Readability of Reading Comprehension Texts in Iranian Senior High schools Regarding Students' Background Knowledge and Interest

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Abstract—This research study considered the readability indexes of reading passages in English textbooks taught at Iranian senior high schools. For measuring the readability indexes of the passages, 30 English passages were fed into the computer and Flesch readability indexes of the passages were estimated. This study also examined students' prior knowledge-interest levels to see to what extent students were interested or had background knowledge of the passages in their English textbooks.120 participants including 60 males and 60 females took part in the study and completed a Likert-type scale questionnaire. Other issues that were analyzed in the study were the association between students' interest level and their background knowledge level, and the relationship between students' interest- background knowledge levels with the readability indexes of the passages. The results of the study indicated that the readability indexes of the passages in high school English textbooks did not accord with Flesch readability standard. The results also showed that students mostly had an average and a low level of interest and background knowledge regarding reading passages in their English text books. The findings of the study revealed a significant relationship between students' interest level and their background knowledge level. This study also showed an insignificant relationship between students' interest level and the readability indexes of the passages in books two, three and four while based on Flesch readability formula there was a significant relationship between these two variables in book one. The results of the last part of the study revealed an insignificant relationship between students' background knowledge level and the readability indexes of the passages.

Index Terms—text readability, readability formula, Flesch readability formula, students' interest level, students' background knowledge level

I. INTRODUCTION

As one of the most significant factors in teaching English as a second or foreign language, reading comprehension is an important element and the question of the readability of the texts has special importance.

Fulcher (1997) believes that text readability or level is thought of as getting an appropriate balance between supports and challenges. Supports are the features that make a text easy to read, and challenges are the potential difficulties for particular readers. Davids (2002) also defines readability as how easy or hard the text is for a group of readers of certain or at a great level.

According to Klare (1963), readability formulas can be defined as mathematical equations used for the determination or prediction of the level of reading competence necessary for the comprehension of a particular piece of writing in order to provide an index of probable difficulty for the reader.

While over 200 readability formulas have been presented to evaluate the readability indexes of the passages, the researcher tried to use the most popular and the most famous one.

Flesch Reading Ease Readability Formula which is installed in Microsoft Office Word can be supposed as the most popular one. This formula rates texts on a 100-point scale. The higher the score, the easier it is to understand the texts.

TABLE 1:
FLESH'S READING EASE SCORE (DUBAY, 2004)

Reading Score	Style Description	Estimated Reading Grade	Estimated Percent of U.S. Adults
0 to 30	Very difficult	College graduate	4.5%
30 to 40	Difficult	13th to 16th grade	33%
50 to 60	Fairly difficult	10th to 12th grade	54%
60 to 70	Standard	8th and 9th grade	83%
70 to 80	Fairly easy	7th grade	88%
80 to 90	Easy	6th grade	91%
90 to 100	Very easy	5th grade	93%

Readability formulas have been criticized for many reasons. Some researchers in this case believe that these formulas are measurements based on a text isolated from the context of its use and they also believe that readability formulas cannot reflect reader characteristics like background knowledge, interest, values, and purpose. So the researcher in this study first of all intended to apply the above mentioned readability formula to reading comprehension texts in Iranian senior high schools and then examined the extent to which students were interested in or had background knowledge of the passages in their English text books. The relationship between students' interest level and background knowledge level with the outcomes of applying readability formula was considered as well.

Strangman and Hall (2005) contended that background knowledge is a term for more specific knowledge dimensions such as metacognition, subject matter, strategy, personal, self- knowledge, and conceptual knowledge.

Not only must the reader have some familiarity with contents of a selection, he or she must also have interest assumed by the author (Adams and Bruce, 1982). Hidi (2006) defines interest as a unique motivational variable, as well as psychological state that occurs during interaction between persons and their object of interest. She believes that interest is characterized by increased attention, concentration and affect.

II. REVIEW OF LITERATURE

Early work on readability formulas began between 1915 and 1920 in the search for objective methods to judge individual reading abilities, especially with the advent of standardized reading texts (Gillam & Newbold, 2010). Thorndike's *the teacher's work book* (1921) was the first milestone, his tabulations of the frequency of 10000 printed words in sample texts set the stage for the readability formulas (Carrel, 1988).Thorndike's book was followed by another landmark work by George Kingsleg Zipf in 1949.Zipf came up with *Human Behavior and the Principles of Least Effort*, in which he declared a mathematical relationship between the hard and easy words, called Zapf's curve (Scott, 2005).

Nowadays readability formulas can be applied to anything from textbooks to different printed materials. Some of these applications are as follows: (educational system: McCellan, 1971; Reed, 1988; newspapers: Fusaro &Conover, 1983; Meyer, 2004; radio programs: Goldstein, 1940; Lowrey; 2006).

Since readability is an issue more complex than observable features of sentences, the researcher in this study tried to discuss two reader-based variables (readers' background knowledge and interest) to see to what extent learners were interested or had background knowledge of the passages in their English textbooks. The next review shows literature on readers' background knowledge and interest as two elements effective on reading fluency.

Research studies in educational psychology have confirmed a strong relationship between background knowledge and interest on one hand and comprehending different texts on the other hand. Some of these studies are as follows: (Johnson, 1982; Entin&Klare, 1985; Jalilifar& Assi, 2008; Leloup, 1993; Eidswick, 2010).

The results of many interest-prior knowledge studies that have been done in L2 learning show the significance of considering these two variables on the part of the learners. So, the researcher in this study considered text-type through readability formulas and students' background knowledge and interest as three variables that make a piece of writing understandable for different groups of learners.

III. STATEMENT OF THE PROBLEM

The researcher as an English teacher in Iranian high schools has always been concerned about the objectives defined for teaching and learning texts in English textbooks. It seems that the students are not interested, engaged and motivated enough to study reading comprehension texts. They always complain about the difficulty level of the texts, vocabulary items, the length of the texts, and the comprehension questions mentioned at the end of the texts. This problem can overshadow the quality of teaching and learning.

Apart from the problems on the part of the students, due to the difficulty level of the texts and students' lack of background knowledge and interest, teachers sometimes do not follow standard teaching procedures and techniques. They translate the texts word by word to give their students a better understanding of the texts. It seems that the purpose beyond teaching and learning these texts relates to word understanding and not text comprehension.

IV. OBJECTIVES OF THE STUDY

The primary objective of this study was to apply readability formula to measure the difficulty level of reading comprehension texts written in high school English textbooks. The second objective was to examine the extent, to which students are interested in or have background knowledge of reading passages in their English text books. The third objective was to consider the relationship between students' interest level and their background knowledge level. The fourth objective was to consider the relationship between students' interest and background knowledge levels with the difficulty level of reading passages in English text books.

The following research questions were to be answered through this study:

1-Do the current rank orders of reading comprehension texts in high school English textbooks accord with readability formulas?

2-To what extent are students interested in reading passages written in their English text books?

3-To what extent do students have background knowledge of reading passages in their English textbooks?

4-Is there any relationship between students' background knowledge level and students' interest level regarding reading passages in their English textbooks?

5-Is there any relationship between students' interest and background knowledge levels with the readability indexes of reading passages in English textbooks?

V. Method

A. Participants

This research study was done with a total of 120 students studying English in Erfan and Andishe high schools located in district three in Shiraz. Sixty of these participants were male and sixty were female. They were selected from among a group with an intermediate and advanced level of English. They were selected based on availability.

B. Materials and Instruments

Thirty reading passages of four English textbooks taught at the high schools of Iran were used as the materials to be evaluated using Flesch readability formula. The lists of the books are as follows:

1-Birjandy, P., Soheili, A., Noroozi, M., & Mahmoodi, Gh. (2006). *English Book 1*.Tehran: Textbook Publishing Company of Iran.

2-Birjandi et al., (2005).*English Book 2*.Tehran: Textbook Publishing Company of Iran.

3-Birjandi et al., (2007).*English Book 3*.Tehran: Textbook Publishing Company of Iran.

4-Birjandy, P., Ananisarab, M.R., & Samimi, D. (2007). *Learning to Read English for Pre-University Students*. Tehran: Textbook Publishing Company of Iran.

The 30 chosen passages have different characteristics in terms of subject matter and readability index. The topics of reading passages are factual, anecdotal, and sometimes funny.

For the purpose of testing students' background knowledge and interest level, a questionnaire was devised, translated, and distributed using Likert scale including 5 choices (low, fairly low, mid-level, fairly high, and high). Attempts were made to ensure that the items were understandable for the participants.

In providing the questionnaire, the researcher was inspired by an article entitled "How to Generate Interest So Reading Comprehension Improves", by Susan M. Ebbers (2011). In this article Ebbers used a questionnaire to determine which topics interest learners and how much they already know about the topics. Cronbach's alpha (0.70) was calculated for the reliability of the questionnaire.

C. Procedures

The following procedures were conducted to meet the objectives of the study:

First, after Microsoft Office Word finished the processes of checking some of the features of difficulty level, i.e., the number of syllables or words, the length of sentences, and the syntactic complexity of sentences, the readability level of 30 passages was calculated and the researcher considered the results one by one. The computer evaluation of the text-readability level was based on Flesch Reading Ease Readability formula.

Second, on the basis of students' background knowledge and interest levels, the questionnaire was translated and checked by some experts and was administered to the participants. It was conducted during a regular class period, with the help of researcher's colleges who were well acquainted with the general objectives of the research. The students were instructed to read each of the items in the questionnaire and circle the numbers which best indicated their choice in the questionnaire ranging from 1(low) to 5(high).

The data required for this study came from both the participants' views and the computer evaluation of text-readability.

D. Data Analysis Procedures

In this study a model of readability standard presented by Flesch, was used to measure the readability indexes of the passages. To carry out the statistical analyses, Statistical Package for Social Sciences (SPSS 16) was used.

For the first research question of the study examining if the readability indexes of reading passages in high school English textbooks were in accordance with readability formulas, Flesch readability formula was applied to different passages and the results were analyzed through descriptive statistics. Then the raw scores obtained by the application of readability formula were reported.

For the second and third questions of the research, investigating the degree to which students were interested in or had enough background knowledge of the passages in their English text books, the questionnaire was distributed. The data obtained with the questionnaire was coded and a descriptive analysis was run to obtain the percentages and the frequencies of students' interest and background knowledge levels.

For answering the fourth and fifth research questions estimating the relationship between students' background knowledge and interest levels, and the relationship between students' background knowledge and interest levels with the readability of reading passages, regression and correlation analyses were used to measure the association between these variables.

VI. RESULTS AND DISCUSSION

Table 2 shows the readability scores and the current rank order of English passages in four English textbooks. The logical rank order of the passages which is based on Flesch readability scores has been mentioned as well.

TABLE 2.
READABILITY SCORES AND LOGICAL RANK ORDER OF READING PASSAGES IN FOUR ENGLISH TEXTBOOKS, USING FLESCH READING EASE READABILITY FORMULA

Passages in Book1	1	2	3	4	5	6	7	8	9
Flesch Score	88.7	95.2	90	100	81.3	96	96.9	99.5	80.5
Logical Rank Order	7	5	6	1	8	4	3	2	9
Passages in Book2	1	2	3	4	5	6	7		
Flesch Score	92.5	98.5	99.6	89.5	100	97.9	79.3		
Logical Rank Order	5	3	2	6	1	4	7		
Passages in Book3	1	2	3	4	5	6			
Flesch Score	66.2	67.2	66.9	66.4	88	62.4			
Logical Rank Order	5	2	3	4	1	6			
Passages in Book4	1	2	3	4	5	6	7	8	
Flesch Score	70.5	62.5	75.3	69.1	51.1	68	51	58.9	
Logical Rank Order	2	5	1	3	7	4	8	6	

Comparing the results of applying Flesch readability formula and as Table 2 shows the passages in books 1, 2, 3, and 4 in English textbooks taught at Iranian high schools do not follow a standard readability procedure. This means that with regard to readability accounts, they have not been arranged in a logical order. Moreover, considering the number of the passages in each book, it seems natural that book one should have fewer passages than book two and book three should have more passages than book two. But as Table 2 shows the order is not logical. In order to have a comprehensible language, the passages should be revised to logical and standard orders. In this way the readers can cope much better with the content of the passages in their English text books and the passages will have standard readability indexes.

TABLE 3.
MEAN AND STANDARD DEVIATION OF STUDENTS' INTEREST LEVEL REGARDING ENGLISH PASSAGES IN BOOKS 1, 2, 3, AND 4

Passages in Book1	1	2	3	4	5	6	7	8	9	total
Mean	2.17	3.96	2.38	4.1	2.13	3.63	4.13	4.03	3.03	29.23
Std.Deviation	0.592	0.793	0.622	0.607	0.629	0.964	0.681	0.85	0.928	3.213
Passages In Book2	1	2	3	4	5	6	7			total
Mean	3.43	2.79	3.55	3.4	3.27	3.43	2.13			21.8
Std.Deviation	1.455	1.373	1.213	1.303	1.639	0.935	0.507			5.176
Passages in Book3	1	2	3	4	5	6				total
Mean	2.43	2.6	2.67	2.9	2.67	2.3				15.57
Std.Deviation	1.251	1.38	1.37	1.494	1.295	1.236				5.276
Passages in Book4	1	2	3	4	5	6	7	8		total
Mean	3.37	2.53	3.37	3.03	3.13	3.1	2.83	3.67		25.03
Std.Deviation	1.129	1.196	1.098	0.999	0.973	1.062	1.085	0.802		3.828

In order to have a better and more general classification for students' interest level, a statistical application was done. Based on Table 3 one standard deviation was subtracted from the mean of the passages in each book and one standard deviation was added to the mean of the passages in each book. Table 4 shows the result of this application.

TABLE 4.
GENERAL CLASSIFICATION FOR STUDENTS' INTEREST LEVEL REGARDING READING PASSAGES IN FOUR ENGLISH TEXTBOOKS TAUGHT AT IRANIAN SENIOR HIGHSCHOOLS

Level of Interest,Book1	frequency	percent	Cumulative Percent
Low	0	0	0
Average	12	40	40
High	18	60	100
total	30	100	-
Level of Interest,Book2	frequency	percent	Cumulative Percent
Low	6	20	20
Average	22	73.3	93.3
High	2	6.7	100
total	30	100	-
Level of Interest,Book3	frequency	percent	Cumulative Percent
Low	17	56.7	56.7
Average	13	43.3	100
High	0	0	100
total	30	100	-
Level of Interest,Book4	frequency	percent	Cumulative Percent
Low	0	0	0
Average	27	90	90
High	3	10	100
total	30	100	-

Based on Tables 3 and 4 it can be concluded that the students have an average or a low level of interest regarding reading passages in books 2, 3, and 4.The only level of high interest belongs to the passages in book 1.This outcome reminds the authors of these books to evaluate English texts more systematically and scientifically.

TABLE 5.
GENERAL CLASSIFICATION FOR STUDENTS' BACKGROUND KNOWLEDGE LEVEL REGARDING READING PASSAGES IN FOUR ENGLISH TEXTBOOKS TAUGHT AT IRANIAN SENIOR HIGH SCHOOLS

Passages in Book1	1	2	3	4	5	6	7	8	9	total
Mean	1.93	2.71	2	2.8	2.1	2.73	3.23	3.33	2.6	23.2
Std.Deviation	0.785	0.976	0.535	0.761	0.662	0.828	1.006	0.844	0.814	3.527
Passages In Book2	1	2	3	4	5	6	7			total
Mean	2.63	3.1	2.21	2.73	2.6	2.93	2.13			18.1
Std.Deviation	1.273	1.205	1.371	1.363	1.404	1.015	0.681			5.839
Passages in Book3	1	2	3	4	5	6				total
Mean	2.1	1.76	1.7	2.1	2.33	2.1				12.03
Std.Deviation	1.269	1.023	0.877	1.242	1.184	1.062				3.764
Passages in Book4	1	2	3	4	5	6	7	8		total
Mean	2.97	2.17	3.4	3.43	3.1	2.6	2.57	3.2		23.433
Std.Deviation	1.299	0.791	1.07	1.165	1.185	1.163	0.935	0.997		4.264

In order to have a better and more general classification for students' background knowledge level, a statistical application was done. Based on Table 5 one standard deviation was subtracted from the mean of the passages in each book and one standard deviation was added to the mean of the passages in each book. The result of this application is Table 6.

TABLE 6.
GENERAL CLASSIFICATION FOR STUDENTS' BACKGROUND KNOWLEDGE LEVEL REGARDING ENGLISH PASSAGES IN BOOKS 1, 2, 3, AND 4

Level of Background Knowledge,Book1	frequency	percent	Cumulative Percent
Low	0	0	0
Average	22	73.3	73.3
High	8	26.7	100
total	30	100	-
Level of Background Knowledge,Book2	frequency	percent	Cumulative Percent
Low	8	26.7	26.7
Average	19	63.3	90
High	3	10	100
total	30	100	-
Level of Background Knowledge,Book3	frequency	percent	Cumulative Percent
Low	16	53.3	53.3
Average	14	46.7	100
High	0	0	100
total	30	100	-
Level of Background Knowledge,Book4	frequency	percent	Cumulative Percent
Low	0	0	0
Average	21	70	70
High	9	30	100
total	30	100	-

Based on Tables 5 and 6 it can be concluded that the students have an average or a low level of background knowledge regarding reading passages in books 1, 2, 3, and 4. This again reminds the authors of these books to consider students' background knowledge level before inserting these passages in English textbooks.

TABLE 7
TOTAL CORRELATION AND REGRESSION ANALYSES BETWEEN STUDENTS' BACKGROUND KNOWLEDGE LEVEL AND THEIR INTEREST LEVEL REGARDING READING PASSAGES IN FOUR ENGLISH BOOKS TAUGHT AT IRANIAN SENIOR HIGH SCHOOLS

Pearson Correlation	R^2	R	B	Beta	T	F	Sig
0.753	0.567	0.753	0.784	0.753	12.42	154.2	0.000
Dependent Variable = Students' level of interest							
Independent Variable =Students' level of background knowledge							

Based on Table 7 there is a positive and a significant relationship between students' interest level and their background knowledge level.

TABLE 8.
CORRELATION AND REGRESSION ANALYSES OF READABILITY INDEXES OF THE PASSAGES IN BOOKS 1, 2, 3, 4 AND STUDENTS' INTEREST LEVEL BASED ON FLESCH READABILITY FORMULA

Book1	Pearson Correlation	R^2	R	B	Beta	T	F	Sig
Flesch	0/78	0/61	0/78	0/08	0/78	3/32	11/04	0/013
Book2	Pearson Correlation	R^2	R	B	Beta	T	F	Sig
Flesch	0/67	0/45	0/67	0/043	0/67	2/02	4/07	0/1
Book3	Pearson Correlation	R^2	R	B	Beta	T	F	Sig
Flesch	0/3	0/09	0/3	0/007	0/3	0/63	0/39	0/57
Book4	Pearson Correlation	R^2	R	B	Beta	T	F	Sig
Flesch	0/25	0/06	0/25	0/01	0/25	0/65	0/42	0/52

TABLE 9.
CORRELATION AND REGRESSION ANALYSES OF READABILITY INDEXES OF THE PASSAGES IN BOOKS 1, 2, 3, 4 AND STUDENTS' BACKGROUND KNOWLEDGE LEVEL BASED ON FLESCH READABILITY FORMULA

Book1	Pearson Correlation	R^2	R	B	Beta	T	F	Sig
Flesch	0/63	0/4	0/63	0/04	0/63	2/14	4/56	0/07
Book2	Pearson Correlation	R^2	R	B	Beta	T	F	Sig
Flesch	0/46	0/21	0/46	0/02	0/46	1/15	1/31	0/3
Book3	Pearson Correlation	R^2	R	B	Beta	T	F	Sig
Flesch	0/55	0/31	0/55	0/01	0/55	1/33	1/76	0/26
Book4	Pearson Correlation	R^2	R	B	Beta	T	F	Sig
Flesch	0/32	0/1	0/32	0/02	0/32	0/83	0/69	0/46

Considering the relationship between students' interest level and the readability indexes of the passages, the scores and the levels of significance show different results. Based on Table 8 and the scores obtained from Flesch readability formula there is a meaningful relationship between students' interest level and the readability indexes of the passages in

book one. P<0.013 means that whenever there is an increase in students' interest level, there is a decrease in difficulty level of reading passages. The relationship between these two variables is insignificant regarding reading passages in books two, three, and four.

Analyzing the results of the relationship between students' background knowledge level and the readability indexes of the passages in four English textbooks, the levels of significance in Table 9 demonstrate that there is no meaningful and significant relationship between these two variables. The outcomes of this part of the study are based on the application of Flesch readability formula.

VII. CONCLUSIONS

The evidence presented in this study led to the following conclusions:

1-From the first phase of the study, determining the readability indexes of reading passages, the conclusion may be reached that the arrangement of the passages was not standard and should be changed. A look at all readability scores showed that most of the passages in book one were more difficult than those in book two and some of the passages in book three were more difficult than those in book four. So, it can be concluded that most passages in books one, two, three, and four would not be appropriate for those reading at that specific age and educational level.

2-The students who took part in the second phase of the study, addressing students' interest and background knowledge levels, mostly showed an average and a low level of interest and background knowledge.

The passages, which earned the highest interest level, were:

book one passage eight, *Eat Clothes Eat*, passage seven, *High Ways in the Sky*, passage two, *The Funny Farmhand*, and passage four, *The School Bus*, book two passage five, *The Little Old* **Man Who Couldn't Read**, and passage one, *Washoe and the Puzzles*, book three passage four, **The Olympic Games,** passage three, *Memory*, and passage two, *The Value of Education*, and book four passage eight *Great Men and Women,* passage one, *Why Exercise is Important*, passage three, *Global Warming, Global Concern,* and passage four *Earthquakes and How to Survive Them*.

The passages, which earned the highest background knowledge rating, were:

book one passage eight, *Eat Clothes Eat*, and passage seven, *High Ways in the* **Sky,** book two passage five, *The Little Old* **Man Who Couldn't Read**, passage one, *Washoe and the Puzzles*, passage two, *The Other Side of the Moon*, and passage four *Charles Dickens and the Little Children*, book three passage one, *TV. Or no TV*., and passage four, **The Olympic Games,** and book four passage one, *Why Exercise Is Important*, passage three, *Global Warming, Global Concern* , passage four, *Earthquakes and How to Survive them*, and passage eight, *Great Men and Women.*

3-Cosidering the relationship between students' background knowledge level and students' interest level, it was concluded that there was a significant correlation between these two variables. In other words, most passages which were interesting for the students were also those with the highest prior knowledge order.

4-Examinig the association between students' interest and background knowledge levels with the readability indexes of the reading passages, the conclusion reached at this point was that there was no correlation between students' background knowledge level and the difficulty level of reading passages.

Based on Flesch readability formula there was a positive relationship between students' interest level and the difficulty level of reading passages in book one. This showed that whenever there was an increase in the difficulty level of reading passages (the text becomes easier), there was an increase in students' interest level as well. This relationship was not meaningful regarding reading passages in books two, three, and four.

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