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The level of readability of the computer sciences textbook among the eleventh grade students in Jordan

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This study aimed to identify readability level of computer science textbooks among the Jordanian eleventh grade students. A cross-sectional, descriptive study was conducted. The study population consisted of all eleventh graders of Al-Mafraq education directorate. The study sample comprised 122 male and female eleventh graders, chosen by intended sampling method from two public schools. However, to answer the research questions, the researchers prepared a close test as an instrument to measure the readability levels using three randomly selected texts, which have never been used, from eleventh grade computer science textbook. After validating the instrument, it was administered to the study participants. The following results were reported: Eleventh grade computer science textbook readability levels were classified based on the scores students attained during the test as follows: the independent level of readability (48.9%), followed by depressed level (35.1%) and finally the educational level with (16.1%); the existence of positive statistically significant relationship at (α≤ 0.05) level between student achievement in computer subject and its readability level; there were statistically significant differences at (α≤ 0.05) level; the eleventh computer sciences textbook readability levels attributable to student's gender, is in favor of females. Based on these results, some recommendations were suggested.

Key words: Readability, computer sciences textbook, eleventh grade.

INTRODUCTION

School curriculum is one of the most important components of the educational process; however, this view differs based on educational systems' development. Furthermore, curriculum is one of the most influential components on learners as it is the major tool in providing knowledge, where it includes all cognitions, concepts, skills and values, as well as all cognitive, intellectual and affective behavioral goals that are expected to be acquired by students. Therefore; school curriculum and textbook, enjoy a great deal of care of Jordan ministry of education in terms of continuous development and evaluation. The ministry of education introduced and started teaching computer science since 1984 in its secondary schools (Al-Khateeb, 1993).

Furthermore, Marei and Al-Hilla (2001) showed that school curriculum development and evaluation is the optimal means for the improvement of teaching and learning process. However; computer curricula pave the way for students to acquire computer skills; while connecting them to knowledge in the economy, which is the current trend in Jordan (Ministry of Education, 2013)

Developing school textbooks and issuing them in a manner that can be applied in schools, which requires that these books be consistent with students' level and takes into account readers' level and readability of the material in terms of language difficulty and the nature of its presentation.

However, among factors related to readability of the letters' design are: familiarity with words in the written material, frequency of their use of textbooks, sentence order, organization of written material, and dividing them into short sentences, which influence readability level. Furthermore, readability measurement is of great importance, to ensure that students' school materials are consistent with their reading ability. Consequently, student comprehension of the real material is ensured and student feeling of depression will be avoided. Several recent studies including that of AL-Hweiti(2010) and Al-Bordi (2013) conclude that student's achievement drops if their textbooks readability is above their reading level, whatever it is.

Given the importance of computers in our current age and its strong connection with various aspects of labor market, curriculum developers must consider the need to deliver it to students in a manner consistent with their capability to enable them understand it. Thus, the researchers believe that the ministry of education made a successful option in changing the content of computer science curriculum for the eleventh grade to be consistent with their current age. However, this success must be completed by divining its intended objectives which, researchers believe, will depend on students' ability to understand its content as well as ability to deal with it. Therefore, it became important to address eleventh grade computer science textbook readability.

Significance of the study

The current study addressed a very important issue readability level of eleventh grade computer sciences textbook. However, it is beneficial in the following ways:
1. It is consistent with school textbooks and curriculum development; while the evaluation process occurs in Jordanian educational sector.
2. It might help curriculum policy makers and textbooks authors by providing them with readability level of the eleventh grade computer science textbook in Jordan.
3. It might benefit teachers by showing them the readability level of different texts from eleventh grade computer sciences book, which will contribute in

introducing these books based on their readability level.
4. Results of this study might provide educational decision makers feedbacks regarding the degree of eleventh grade computer sciences textbook consistency, with students' level and capabilities.
5. It might help in confronting reading weakness among students in general and in dealing with computer material in particular, as well as enhancing school book with questions and activities that elicit students' intellect.

Objectives of the study

The study aimed at identifying the readability level of the eleventh grade computer sciences textbook as well as identifying the effect of some variables including gender and student achievement on computer science textbooks of eleventh grade reliability level.

The problem of the study

Curriculum and textbooks in this current era have triggered great interest, for the purpose of developing, updating, and enhancing them as well as avoiding shortcomings upon implementation among which have been shown by numerous studies (Al-Momani and AL-Momani (2011) and Al-khaldi (2013)) on different Jordanian school textbook which reported low readability. However, Al-Momani and Al-Momani (2011) suggested the adoption methods to measure school textbook readability and verifying its appropriateness with students' level before adopting them. Moreover, Al-Khaldi (2013) suggested the adoption of readability within school textbooks specifications, thereby; no school texts should be approved for teaching unless their readability level has been determined. Therefore, the current study focuses on the need for curriculum development and updating, while considering a good readability level that enable students understand school textbooks easily.

Furthermore, computer books and curricula witnessed development in the market needs two years ago. In addition, the researcher, who is a computer science teacher, noticed the importance of school text for both teachers and students, the need for school textbooks be consistent with students in terms of difficulty and provide students opportunity to participate through good questions and activities, prompting students' interaction. Therefore, new textbook readability was investigated and first of which was eleventh grade computer sciences textbooks in Jordan. Thus, the research problem seeks to identify the eleventh grade computer science readability level and its relationship with student's gender and achievement level.

Questions of the study

The researcher seeks to answer the following question:

What is the readability level of eleventh grade computer science textbook and what is its correlation with some variables according to the following questions:

1. Does an eleventh grade computer science textbook readability level differ due to students' achievement?
2. Does the eleventh grade computer science textbook readability differ due to students' gender?

Limitations of the study

1. Place constraints: The study was confined to public schools at Al-Mafraq education directorate.
2. Time constraint: The study was conducted during the first semester of the 2017/2018 school academic year.
3. Topic constraint. The study was limited to measuring the eleventh grade computer science texts readability.
4. Human constraints: The study was conducted on a sample of eleventh graders at Al-Mafraq public schools.
5. Generalization of the study results will be constrained by the instrument's psychometric properties as well as subject objectivity in responding to the study instrument.

Definition of terms

Computer science textbooks

The book approved by the Ministry of Educations in Jordan for teaching eleventh graders in schools from 2016/2017 school year, contains four study units for two semesters.

Readability

Degree of ease or difficulty of the readability of the textbook is measured by the score obtained by a student on close test prepared by the researcher.

Close test

A test measuring readability level was done by omitting some words in a systematic way and the student is required to recall them and respondents are classified according to their scores on this test into three levels: Independent, educational and depressed level.

Theoretical framework and previous studies

Origin of readability

Studies on readability originated in the United States during 1940 as a result of nonexistence of textbooks that are appropriate for elementary stage students as they

were studying secondary stage textbooks, in addition to the fact that scientific research tools that were used in solving problems had developed during that period.

Readability concept

Readability is the result of reader's interaction with the reading material; which it expresses the extent of congruence between them as those interested in readability focus their attention on two basic concepts: the first of which is the reading material and different levels of its difficulty, and the other is readers and their various reading levels (Nejadat, 2000). Numerous researchers have provided various definitions for readability, among which is the degree of relative difficulty of scientific texts that students encounter in understanding their content (Bogahoos and Ismail, 2001: 119).

Furthermore, Teimeh and Mannaa (2004) emphasized that readability is the determinant difficulty or ease degree of a text through studying factors that might affect this level such as structures, vocabulary, concepts, and learning desire. (Abu Salit) 2007 believes that credibility has connotations, as it connotes written text clarity level and reader capability level to understand text content, either explicit or implicit information; and more precisely, readability construct refers to relative degree of text difficulty the reader encounter in understanding its content. Finally, Firlar and Temizyurek (2010: 646) define readability as the ability possessed by an individual to understand written text given its, simplicity and writing technicality. So, from these various definitions, readability is a process of analyzing a written text, and then to measure its ease and difficulty as well as factors influencing the success of reading and the understanding written texts.

Importance of the study of readability

Readability is a process of great importance. Authors apply it to textbooks, to help them identify educational materials specifications contained in their book and manner of presentation. It also contributes to communicating educational materials to a large segment of learners possible. However, readability gained increased interest as a result of the proven correlational relationships between high achievement and school textbooks. The readability was prepared according to readability standards (Njadat, 2000).

Factors influencing readability

Readability degree is affected by various factors; some are readers and others, related text. Here is a brief

explanation:

First: Readers related factors:

1. learners' Attitudes and Tendencies:

Among factors influencing text difficulty that are learners related is the issue of their tendencies, non-motivation for learning, since students' tendencies and their likeness of the text are among the important factors directly affecting their understanding of it (BaniSaeb, 2008).

2. Previous experience

A student's previous experience helps him understand a text; a student with rich experience about the subject relates his previous experiences and information contained in the new text (BaniSaeb, 2008).

Text readability degree is influenced with text construction factors in terms of shape content and style; so computationally, linguistically and idea intensity affects text understanding and comprehension.

Methods for measuring readability

Methods and techniques which the curricula developers and authors of school textbooks, as well as researchers can use to measure the degree of readability are numerous as indicated by previous studies. The following explains this:

Descriptive methods

Judgments technique

These are judgments made by a panel of referees on the clarity of material for the reader. This technique is also easily applied and is characterized by simplicity and quick computation. However; among its major drawbacks is variance in referees' experiences and capabilities (Basyouni, 2002). However, among the most widely used techniques is teachers' judgment since they are more suitable and more capable to perform this job for their direct contact with students studying targeted texts compared to others. Thus, they can know students' tendencies, capabilities and previous experiences in judging school textbook readability.

Quantitative methods

Using readability equations methods

These methods are predicting tools used in calculating

word and sentence variables in the written text to determine its difficulty level, the most salient of which are: Dale and shall equation, desk formula, Fry Rabidity Coraph and Fog – gunning formula.

Comprehension test

This test is based on selecting a sample of textbooks. A test is prepared when the comprehension levels are represented as classified by Bloom; translation, explanation and interpretation. However, translation is explaining and rephrasing text in a new form, using new sentences without changing the meaning embedded in the text; while explanation is reorganizing of ideas by the person who wants to translate, in his words; whereas interpretation is the induction of new indirect meaning from the direct explicit text (Saqer, 2001). This test measures general text understanding and reader's capabilities. Thus it is characterized by dealing with the reader directly.

Sentence completion test

This test is suitable to determine comprehension and understanding range, as it is composed of items to be filled by examinees with specific words or phrases, and is characterized by ease of preparation. However, among its drawbacks is the need for great efforts in scoring (Mowkly, 2002).

Close test

A test that requires examinees to deal with a text from which some words are systematically omitted and students are told to rewrite them. Consequently, he scores if he predicts the correct word (Teimeh and Mannaa, 2001). This test is also known as a test measuring readability by systemic omission for words, where student have to recall them.

Text readability levels

Independent level

The level at which a student can comprehend a text without help, and in the current study it is measured by a student attaining a score between 6l to 100% in the completion test.

Educational Level

A level at which a student, can with the teacher's help,

comprehend a text. In the current study, it was measured by students attaining a score between 41-60% in the completion test.

Depressive level

A level at which a student fails to comprehend a text, even with the teacher's help. In the current study, it was measured by student attaining a score between 0-40% on a completion test.

Based on the above mentioned, the researchers think that the readability of the school textbook is the main factor as regard the extent of its benefit. If the author of the textbook takes care of the readability criteria, the students' understanding and achievement level will increase as well.

Previous studies

This section includes some of the previous studies the researchers found in the university library, including AL-AL-Beit, Hashemite, Jordan, and Islamic university Gaza libraries, employing research engines such as Yahoo and Google.

Al-Eisa (2011) conducted a study aimed at measuring the readability of the first middle grade mathematics Textbook in Saudi Arabia and its relationship with student achievement in mathematics. A close test was administered on a sample of (292) students. The results showed a high readability level of this book in general, since majority of the students fell within the independent level as well as a weak correlation between student performance on close test and achievement in math.

Al-Bordi (2013) conducted a study aimed at measuring the second grade science textbook readability level in Saudi Arabia, in addition to determining its relation with students' achievement in science and Arabic Language. Close test was conducted on a sample of (655) students'. Results showed that science textbook readability was under the depressive level. Results also showed a weak correlation between science book readability and student achievement in Arabic Language.

Gyasi (2013) conducted a study aimed at identifying the readability level of secondary school science textbooks. Close test and fog-gunning tests were administered to a sample of (300) students. Results showed that the readability of the science books fell within the depressive readability level. However; they were appropriate for what they were designed for in a moderate fashion.

Al-Khaldi (2013) conducted a study aimed at measuring the ninth grades Islamic education textbooks readability level and identifying if topics sequence is done according to their readability. The study also aimed to find students' gender effect on readability of these books. A close test

was administered to a sample of 393 students. Results showed that textbook fell within depressive level, and no statistically significant differences due to student's gender were found. Finally, results showed that textbook topics were not sequenced according to their readability level.

Sibanda (2014) conducted a study aimed at identifying readability degree of natural sciences textbook for fourth grade in South Africa. Data were collected through interviews with some students and through the administration of close test on a sample of 48 fourth graders. Results showed that fourth grade natural sciences textbooks fell within the depressive readability level.

Abbas (2015) conducted a study aimed at identifying readability level of seventh grade Arabic Language textbook in Jordan. Close test was administered to a sample of 270 students. Results showed that readability of the texts fell within the depressive level. Results also showed that topics in these books were not sequenced according to their readability level. Results also showed statistically significant differences due to students' gender, which is in favor of females, as well as the existence of positive correlation between students' achievement and textbooks readability.

Cardak et al., (2016) conducted a study aimed at evaluating readability of Turkish seventh grade new sciences book and its appropriateness to the age level of students. The study employed flesch, fog –gunniug close test and sonmez tests on a sample of 70 male and female seventh graders. Results showed that flesch and fog gunning were not suitable for Turkish languages. Results of close test showed that students cannot understand without teachers' support. However; sonmez results showed that the book was clear and understandable, and this test was the most accurate and appropriate for Turkish language.

Comments on previous studies

The current study is consistent with the studies of Abbas (2015), Al-Bordi (2013), Al-Eisa (2011) in connecting textbook readability with study achievement. Moreover, the study was consistent with the study of Abbas (2015), Al-Khaldi (2013) study in connecting book readability level with student gender, but it differ from Cardak et al., (2016) and all previous studies which investigated the degree of book appropriateness for students age as well in the books of study, which is eleventh grade computer science in Jordan; while other studies addressed other different books. The current study is unique in that it aims to identify the relationship between achievement and readability of the eleventh grade computer science textbooks in Jordan. For the best of the researchers' knowledge, there were no previous studies that addressed the relationship between readability and achievement in computer sciences textbook.

Table 1. Schools and sections from which the sample was chosen.

School	Number of sections	Sections	No. student	Total
The First- Al-Mafraq secondary school for males	3	A	19	60
		B	23	
		C	18	
Al-Mafraq secondary school for female	2	A	33	62
		C	29	
Grand Total				122

Table 2. Text sample selected from the eleventh grade textbook.

Text Number	Title	Part
1	Hard-disk	First
2	Electronic garbage	First
3	Social networks developers authorities	Second

METHODOLOGY

The current study employed correlational methodology because of its appropriateness for its nature, where researchers describe eleventh grade computer science books in Jordan through collecting, analyzing and measuring data; reaching and interpretation of results with the help of study samples tool and statistical processing.

Population of the study

The study population consisted of all the eleventh grade students' in Al-Mafraq public schools, totaling 2561 male and female students. 1206 of them are males and 1355 females. According to Al-Mafraq, directorate of education statistics, 2017/2018, the population also consisted of eleventh grade computer science textbooks, consisting of two parts; however, texts related to programming topics were excluded because they contain symbols and texts in English language.

Sample of the study

The sample of this study was purposely selected from eleventh grade students at Al-Mafraq directorate of education, and consisting of (60) males and (62) females chosen from two secondary schools: one for males which three sections and a school for females of which two sections were selected, the Table 1 below shows this.

As for texts sample, it was represented by the selection of three texts chosen randomly from computer science books for eleventh grade, for the school year 2017/2018. The researchers selected different topics from the two parts of the books, parts which students have never studied before. Table 2 shows such details.

The instrument of the study

The study employs close test to measure computer science readability level for the eleventh grade. The research tool was developed based on previous studies including Al-Bordi (2013) and Abbas (2015). In the following sequence:

Instrument validity

To establish tool's validity, it was submitted in its first draft to a panel of specialized referees in teaching methods and curricula, totaling 8 referees, and was asked to give their opinions regarding texts included in the test in its first version, and their opinions were considered when preparing the final version of the tool.

Instrument reliability

Test reliability was measured using test- retest method, where it was administered on a pilot sample from the population, but not from its sample. The sample consisted of (53) students, (25) females and (28) males, two times within a period of 14 days for the second application. After calculating the reliability coefficient using K R 20 Formula, the Correlation coefficient was (24%).

Test scoring

Each space filled with the correct word was assigned two scores. However, failure to answer correctly, both scores was not given. Scoring was carried out with the help of an experienced scorer to score the test, scoring results of researchers were compared to obtain agreement coefficient between them; however, agreement percentage was 87%.

Additionally, the following division was adopted to classify readability level.
1. Less than (41) scores…. Depressive level
2. (41- 60) score …. Educational level.
3.(61- 100) score…. Independent level.

Procedures of the study

To achieve the study objectives, the following procedures were performed.

1. Identification of research problems and questions.

Table 3. Frequencies and percentages of eleventh grade computer science book readability level.

Readability level	Males		Females		Total	
	number	%	number	%	number	%
Depressive	53	62.4	8	9.0	61	35.1
Educational	13	15.3	15	16.9	28	16.1
Independent	19	22.4	66	74.2	85	48.9
Total	85	48.6	89	51.4	174	100

*F = Frequency.

Table 4. Pearson correlation coefficient between readability and students' achievement.

Variable		Readability level
Students	Correlation coefficient	*(0.62)
achievement	Statistical significance	(00.00)

* Significant at (α ≤ 0.05) level

2. Reviewing related educational literature and previous studies related to the subject.
3. Development of close test in its final version.
4. Getting a facilitating task letter from al–Al Beit University addressed to Al-Mafraq directorate of Education.
5. Getting a facilitating task letter from Al-Mafraq directorate of education addressed to public schools' principals to facilitate their application of the study.
6. Administering study text on the sample, scoring the test and giving marks.
7. Getting the assistance of one statistics specialist to analyze data using SPSS.
8. Suggesting some recommendations based on the results obtained.

Variables of the study

Independent variable

1) Gender: it has two levels (male and female).
2) Study achievement: has two levels.

Dependent variable

Readability of the eleventh grade computer science in Jordan

Statistical analysis

The study used frequencies, percentage, independent samples T-Test, pension correlation coefficient and K -R- 20 Formula.

RESULTS

Results related to the first research question:

"What is the readability level of the eleventh grade computer sciences textbook in Jordan?" to answer this question, frequencies and percentages of the eleventh grade computer sciences readability were calculated and Table 3 illustrates the results.

Table 3 shows that the highest percentage of subjects' distribution according to readability level of the eleventh grade computer science book, which was 48.9% for independent level, followed by the depressive level (35.1%) and finally the educational level (16.1%).

Results related to the second research question:

"Does readability level of the eleventh grade computer science book differ according to students' achievement?" Table 4 shows results.

Table 4 shows a positive relationship between readability level of the eleventh grade computer sciences book and students achievement. The correlation coefficient was 0.62 and was statistically significant at (α ≤ 0.05) level.

Results related to the third research question which says:

"Does readability level of the eleventh grade computer science book differ according to student's gender?" to answer this question, Independent Samples T- test was used in an attempt to find student's gender effect on book readability level. Table 5 shows the results.

Table 5 shows difference in readability level of the eleventh grade computer science books due to student gender, where T was (10.27) with a statistical significance at (α ≤ 0.05) level; indicating the existence of significant difference between male and female students in favor of

Table 5. Results of independent sample T-test for gender effect on readability level.

Gender	Mean	SD	T – value	Statistical Significance
Male	37.16	23.79	10.27	0.00
Female	70.13	18.30		

females suggesting that female readability level was better than that of males.

DISCUSSION

Discussion of the results related to the first question:

"What is the level of the eleventh grade computer science textbooks in Jordan?"

Results showed that majority of the study sample fell within independent level, which was 48.9%, while the remaining percentage was divided between educational level (16.1) and depressive level (35.1%) respectively.

In the light of these findings, it can be concluded that eleventh grade computer science textbooks readability level falls within the independent level, which means that ease coefficient was higher than difficulty coefficient. Thus, this can be attributed to the material content that addressed topics related to the current age and technological developments. Besides, its printing style in terms of letter size, lines' length, margins sizes, quality of paper used and the method of presenting information. Results of this study were consistent with Al-Eisa (2011) study, where majority of the study sample fall within the independent level, but different form a group of studies in which samples fall within the depressive level; including Momani and Al, Momani (2011), Al-Bordi (2013) Gyasi (2013), Al-Khaldi (2013), Sibanda (2014), and Abbas (2015).

Therefore, the readability of computer science is the determinant of its benefit and nearness of students. Based on these results, it can be said that the eleventh graders in Jordan will achieve success in integrating with computer science books. This will result in increasing their ability to understand its content and benefit from it. This is what the ministry of education in Jordan seeks to achieve during the last three years, from these textbooks.

Discussion of the results related to second research question:

"Does readability level of the eleventh grade computer science textbooks differ due to students' achievement in that subject?"

Results showed a statistically significant positive computer science and readability degree of this book, where (r) was (0.62).

This might be attributed to the fact that previously possessed information by the students' regarding the computer material topics could be suitable and will aid them in the readability test. It can be attributed to the fact that the materials of the computer sciences textbooks for the tenth and eleventh grades contained the innovations of this age which the students are already familiar with at home and school, which might improve their level of readability in the eleventh grade.

Additionally, this might be attributed to the fact that students possess the ability to read and understand computer material of the tenth grade, as well as their ability to recall previous knowledge and information which might help them in achieving these results on the readability test regarding eleventh grade computer science book.

This finding is consistent with Abbas (2015), in that study average has a positive relationship with school textbook readability. However, this study differs from Al-Eisa (2011) and Al-Bordi (2013) in that the relationship between readability and achievement was very weak.

This finding is similar to the results of the studies of Al-Eisa (2011) and Al-Bordi (2013) as well as Abbas (2015) in connecting achievement with the readability level; where Al-eisa connected students' achievement in mathematics with readability mean of the first middle grade in math, and Al-Bordi (2013), which connected achievement with readability in science for the second middle grade and in science, and Abbas prepared (2015) an achievement test for Arabic Language book for the seventh grade and related its results to readability level of the seventh grade Arabic language book. The current study connected the tenth grade computer sciences achievement with the readability of the eleventh grade computer science book.

Discussion of the results related to the third question:

"Does readability level of the eleventh grade computer book differ due to student's gender? Results show statistically significant differences at (α ≤ 0.05) level in readability level between males and females, in favor of females, among the eleventh graders. This might be attributed to the female superiority over males in their linguistic and comprehension abilities, as well as their high abilities in recalling, and their increased motivation and desire to learn, as well as the nature of the Jordanian

society which give males more freedom than females to stay outside the home while females must remain at home.

Consequently, females spend more time at home than males and this may explain their higher achievement than males. Besides, the females show more commitment to their homework assignment and examinations as indicated by the study ofAl-Momaniand Al-Momani (2011).

This result is consistent with Al-Momani and Al-Momani (2011), Al-Khaldi (2013), and Abbas (2015) studies.

RECOMMENDATIONS

In light of the above results, the researchers suggest the following recommendations:

1. There is a necessity to conduct more research on readability of the computer sciences textbooks for the rest of the grades.
2. More studies should be conducted on readability of different school textbooks before applying them in the field.
3. More studies should be conducting on readability of various school books to investigate their readability when authoring and developing them as well as before generalizing and applying them.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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