teacher.

B. Data Collection and Word Association Technique

A word association test was utilized as the data collection tool in the study. A total of six concepts related to information technologies thought to be underlying the topic and importance were selected. These concepts were 1) Computer, 2) Internet, 3) Communication, 4) Technology, 5) Computer-assisted Instruction, and 6) Information Technologies. The views of four experts were taken during the creation of the test. Three faculty members and an Information Technologies teacher were asked their opinions regarding the test. The six concepts selected for the study were submitted to the experts. All four experts approved the selected six concepts and determined them as the key concepts for use in this study. Afterwards, the test was organized in a manner so that each key concept would be on a single page and written one under another five times, that is, the number of answers requested. The purpose of repeating the key concept until the end of the page was to prevent the risk of successive answers. If a student answering the test did not turn back to the key concepts, he/she would write words related to the concept he/she had written, which would remove the test's purpose [3]. Through a review of the previous studies, it was determined that providing the students with 30 minutes for each answer sheet would be the most suitable allocation of time [2], [3], [8]-[10], [13], [14]. The test was given to the students after providing the necessary instructions and examples.

C. Data Analysis

The response words the students provided to the key concepts were examined in detail to analyze the results of the word association test. A detailed frequency table was prepared to show how many times, and which words and concepts were repeated in response to a key concept. Using the frequency table, a concept map was created. The breakpoint technique suggested by Bahar, Johnstone and Sutcliffe [1] was used in the creation of the concept map. In the breakpoint technique, a certain value below the most frequently given response word was determined as the breakpoint for each key concept in the frequency table. The concepts above this value constitute the first part of the concept map. Afterwards, the breakpoint is periodically lowered and the process is continued until all the key words appear on the concept map. In the present study, the data were interpreted by observing the associations among the concepts and newly generated words with the help of the concept maps created, using the breakpoint technique. Using this technique in the data analysis, ten concept maps were created according to the following breakpoints: 180-above, 179-160, 159-140, 139-120, 119-100, 99-80, 79-60, 59-40, 39-20, and 19-9.

III. Findings and Discussion

Utilizing the word association technique, the number of the responses generated for the key concepts is among the first methods used in the evaluation of the data through this technique. The numbers and qualities of the other words not associated with the key concepts can be used to determine whether that concept is understood, because the understanding of a concept depends on the words associated with that concept. It can be said that a concept not associated with any words does not make any sense for the students and the concept becomes more comprehensible as it is associated with more words [1], [3], [8], [13], [16], [22], [25]. The findings from the present study show the students responded the most to the concept, Computer, in the word association test. The concepts of Internet and Technology followed with values close to one another. As also stated by the researchers, it could be said the concept, computer, occupies a more significant place in the students' minds compared to the other concepts selected for the study. The concept least responded to by the students was Information Technologies. Based on this finding, it can be said the students had superficial knowledge about this concept, which did not have a solid place in their cognitive structures.

In addition to the types of response words provided for key concepts, the number and order of utterance of the common response words provided for key concepts are also important in the analysis of word association test results. This knowledge of number and order of response words helps researchers analyze and map the semantic relationships among key words [3]. For this reason, concept maps were created using the collected data and the relationships among the concepts were examined.

The strongest relationships among the concepts were observed on the concept map, established according to a breakpoint of 180 and above. The key concept, Computer, was associated with the response word, Game, and the key concept, Communication, was associated with the response word, phone. The reason for the students' associating Communication with Phone is phones are still seen as the basic means of communication in this day of highly advanced technology and a new means of communication. The

incredible present developments in the mobile technology could be the reason for this point of view. Students' associating the concept, Computer, with Game indicates students mostly use computers for playing games and entertainment. In a study conducted on secondary stage elementary school students, Tuti [27] also found that students mainly used computers for entertainment activities like 'playing games' and 'listening to music'. Based on this finding, it is recommended educators and families should be warned about supervising students' meaningful use of computers. Since computer games very much attract the attention of students, it is certain they will also be effective in attracting students to school subjects. Recently, several studies have been conducted and similar results have been obtained on the use of computer games in education. In a study conducted by Bayırtepe and Tüzün [5] on elementary school students, it was determined computer games were successful in attracting students' attention to school subjects. In their study on sixth grade elementary schools students, Bakar, Tüzün and Çağıltay [4] found educational computer games increased students' motivation and could be used as support material in classes. Similar to the aforementioned studies, various studies showed computer games could be used as motivational tools to increase students' interest in classes [17], [18], [28].

IV. Suggestions

In summary, it should be mentioned that of the concepts related to information technologies, those associated with each other at the highest level and with the highest number of words are Computer, Internet and Communication. This shows these three concepts constitute the core of the students' cognitive structures regarding information technologies. The nature of these associations shows students excessively use these tools in their daily lives for entertainment, communication, and acquiring information. This finding was observed in the total of the responses provided to the key concepts by the students. The response words the students provided most were Computer, phone, Game, Facebook, and Internet. Today, such uses of technology have become an indispensable part of our students' lives. For this reason, we should design our educational environment in accordance with the needs of the new generation. It is a fact that unless we perform such arrangements, we cannot achieve success in education. In his study on 'New Millennium Learners', Şahin [26] concludes it is necessary to well understand the characteristics of the new generation, who are growing up in an environment surrounded by technology and arrange the educational environments, based on this understanding, to be successful in the area of education.

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