University of Oran2 Mohammed Ben Ahmed
Faculty of Foreign Languages

THESIS

Submitted in Candidacy for the Degree of "Doctorat Es-Sciences"
In English - Specialty Languages -

Devising Readability Formulas for EFL Learning in the Algerian Middle School: Workable Theorems to Harmonize Texts with Contexts

Presented and defended publicly by:

Mr. Younes BEHIRA

Board of Examiners:

Louafia BOUKRERIS	Professor	University of Oran 2	**Chairwoman**
Abdelghani NAIT BRAHIM	Professor	Higher Teacher Training School of Oran	**Supervisor**
Ulrike PADO	Professor	University of Applied Sciences of Stuttgart	**Co-Supervisor**
Nahed Rajaa GHLAMALLAH	MCA	University of Oran 2	**Examiner**
Fatma ZAGHAR	MCA	University of Oran 2	**Examiner**
Ammar BENABED	MCA	University of Tiaret	**Examiner**

Academic Year: 2021-2022

DEDICATION

To my parents and my family.

ACKNOWLEDGEMENTS

Words are not enough to express how much I am lucky to have Prof. Abdelghani NAIT-BRAHIM as my supervisor. In addition to his unquestionable academic competencies, he is a Man of Honour. Along the academic journey we had together, he made me feel that all my ups and downs deeply affected him which means a lot to me. Being a supportive person, Prof. Abdelghani NAIT-BRAHIM is the one who went far beyond the academic borders between him and me as a supervisee by creating a specific sphere in which you never feel alone in difficult moments, in which you feel that the work you do is unique of its type, and in which you feel that your supervisor is here for you doing whatever it requires from him to fulfill the work objectives. Thank you Professor for everything you have done for me, and thank you for being who you are.

My special thanks and gratitude go to my co-supervisor Prof. Ulrike PADO from the University of Applied Sciences of Stuttgart (HFT Stuttgart) for the huge work she did, without which, this research work would never take its current form. During the academic stay I had in HFT Stuttgart, she took care of me both academically and socially. I will never forget how she welcomed me at her home during the first week of my stay and all what she said to make me sure that she will do whatever she can to help me achieve the objectives of my academic stay. Prof. Ulrike PADO believed in the originality and importance of my research. She provided me with the academic advising and training which not only helped me finish this research work but inspired me to do other future works. Thank you Professor for everything you have done for me.

The most important part of my research work was done in HFT Stuttgart in Germany during my academic stay there (2019/2020). Therefore, I have to

thank the Algerian Ministry of Higher Education and Scientific Research and the selection committee headed by Prof. Mohamed MILIANI for granting me a 9-month scholarship in HFT Stuttgart to finish my PhD thesis.

I am really thankful to HFT Stuttgart and its administrative and technical staff for accepting me in their university and providing me with all I needed to accomplish my research objectives during my academic stay. Many thanks also go to Mr. Ratnadeep Rajendra Kharade for developing the website of BNP Readability Formulas which is hosted on the M4_Lab transfer portal of HFT Stuttgart. I should also thank Professor Sebastian PADO form the University of Stuttgart for his orientation and the fruitful discussions I had with him.

I feel indebted to the teachers and their learners from Oran, Relizane and Tiaret who participated in this study by doing many experiments and providing feedback. I also thank the middle school inspectors from Relizane and Tissemssilet whose feedback was of a great help during the processes of devising and testing BNP Readability Formulas.

I would like also to thank Prof. Sidi Mohammed LAKHDAR-BARKA for what he taught me and his encouragement. Special thanks also go to Dr. Ammar BENABED for his encouragement and feedback.

Many thanks to Prof. BOUKRERIS Louafia, Dr. Nahed Rajaa GHLAMALLAH, Dr. Fatma ZAGHAR and Dr. Ammar BENABED for accepting to read this research work, and for their constructive comments.

Abstract

Research on readability has extended over the last three centuries (Sherman 1893; Thorndike 1921;Flesch 1948; Dale and Chall 995, Solomon 2007, etc) giving birth to many English readability formulas for US schoolers. However, due to the differences between their creation context and schooling system, these formulas are unworkable in Algerian EFL teaching/learning contexts. This study, hence, suggests formulas as scientific tools to be used by Algerian classroom teachers in predicting the readability of the reading texts for middle school EFL learners through estimated reading time. To get the approximate reading time for each level and category of readers, learners from different middle schools in Algeria participated in the study by reading selected texts. On the basis of the study data, linear regression models were trained in WEKA software using the counts of words, syllables, and characters of the selected texts as well as the average reading time per word, per syllable, and per character of the target readers. The analysis and testing of the models on texts of different length and percentage of polysyllabic words demonstrate a consistency in the models developed using the variables of the character count and the average reading time per character compared to the other models. Study results show that the higher the middle school level, the shorter the target readers' estimated reading time is; and the better the target reader's level in English, the shorter the estimated reading time is. BNP Readability Formulas, which are the first that combine a text characteristic (character count) and the target reader's characteristic (reading speed), were tested by teachers in different middle schools confirming their efficiency in predicting compatible reading times to Algerian middle school EFL learners. These estimates can also be used in textbook development to maintain gradation and consistency through the textbook reading texts and middle school levels.

Key words: EFL, reading, readability formulas, estimated reading time, reading speed, character count.

ملخص

البحث حول المقروئية على مدى القرون الثلاث الأخيرة (Sherman1893; Thorndike1921 ; Solomon 2007 ; Dale and Chall 1995 ; Flesch 1948، إلخ) أدى إلى تطوير صيغ رياضية للمقروئية للغة الإنجليزية للمتمدرسين في الولايات المتحدة الأمريكية. ونظرًا للاختلافات من حيث الوسط ونظام التعليم، فإن هذه الصيغ غير قابلة للتطبيق في أوساط تعليم و تعلم اللغة الإنجليزية كلغة أجنبية بالجزائر . بالتالي، تقترح هذه الدراسة صيغا رياضية كأدوات علمية لاستخدامها من قبل الأساتذة الجزائريين لتوقع مقروئية نصوص القراءة لمتعلمي اللغة الإنجليزية كلغة أجنبية في مؤسسات التعليم المتوسط من خلال تقدير وقت القراءة. للحصول على وقت القراءة التقريبي لكل مستوى وفئة من القراء ، شارك تلاميذ من متوسطات مختلفة في الجزائر في الدراسة من خلال قراءة نصوص مختارة. بناءً على بيانات الدراسة، تم تدريب نماذج الانحدار الخطي في برنامج WEKA باستخدام تعداد الكلمات، المقاطع، وأحرف النصوص المختارة بالإضافة إلى متوسط وقت القراءة لكل كلمة، مقطع، وحرف للقراء المستهدفين . يوضح تحليل واختبار النماذج على نصوص مختلفة الطول والنسبة المئوية للكلمات متعددة المقاطع التوافق في النماذج المطورة باستخدام متغيرات عدد الأحرف ومتوسط وقت القراءة لكل حرف مقارنة بالنماذج الأخرى. تظهر نتائج الدراسة أنه كلما ارتفع المستوى الدراسي، قل وقت القراءة المقدر للقراء المستهدفين؛ وكلما كان مستوى القارئ المستهدف في اللغة الإنجليزية أفضل، قل وقت القراءة المقدر. تم اختبار صيغ BNP للمقروئية ، وهي الأولى التي تجمع بين خاصية النص (عدد الأحرف) وخاصية القارئ المستهدف (سرعة القراءة) ، من قبل الأساتذة في المؤسسات التعليمية المتوسطة المختلفة لتأكيد فعاليتها في التنبؤ بأوقات القراءة الموافقة لمتعلمي اللغة الإنجليزية كلغة أجنبية في المؤسسة التعليمية المتوسطة الجزائرية. يمكن أيضًا استعمال هذه التقديرات في تطوير الكتب المدرسية لضمان التدرج والتوافق لنصوص القراءة للكتب المدرسية والمستويات التعليمية المتوسطة.

الكلمات المفتاحية: اللغة الإنجليزية كلغة أجنبية ، القراءة ، صيغ المقروئية ، وقت القراءة المقدر، سرعة القراءة ، عدد الأحرف.

Résumé

La recherche sur la lisibilité qui s'étend sur les trois derniers siècles (Sherman 1893 ; Thorndike 1921 ; Flesch 1948 ; Dale et Chall 995, Solomon 2007, etc.) a abouti au développement de formules de lisibilité de l'anglais pour les écoliers américains. Cependant, en raison des différences entre leur contexte de création et système scolaire, ces formules sont inapplicables dans les contextes d'enseignement/apprentissage de l'anglais langue étrangère (EFL) en Algérie. Cette étude propose donc des formules comme outils scientifiques à utiliser par les enseignants algériens pour prédire la lisibilité des textes de lecture pour les apprenants EFL du collège à travers le temps de lecture estimé. Pour obtenir le temps de lecture approximatif pour chaque niveau et catégorie de lecteurs, des apprenants de différents collèges en Algérie ont participé à l'étude en lisant des textes sélectionnés. Sur la base des données que l'étude a fourni, des modèles de régression linéaire ont été entraînés dans le logiciel WEKA en utilisant le nombre de mots, de syllabes et de caractères des textes sélectionnés ainsi que le temps de lecture moyen par mot, par syllabe et par caractère des lecteurs cibles. L'analyse et le test des modèles sur des textes de longueur et de pourcentage de mots polysyllabiques différents démontrent une cohérence dans les modèles développés en utilisant les variables du nombre de caractères et du temps moyen de lecture par caractère par rapport aux autres modèles. Les résultats de l'étude montrent que plus le niveau du collège est élevé, plus le temps de lecture estimé des lecteurs cibles est court; et plus le niveau du lecteur cible en anglais est bon, plus le temps de lecture estimé est court. Les formules BNP, qui sont les premières à combiner une caractéristique du texte (nombre de caractères) et une caractéristique du lecteur cible (vitesse de lecture), ont été testées par des enseignants de différents collèges confirmant leur efficacité pour prédire des temps de lecture compatibles aux apprenants EFL du collège algérien. Ces estimations peuvent également être utilisées dans le développement des manuels scolaires pour maintenir la

gradation et la cohérence à travers les textes de lecture des manuels scolaires et les niveaux du collège.

Mots clés : Anglais langue étrangère, lecture, formules de lisibilité, temps de lecture estimé, vitesse de lecture, nombre de caractères.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

1MST: First Year Middle School Textbook

2MST: Second Year Middle School Textbook

3MST: Third Year Middle School Textbook

4MST: Fourth Year Middle School Textbook

AC/100W: Average count of Characters per 100 Words

AC/50W: Average count of Characters per 50 Words

AC/50W: Average count of Characters per 50 Words

ACS: Average count of Characters per Sentence

AFW: Average number of Familiar Words

AL/100W: Average number of Letters per 100 words

ART: Average Reading Time

ARTC: Average Reading Time per Character

ARTSY: Average Reading Time per Syllable

ARTW: Average Reading Time per Word

AS/100W: Average count of Syllables per 100 Words

AS/50W: Average count of Syllables per 50 Words

ASL: Average Sentence Length

ASS: Average count of Syllables per Sentence

ASW: Average count of Syllables per Word

AWL: Average Word Length

BNP: Behira, Nait-Brahim, Pado

C: Character

CA: Category

DSW: Double-Syllable Words

ERT: Estimated Reading Time

ERTG: Estimated Reading Time Gap

GL: Grade Level

LRM: Linear Regression Model

m: minute

MS: Middle School

MSL: Middle School Level

MST: Middle School Textbook

MSYW in 150W/10: Monosyllabic Words in a sample text of 150 Words

NSY: Number of Syllables

OD: Observed Data

PD: Predicted Data

PSW: Polysyllabic Words

PRT: Participant Reading Time

r: Correlation coefficient

RMSE: Root Mean Squared Error

RT: Reading Time

RTS: Reading Time in Seconds

RTG: Reading Time Gap

RW: Repeated Words

S: Sentences

s: seconds

SSW: Single-Syllable Words

SY: Syllable

TRTs: Textbook Reading Texts

UW: Unique Words

W: Word

GENERAL INTRODUCTION

General Introduction

The Algerian Ministry of National Education takes charge of the production and publication of middle and secondary school English textbooks. The proclaimed reason for such a political decision is the government's responsibility for developing the Algerian educational system and guaranteeing free education for all Algerians, though they have to pay 'symbolic' prices for textbooks.

The educational investment in designing textbooks cannot reach its objectives if the textbooks do not match the different target teaching/learning contexts. Thus, the ones who are in charge of such investment must ensure that the textbooks are not to be rejected by the target learners and their teachers for any reason.

In the maze of theories and the shortage of scientific tools in designing a textbook for EFL learners, most published Algerian English textbooks have been in the spotlight of criticism for many reasons. Nobody can deny the fact that constructive criticism is part and parcel of the process of textbook writing. No textbook is expected to be blindly adopted by all parties other than its designers and the ones behind them. Most textbook designers must be aware of the fact that whatever the amount of money and time 'invested' in designing a textbook, it will never match all different target teaching/learning contexts. Thus, there is no panacea prescription but a 'simulative' approach adopted by textbook writers to provide both teachers and learners with a flexible framework that can be used as it is set or, in case of incongruence, adapted.

The developments in scientific disciplines such as mathematics and computing are of great help to textbook writers. They can help them reduce the

gap between the designed textbooks and the target readers in terms of the type of topics treated and the language used in developing them. Such objective can be achieved through the use of a readability formula as an interdisciplinary tool by both textbook designers and classroom teachers.

The last century has noticed the introduction of many readability formulas designed as yardsticks for predicting the readability level of a reading text and its suitability for a given learner. Other researchers have gone further by introducing a readability formula to check the suitability of a reading text to the target readers' interests. As all pioneering ideas are always under scrutiny and, in most cases, subject to rejection, the readability formulas were criticized by many linguists who didn't believe in the usefulness of such a new interdisciplinary approach. In spite of those criticisms, the readability formulas have proved their efficiency, not only in education, but also in other sectors such as business, military, etc.

The evaluation of the reading texts[1] of the institutional secondary school third-year English textbook *'New Prospects'* reveals that the textbook designers adopted no readability criteria in the selection and adaptation of the reading texts. The textbook reading texts are beyond the level of the target readers and not graded according to their difficulty and length.

The fact that the Algerian BEM[2] English examination is exclusively of the written mode is the main reason behind the importance given by most classroom teachers to the reading skill. In this exam, learners have to read a text to do the subsequent exercises. However, it has been noticed that middle school teachers find difficulties in selecting and/or adjusting the reading texts to

[1] Behira, Younes. Text and Context: Identifying the Cause and Bridging the

[2] BEM is an acronym for *Brevet d'Enseignement Moyen* (Middle School Certificate). By the end of their middle school 4th year, Algerian learners sit for the national BEM examination which determines whether they will be able to proceed to secondary school.

their learners' level. Such a task is an impression-based professional activity for the majority of teachers, as they have no specific scientific tools, such as readability formulas, to make use of. The existing formulas cannot be adopted by Algerian classroom teachers due to the many differences between the contexts they are devised for and the Algerian EFL context. Hence, devising specific formulas for Algerian middle school EFL learners becomes an urgent need to facilitate the selection and/or adaptation of Algerian middle school EFL textbook reading texts for both textbook writers and teachers.

Additionally, teachers usually have to manage their session time by allotting specific time to each activity learners do in class, including reading. The latter is the most challenging activity for both the learners, whose understandability of the text determines the extent to which they can do the accompanying tasks, and the teachers, whose main preoccupation is providing learners with a readable text, i.e., a text that can be read and understood in a specific time. Gérard and Roegiers (2009: 244) affirms that "the degree of readability does not depend only on the text per se (and its support), but also on the reader's characteristics[3]." One of the readers' characteristics is the reading speed which differs among Algerian middle school learners as an English beginner takes more time reading a text than an intermediate learner. Therefore, a formula that estimates the reading time of a text can help the teacher choose appropriate texts and plan their reading sessions. For instance, let's estimate that the maximum reading time set for a specific group of learners is 6 minutes which is equivalent to 10% out of a 60-minute session. If the estimated reading time of the text is longer than the time set for reading, then

[3] My translation.

- Original Quotation:

  " … le degré de lisibilité dépend non seulement du texte lui-même (et de son support), mais aussi de caractéristiques propres au lecteur…"

the teacher will find the text unsuitable for his learners, and thus either adapt it to fit the set reading time or search for another one.

The devised readability formulas, henceforth BNP[4] Readability Formulas, provide teachers with approximate estimated reading time for a text to help them manage their time in the classroom and predict the suitability of the text for the target readers. Moreover, the formulas can be used by Algerian textbook writers to select appropriate reading texts that match the target learners' reading ability. Using these formulas, textbook writers can also provide classroom teachers with the approximate estimated reading time for each selected reading text to help them anticipate and manage their reading sessions. Additionally, the formulas will help textbook designers maintain length gradation of the textbook reading texts and consistency along middle school levels. Furthermore, BNP formulas are developed for both intensive and extensive reading sessions. A text that takes 30 minutes to be read by learners is too long to be taught in a 60-minute session; however, teachers can use the same text for an extensive reading session.

In should be noted that BNP Readability Formulas are by no means deemed here the unique tools to predict the readability of the texts as they are based on measurable data. It is admitted that other non-measurable text characteristics, such as composition, obscurity and topic, are also to be taken into consideration when selecting and/or adapting a text. For instance, with regard to topic, a text on football is predicted to be less difficult to read, thus requiring less reading time, than a text discussing globalization due the differences in vocabulary, as it can be hypothesized that beginners are more familiar with football-related vocabulary than the one of globalization. Thus,

[4] **BNP** stands for the surnames' initials of the Doctorat ES-Sciences thesis writer 'Behira', the supervisor 'Nait-Brahim' and the co-supervisor 'Pado'.

BNP Readability Formulas focus on measurable data related to the length of the text and the target reader's reading speed.

To achieve the purpose of the study, we derive linear regression models to predict learner reading times in different grade levels given properties of the text such as the number of words, syllables or characters. These properties are well-established in the literature as useful for reading difficulty prediction, yet easily observable from the text without complex pre-processing. Thus, the following research questions are addressed:

1) To what extent can mathematical formulas that combine both a text characteristic and a target reader's characteristic predict the suitability of a reading text for Algerian middle school EFL learners?

2) To what extent can estimated reading time help predict the suitability of a reading text for the intended readers?

3) How can mathematical formulas help textbook designers and classroom teachers select and/or adapt Algerian middle school EFL textbook reading texts?

As an attempt to answer the research questions, we put forward the following hypotheses:

1) Mathematical formulas are very useful tools in predicting the suitability of a reading text for Algerian middle school EFL learners. It can help both textbook designers and teachers in selecting, evaluating and adapting reading texts to suit the target EFL contexts.

2) Estimated reading time will provide and maintain consistency and standardization through middle school levels and across all Algerian middle schools.

3) Mathematical formulas that predict readability through estimated reading time will help textbook designers and practitioner teachers manage classroom reading sessions by selecting appropriate reading texts that match the allotted session time.

The research work goes through four main phases: Review, Devise, Test, and Survey. The first chapter reviews the pioneering and most important readability tools that have marked the readability literature with reference to the incompatibility of the existing readability formulas with the Algerian EFL context. The second chapter discusses the linguistic counts and readability of the reading texts of the four middle-school EFL textbooks. The third chapter describes the research participants and discusses the collected data. It includes the development of overall and individual linear regression models as mathematical formulas to estimate the reading time for the Algerian middle school EFL learners. It also discusses the methodology and techniques adopted in devising the formulas which are, according to McLaughlin (1969: 640), “mathematical equation[s] derived by regression analysis” to find “the equation which best expresses the relationship between two variables.” The devised

formulas are tested on different sample texts to identify the variables that best correlate with each other, and hence the best equations are adopted. The last chapter includes the testing of the trained linear regression models on different reading texts. It also discusses the testing of BNP Readability Formulas by practitioner teachers from different middle schools. It ends up by discussing the results and the application of the formulas by Algerian teachers and textbook writers.

CHAPTER ONE

Reading, Readability

and Readability Formulas

Chapter One
Reading, Readability
and Readability Formulas

Chapter One
Reading, Readability and Readability Formulas

I.1. Introduction

This chapter discusses the concept of readability and previous work on readability prediction, both manually derived, and, more recently, using methods of machine learning and computational linguistics. It also sheds light on the incompatibility of the existing readability formulas with the Algerian middle school EFL context.

I.2. Reading

I.2.1. Process of Reading

The paramount importance that reading enjoys in developing learners' proficiency makes of it a fundamental language skill. Anderson provides a comprehensive definition for the reading skill to explain the combination of "the text, the reader, fluency and the strategies" that "The act of reading" includes:

> Reading is a fluent process of readers combining information from a text and their own background knowledge…. . Strategic reading is defined as the ability of the reader to use a wide variety of reading strategies to accomplish a purpose for reading.... . Fluent reading is defined as the ability to read at an appropriate rate with adequate comprehension.
>
> (Anderson 2003: 68)

No teaching/learning programme can exclude the reading skill development from its outcomes. McDonough et al. (2013: 110) highlights the practicality of teaching a reading script than a spoken one. They debate for the "text as process" viewpoint which views reading as a process that engages readers in an "interaction between the reader and the text" as opposed to the "text as object" viewpoint that depicts the reader as an "'empty vessel' that merely receives information" (ibid.: 112-113).

Such "a kind of dialogue between the reader and the text, or even between the reader and the author" (Widdowson, Quoted in Hedge 2000: 188) makes of the activity of reading enjoyable and interesting (McDonough et al. 2013: 49). During this interaction, the reader is either "interested in constructing a personal interpretation of a text or, on the other hand, may be more interested in trying to get the author's original intentions"(ibid.: 189).

I.2.2. Types of Reading

Reading is characterized by its two main types: intensive reading and extensive reading.

I.2.2.1. Intensive Reading

Intensive reading usually takes place in classroom settings with the aim of developing readers' ability as explained by McDonough et al.:

> Intensive study of reading texts can be a means of increasing learners' knowledge of language features and control of reading strategies. It can also improve their comprehension skill.
>
> (McDonough et al. 2013: 25)

Intensive reading is often “more concentrated, less relaxed, and often dedicated not so much to pleasure as to the achievement of a study goal” Harmer (2001: 204). It is, in most cases, framed by a specific reading time and accompanied with reading tasks that aim at facilitating and testing the readers’ text comprehensibility. These reading tasks take different forms as put by Harmer:

> We may ask students to work out what kind of text they are reading, tease out details of meaning, look at particular uses of grammar and vocabulary, and then use the information in the text to move on to other learning activities. We will encourage them to reflect on different reading skills.
>
> (Harmer 2007: 100)

I.2.2.2. Extensive Reading

Extensive reading, compared to intensive reading, often takes place in non classroom settings (ibid.: 99). This type of reading is viewed by Anderson as complementary to intensive reading stating that:

> … [teachers] need to encourage learners to read longer texts without an emphasis on testing their skills. Extensive reading provides opportunities to practice strategies introduced during intensive reading instruction.
>
> (Anderson 2003: 72)

Hedge (2000: 202) lists six main characteristics of extensive reading:

(a) Reading large quantities of material…
(b) Reading consistently over time on a frequent and regular basis.
(c) Reading longer texts…

(d) Reading for general meaning, primarily for pleasure, curiosity, or professional interest.
(e) Reading longer texts during class time but also engaging in individual, independent reading at home, ideally of self-selected material.

I.2.3. Constraints on Reading Comprehension

Failing in comprehending a text is a failure in achieving the goal of reading (Anderson 2003: 68). Among the causes that restrains reading comprehension Westwood (2008: 33-37) lists seven:

1) Limited vocabulary knowledge.
2) Lack of fluency.
3) Lack of familiarity with the subject matter.
4) Difficulty level of the text.
5) Inadequate use of effecting reading strategies.
6) Weak verbal reasoning.
7) Problems with processing information.
8) Problems in recalling information after reading.

The aforementioned obstacles to reading comprehension are highly interrelated. “They can be grouped into three main groups: limited prior knowledge, readability and lack of interest” (Behira 2014: 41).

I.3. Readability

The concept of readability has been used to refer to the ease with which readers comprehend a reading text (Lorge 1944: 404; Richards et al. 1992:

306). Gérard and Roegiers (2009: 244) define readability as “the measure by which the reader may easily receive the author’s message[5].” Dale and Chall (1949) provide a more comprehensive definition to readability by referring to the readers’ reading speed and their interest, in addition to their understandability of the text, stating that:

> ... readability is the sum total (including the interactions) of all those elements within a given piece of printed material that affects the success that a group of readers have [sic]with it. The success is the extent to which they understand it, read it at an optimum speed, and find it interesting. (23)

Harmer (2007: 99) explains that a text is by no means useful for “language acquisition” if it is incomprehensible to its readers. Therefore, “the difficulty level of a text” must match the “reading ability” of the target readers (Westwood 2008:35). Moreover, Gérard and Roegiers (2009: 244) deal with not only the text’s difficulty level but also the “readers’ characteristics” by providing a list of points that are categorised as the following:

(a) Text’s point of view:

1) Material factors: characters, length of sentences; the quality of paper...
2) Ideas expressed
3) The way ideas are expressed: form, vocabulary, syntax...

(b) Reader’s view point:

1) Intelligence and level of development
2) Knowledge (including linguistic one)
3) Reading ability
4) Personality: motivation, interests
5) Physical state: eyesight, degree of fatigue...

[5] My translation.

6) Capacity of attention[6]

I.4. Readability Formulas

The pioneering work of Sherman (1893) on the objective analysis of literary works' linguistic forms sparked other researchers' enthusiasm to develop scientific tools that transcend human's subjectivity in predicting the readability of a written text. Thorndike's word-frequency lists (1921; 1932) and his extended list with Lorge (1944) attempted to classify words according to their difficulty level on the basis of their frequency of use in written prose: the more frequent a word, the easier it is. These lists inspired other researchers to develop other predictive tools of a text difficulty level.

Lively and Pressy worked on developing a statistical approach using the weighted median index number in Thorndike's list to predict the readability level of textbooks (Lively and Pressy 1923). Such a work encouraged other researchers to work on other predictive methods of a text difficulty resulting in the introduction of many readability formulas used in different fields such as education, military, publishing, and healthcare.

Gray and Leary (1935: 98-99) list 82 "expressional elements" related to words, sentences and paragraphs that may indicate the difficulty level of a written text. Since it would be impossible to integrate all these elements, only some significant ones, thought to be better indicators of text difficulty level, were selected for devising the different readability metrics, among which, 20 formulas have been extensively tested and proved for their feasibility in predicting the readability of texts for different reading contexts. Most of these theorems are premised upon two variables: (1) sentence length and (2) word difficulty. The first variable is represented in the formulas by the average sentence length (ASL), which is computed by dividing the count of words (W-count) by the count of sentences in the text. The second variable takes different forms such as the average word length (AWL) in characters/letters, average number of letters

[6] My translation.

(ANL), average number of syllables per word (ASYW), percentage of difficult words (PDW), number of hard/difficult words (NHW/NDW), count or percentage of monosyllabic words (MSYW), count or percentage of polysyllabic words (PSW). In addition to these two omnipresent variables, other ones are adopted such as the number of syllables (NSY), average number of syllables (ASY), number of syllables per 100 words (NSY/100W), number of unfamiliar words (NUW), to name but a few.

This chapter includes a brief description of 16 readability formulas and their mathematical formulations. These formulas are Venneteka Formula (1928), Flesch Reading Ease Readability Formulas (1943, 1948), Dale-Chall Readability Formula (1948), FOG Readability Formula (1952), SPACHE Readability Formulas (1953, 1974), Powers-Sumner-Kearl Readability Formula (1958), SMOG Readability Formula (1963), Linsear Write Readability Formula (1966), Bormuth Readability Formula (1966), Automated Readability Index (1967), Fry Readability Formula (1968), FORCAST Readability Formula (1973), Coleman-Liau Readability Formula (1975), Flesch-Kincaid Grade Level Readability Formula (1975), New Dale-Chall Readability Formula (1995), and the Strain Index (2007). Though they appear to be different, these formulas are highly interrelated due to the shared set of criteria adopted in their development. Most of these theorems are premised upon two variables: word difficulty and sentence length.

I.4.1. Venneteka Formula

Vogel and Washburne created the first readability formula that uses linguistic characteristics of texts as readability variables. They analysed the correlations of 19 textual elements of 152 books with the median reading score of their readers using the Teacher's Word Book of Thorndike. They have tried different combinations of elements and compared their correlations to find out that 4 elements correlate the best (r = 0.845) which are the number of different words in 1000 words (NDFW/1000W), number of prepositions in 1000 words

(NP/1000W), number of uncommon words in 1000 words, and number of simple sentences in 75 sample sentences (NSS/75SS). Using the 4 elements, they developed a regression equation named as Winnetka Formula to get the reading score (RS) of the evaluated text (Vogel and Washburne 1928):

$$RS = (0.085 \times NDFW/1000W) + (0.101 \times NP/1000W) + (0.604 \times NUW/1000W) - (0.411 \times NSS/75SS) + 17.43$$

However, Wennetika Formula was described as complicated, time consuming and unpractical for short texts motivating other researchers in the field to create other simpler and practical formulas. The following table includes Venneteka Formula's scores and their corresponding grades according to Grade Standards of Stanford Achievement Test (Vogel and Washburne 1928).

Table 1. Venneteka Formula's scores and their corresponding grades (Adapted from Vogel and Washburne 1928).

Readability Score	Corresponding Grade
4-16	2
18-34	3
36-52	4
54-62	5
64-70	6
72-78	7
80-86	8
88-94	9
96-102	10
104-112	11

I.4.2. Flesch Reading Ease Readability Formula

Flesch devised his first readability formula in 1943 using three variables: ASL, number of affixes, and number of references to people. As stated by Flesch (1948: 221), the “wide application” of the formula by many “academic institutions” encouraged him “to re-examine the formula and to analyse its shortcomings”. He introduced new “two multiple-correlation regression formulas” using:

(a) The variables of NSY and ASL in 100-word sample(s) of the assessed reading material for the first formula that predicts the reading ease:

$$RE = 206.835 – (0.846 \times NSY) – (1.015 \times ASL)$$

(b) The variables of personal words (PW) and personal sentences (PS) in 100-word sample(s) for the second formula that assesses the human interest:

$$HI = (3.635 \times PW) + (314 \times PS)$$

For the RE formula, according to Flesch , “the longer the words and sentences, the harder to read,” while for the HI formula “the more personal words and sentences, the more interesting is the text.” The formulas rates texts on a 100-point scale: the higher the score, the easier it is to understand the text and the more interesting it is for the reader (229-230). Each score range refers to an estimated US schooling grade (Flesch 1949: 149-151). The following table represents Flesch’s Reading Ease Scores.

Table 2. Flesch's Reading Ease Readability Formula's scores and their corresponding grades (Adapted from DuBay 2004: 22)

Reading Ease Score	Style Description	Estimated Reading Grade
0 to 30	Very difficult	College graduate
30 to 50	Difficult	13th to 16th grade (College)
50 to 60	Fairly difficult	10th to 12th grade (High school)
60 to 70	Standard	8th and 9th grade
70 to 80	Fairly easy	7th grade
80 to 90	Easy	6th grade
90 to 100	Very easy	5th grade

I.4.3. Dale-Chall Readability Formula

Dale-Chall Readability Formula was created by Dale and Chall in 1948 with a 769-word list described as familiar to 80% of 4th American graders:

Raw Score (RS) = (0.0496 x ASL) + (0.1579 x PUW)

Dale and Chall developed their formula using the variables of ASL and PUW. The latter is computed by dividing the W-count not on the 769-word list by the W-count in the sample and multiplying by 100. If PUW is more than 5%, the formula adds 3.6365 to the score to get the compatible US grade of the target reader who can answer at least 50% of the test questions on the evaluated text (Dale and Chall 1948: 41).

Table 3. Dale-Chall Readability Formula's scores and their corresponding grades (Adapted from Dale and Chall 1948).

Readability Raw Score	Corresponding Grade
4.9 and lower	4 and below
5.0–5.9	5 - 6
6.0–6.9	7 - 8
7.0–7.9	9 - 10
8.0–8.9	11 - 12
9.0–9.9	13 to 15

I.4.4. FOG Readability Formula

Four years later, Robert Gunning developed the FOG Index to estimate the reader's grade level (GL):

$$GL = 0.4 \times (ASL + NHW)$$

Both ASL and NHW are the main variables in the FOG Index. NHW refers to the PSW-count in the text except proper nouns, compound and hyphenated easy words, and two syllable verbs with 'es' or 'ed' ending. The scores range from 6 to 17 with reference to the US schooling grades from 6^{th} grade to college graduate (Gunning 1952). The following table includes the corresponding reading levels to the Fog Index's scores.

Table 4. FOG Readability Formula's scores and their corresponding grades(Adapted from Gunning 1952).

Fog Index	Corresponding grade
17	College graduate
16	College senior
15	College junior
14	College sophomore
13	College freshman
12	High school senior
11	High school junior
10	High school sophomore
9	High school freshman
6	Seventh grade
7	Sixth grade
8	Eighth grade

I.4.5. SPACHE Readability Formula

SPACHE Readability Formula was devised by George Spache in 1953. Published in The Elementary School Journal, Spache's work is entitled *'A New Readability Formula for Primary-Grade Reading Materials'*. To enhance its feasibility, Spache published in 1974 a revised version of his readability formula in a book entitled *'Good Reading for Poor Readers'*. Following are the original and revised versions of the SPACHE readability formula:

(a) Original version:

$$GL = (0.141 \times ASL) + (0.086 \times PDW) + 0.839$$

(b) Revised version:

$$GL = (0.121 \times ASL) + (0.082 \times PDW) + 0.659$$

In both versions of the formula, Spache adopts the variables of ASL and PDW. 'Difficult words (DW)' in the SPACHE Formula are the words that the US 3rd graders and below do not recognize. This formula works well in predicting the readability of texts for the US 3rd graders and below (Spache 1974).

I.4.6. Powers-Sumner-Kearl Readability Formula

Powers, Sumner, and Kearl published a new readability formula named 'Powers-Sumner-Kearl Readability Formula' in an article entitled *'A Recalculation of Four Adult Readability Formulas.'* The formula takes the following mathematical formulation:

$$GL = (0.0778 \times ASL) + (0.0455 \times NSY) - 2.2029$$

This formula was developed to estimate the readability of texts for the US school graders between 2nd and 4th grades using two variables: ASL and NSY (Powers et al. 1958).

I.4.7. Linsear Write Readability Formula

Linsear Write Readability Formula was devised by John O'Hayre for the U.S. Air Force in 1966 published in his style manual entitled *'Gobbledygook Has Gotta Go.'* Like many other formulas, the Linsear Write Readability Formula is based on sentence length and polysyllabic words. Four steps are followed is using this formula:

(1) Count a 100-word sample.

(2) Count all one-syllable words except "the", "is", "are", "was", and "were". Count one point for each one-syllable word.
(3) Count the number of sentences in the 100-word sample to the nearest period or semicolon and give three points for each sentence.
(4) Add together the one-syllable word count and the three points for each sentence to get your grade. (O'Hayre 8:1966)

The following table includes the Linsear Write Formula's scores and their corresponding grades.

Table 5. Linsear Write Readability Formula's scores and their corresponding grades (Adapted from O'Hayre 8:1966).

Score	Corresponding Grade
Below 70	Too complicated
70 to 80	Average adult reader
80 to 85	Ideal
over 85	Too simple

I.4.8. Bormuth Readability Formula

Bormuth Readability Formula was devised by John R. Bormuth in 1966. He published his formula in an article entitled *'Readability: A New Approach'* in Reading Research Quarterly Journal. His mathematical formulation includes complicated correlations between the average word length, average number of familiar words, and average sentence length. Following is the mathematical formulation of Bormuth Readability Formula:

GL = 0.886593 – (AWL x 0.03640) + (AFW x 0.161911) – (ASL x 0.21401) – (ASL x 0.000577) – (ASL x 0.000005)

The average number of familiar words (AFW) is calculated in the reading text to evaluate using the Dale-Chall 769-word list by dividing the total number of words by the number of simple words in the text. The resulting number of the mathematical formulation of the formula corresponds to US school grades (Bormuth 1966).

I.4.9. Automated Readability Index

Automated Readability Index was devised in 1967 by Senter and Smith in the Aerospace Medical Research Laboratories for the US army:

RS= (4.71 x AWL) + (0.5 x ASL) – 21.43

The formula was published in a paper entitled *'Automated Readability Index'* (Senter and Smith 1967). It uses the variables of AWL and ASL in predicting the readability of a text to US school graders. The table below includes the reading ages and their corresponding reading grade.

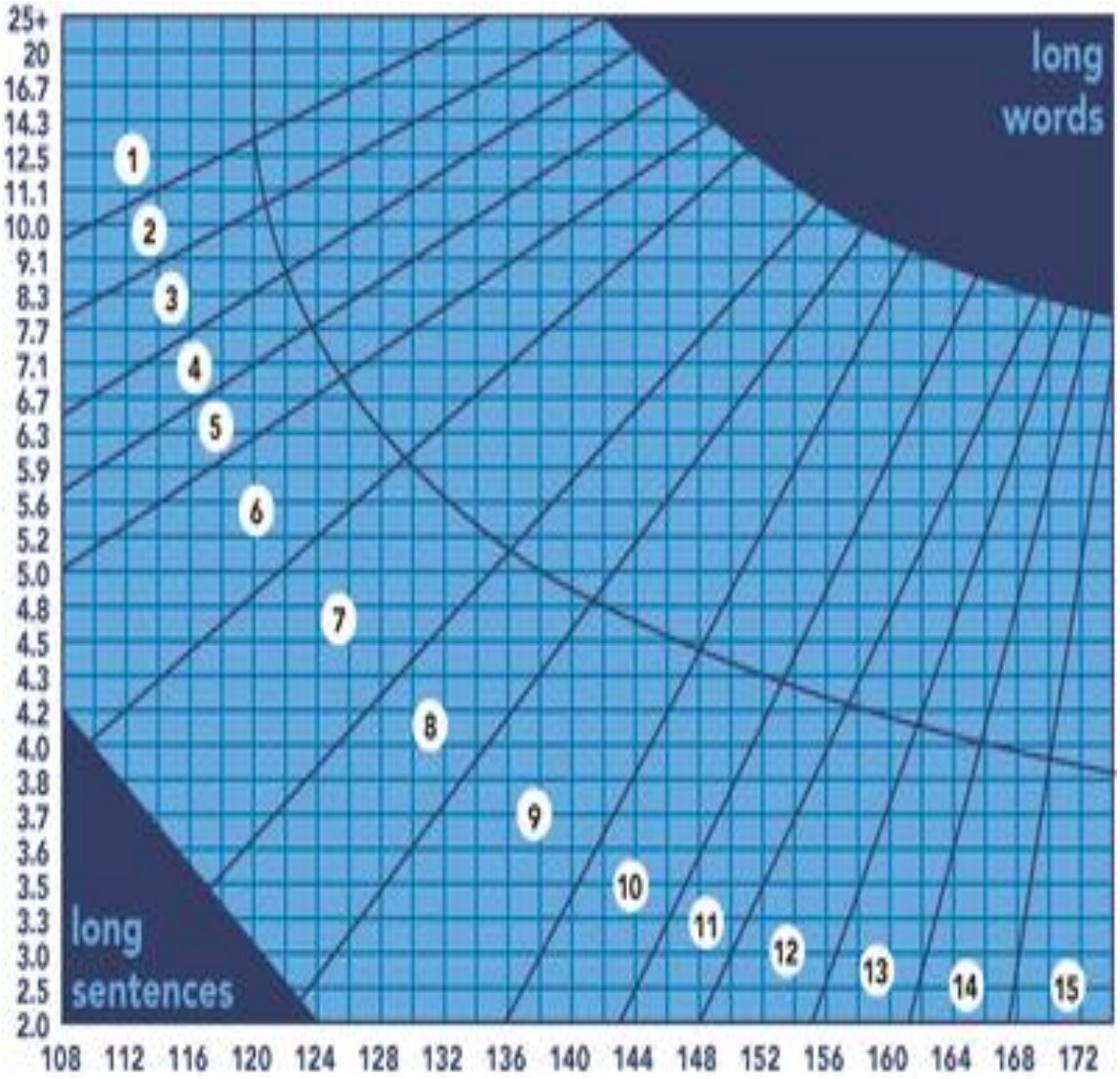
Table 6. Automated Readability Index' scores and their corresponding grades (Adapted from Senter and Smith 1967).

Readability Score	Age	Corresponding US School Grade
1	5-6	Kindergarten
2	6-7	First/Second Grade
3	7-9	Third Grade
4	9-10	Fourth Grade
5	10-11	Fifth Grade
6	11-12	Sixth Grade
7	12-13	Seventh Grade
8	13-14	Eighth Grade
9	14-15	Ninth Grade
10	15-16	Tenth Grade
11	16-17	Eleventh Grade
12	17-18	Twelfth grade
13	18-24	College student
14	24+	Professor

I.4.10. Fry Readability Formula

Edward Fry suggested a simpler predictive tool of readability named the Fry Readability Formula whose users plot the ASL and ANSY of three 100-word samples, selected randomly from the evaluated text, on a graph to get the estimated difficulty level (Fry 1968). The new formula is different from previous formulas that are based on mathematical formulations. Following is the graph used to estimate the readability of a reading text using the Fry Readability Formula.

Figure 1. Fry graph (Fry 1968)



I.4.11. SMOG Readability Formula

In 1969, McLaughlin introduced another simple tool named as the SMOG Readability Formula in the '*Reading'* journal under the title *'SMOG Grading-A New Readability Formula'*:

$$\text{SMOG grade} = 3 + \sqrt{\text{PSW}}$$

SMOG is an acronym that stands for 'Simple Measure of Gobbledygook.' The formula uses just the square root of the PSW-count in 30 sentences selected

from the text (McLaughlin 1969: 639, 643). To use the SMOG Readability Formula to assess a reading text, 10 sentences are taken from the beginning, 10 from the middle, and 10 from the end. The words of more than three syllables are counted in all the 30 selected sentences even if they appear more than once. Then, the square root of the number of polysyllabic words is calculated and added to 3 to get the SMOG grade. The following table includes the SMOG Formula's results and their approximate corresponding US school grades (McLaughlin 1969).

Table 7. SMOG Readability Formula's scores and their corresponding grades (Adapted from McLaughlin 1969).

SMOG Readability Formula's Scores	Corresponding Grades
0-2	4
3 – 6	5
7 – 12	6
13 – 20	7
21 – 30	8
31 – 42	9
43 – 56	10
57 – 72	11
73 – 90	12
91 – 110	13
111 – 132	14
133 – 156	15
157 – 182	16
183 – 210	17
211 – 240	18

In case the sentence count in the evaluated text is less than 30, the following steps are followed to get the reading grade of the text:

(1) Count the number of sentences in the text.

(2) Count the number of PSW in the text.

(3) Use the corresponding conversion number with the number of sentences in the text in the table below.

Table 8. Count of sentences of texts shorter than 30 sentences and their corresponding conversion number

Count of Sentences	Corresponding conversion number
29	1.03
28	1.07
27	1.1
26	1.15
25	1.2
24	1.25
23	1.3
22	1.36
21	1.43
20	1.5
19	1.58
18	1.67
17	1.76
16	1.87
15	2.0
14	2.14
13	2.3
12	2.5
11	2.7
10	3.0

.

(4) The PSW-count in the text is multiplied by the corresponding conversion number.
(5) The average resulted represents the SMOG Formula's result and its corresponding grade in table 7 above (McLaughlin 1969).

I.4.12. FORCAST Readability Formula

A new formula was devised by John Caylor and his research team in 1973 for the US military named FORCAST Readability Formula which takes the following formulation:

GL= 20 – (MSYW in 150W/10)

'MSYW in 150W' refers to the number of monosyllabic words in a sample of 150 words from the evaluated reading text. The FORCAST Readability Formula's scores correspond to the US school grades. The formula aims at evaluating the difficulty level of questionnaires, forms, and tests (Caylor et al. 1973).

I.4.13. Coleman-Liau Readability Formula

Coleman and Liau published their readability formula in 1975 in an article entitled '*A computer readability formula designed for machine scoring'*:

RS= (0.0588 x AL/100W) – (0.296 x AS/100W) – 15.8

The Coleman-Liau Readability Formula is used on a sample of 100 words from the reading text to be evaluated. It uses the average number of letters and the average number of sentences as linguistic variables in the mathematical formulation. The readability scores correspond to the US school grades. For example, a score of 9.7 corresponds to the 10^{th} grade (Coleman and Liau 1975).

I.4.14. Flesch-Kincaid Grade Level Readability Formula

Another example of readability formulas is the Flesch-Kincaid Grade Level Readability Formula:

$$GL= (0.39 \times ASL) + (11.8 \times ASYW) - 15.59$$

This formula was created by Kincaid and his research group for the US navy by adapting the Flesch Reading Ease Readability Formula. It includes two variables: ASL and ASYW. The readability scores correspond to the US school grades. A reading text, for example, that scores 5 is readable to 5th graders (Kincaid et al. 1975). Though the formula was mainly devised for the military use, it has been proved to be efficient for the US education and other economic sectors in the US. The formula is still used by the US Government Department of Defense to test the readability of reading texts.

I.4.15. New Dale-Chall Readability Formula

In 1995, Dale and Chall devised a new readability formula named New Dale-Chall Readability Formula using the variables of PDW and ASL:

$$RS = 64 – (0.95 \times PDW) – (0.69 \times ASL)$$

They also extended their list of familiar words to 3000. The percentage of difficult words (PDW) in New Dale-Chall Readability Formula is calculated by dividing the W-count in the text by the W-count that are not on the Dale-Chall list of 3000 simple words that are familiar to 80 percent of the 4th US school graders (Dale and Chall 1995). The Following table includes the readability scores of New Dale-Chall Readability Formula and their corresponding US school grades.

Table 9. New Dale-Chall Readability Formula's scores and their corresponding grades (Adapted from Dale and Chall 1995).

Readability Score	Grade Level
4.9 and below	4 and below
5.0 - 5.9	5 - 6
6.0 - 6.9	7 - 8
7.0 - 7.9	9 - 10
8.0 - 8.9	11 - 12
9.0 - 9.9	13 - 15
10 and above	16 and Above

I.4.16. Strain Index

In 2007, Solomon used the FOG Index to develop the Strain Index which was introduced in an online article entitled *'Strain Index: A New Readability Formula'*. It was described as a very simple and efficient tool using just the SY-count of the first three sentences of the evaluated text, which is with17-word standard sentence, divided by 10. "The formula may be applied to test the language of all media: broadcast, print, Internet and mobile." In case the score is 5.1 and under, the reading material is very easy to read. However, in case the reading material is 15.3 and over, the reading material is very difficult to read (Solomon 2007).

I.5. Conclusion

Despite the many readability formulas devised to predict text readability, none of these metrics match the Algerian middle school EFL context for many reasons. First, most of the formulas were primarily devised for non-educational contexts (Caylor et al. 1963; Kincaid et al. 1975). Second, the metrics that were developed for the US schooling grades (Flesch 1948; Gunning 1952; McLaughlin 1969; Dale and Chall 1995) do not match the requirements of the Algerian educational context where English enjoys a foreign language status and is taught starting from the 6th schooling grade. Third, some formulas (Lively and Pressy 1923; Vogel and Washburne 1928; Dale and Chall 1995) depend on a list of words that are considered to be familiar or easy words which "may be viewed as the most elemental words in the English language … these words and their meanings are known without formal schooling" (Dale and Chall 1995: 13), the same may not hold for Algerian EFL learners. Fourth, most formulas are devised to evaluate 100-word sample(s) of long texts which make them unpractical in estimating the readability of a short textbook text. Fifth, none of the formulas takes into consideration the reading speed variable though it is referred to by many readability experts (Dale and Chall 1948; McLaughlin 1969) as an important element in evaluating the readability of a text. A long text can be evaluated by a readability formula as easy for specific readers but cannot be adopted for its length and the time it takes to be read.

I.6. Original Quotations

Page 39:

> On pourrait encore définir la lisibilité comme étant la mesure dans laquelle le lecteur peut recevoir de manière aisée le message de l'auteur.
>
> (Gerard & Roegiers 2009: 244)

Pages 39, 40:

- Point de vue du texte :
    - Facteurs matériels : les caractères, la longueur des lignes, la qualité du papier…
    - Idées exprimées
    - Façon d'exprimer les idées : la forme, le vocabulaire, la syntaxe…
- Point de vue du lecteur :
    - Intelligence et niveau de développement
    - Connaissances (y compris linguistiques)
    - Habilité en lecture
    - Personnalité : sa motivation, ses intérêts…
    - Etat physique : sa vue, son degré de fatigue…
    - Capacité d'attention

(ibid.)

CHAPTER TWO

Word Counts and Readability of Middle School Institutional Textbooks' Reading Texts

Chapter Two

Word Counts and Readability of Institutional Middle School Textbooks' Reading Texts

Chapter Two

Word Counts and Readability of Institutional Middle School Textbooks' Reading Texts

II.1. Introduction

This chapter provides a general overview of MSTs reading texts and the analysis of their word counts and readability. The analysis is done for three main reasons to: (a) examine the word counts of MSTs reading texts in terms of gradation and consistency, (b) select the best word counts to be used in training the linear regression models of the readability formulas, and (c) investigate the effect of the word counts on the readability of the reading texts using the different readability formulas, with a focus on the main variables used in the existing formulas.

II.2. Word Counts of MSTs Reading Texts

Algerian learners first study English at middle school for 4 years during which 1st and 2nd year learners study English 2 one-hour sessions a week, while 3rd and 4th year learners have 3 one-hour sessions a week. Additionally, a one-hour tutorial session takes place every week for a number of learners of each class for all levels. The Algerian Ministry of National Education launched general reforms of the Algerian educational system in 2016 by adopting the 'new-generation' textbooks for all subjects including English. The first new textbook was adopted for 1MS learners in 2016, followed by the introduction of a new textbook for the higher level each year and by 2022 all middle and secondary school levels will be using the 'new-generation' textbooks .

The word counts of MSTs reading texts examined in tables 10,11,12,13 and 14 include the following:

- Count of sentences (S-count).
- Count of words (W-count).
- Count of syllables (SY-count).
- Count of characters/alphabet letters (C-count).
- Count and percentage of unique words (UW-count/%) which are the words that appear one time in the text.
- Count and percentage of repeated words (RW-count/%) which are the words that appear more than once in the text.
- Average count of sentence length (ASL) which is calculated by dividing the count of words on the count of sentences.
- Average count of word length (AWL) which is calculated by dividing the count of characters on the count of words.
- Average count of syllables per sentence (ASS) which is calculated by dividing the count of syllables on the count of sentences.
- Average count of syllables per word (ASW) which is calculated by dividing the count of syllables on the count of words.
- Average count of characters per sentence (ACS) which is calculated by dividing the count of characters on the count of sentences.
- Count and/or percentage of single syllable words (SSW-count/%).
- Count and/or percentage of double syllable words (DSW-count/%).
- Count and/or percentage of poly-syllabic words (PSW-count/%).
- Average count of syllables per 100 words (AS/100W).
- Average count of syllables per 50 words (AS/50W).
- Average count of characters per 100 words (AC/100W).
- Average count of characters per 50 words (AC/50W).

The word counts of MSTs reading texts in tables 10, 11, 12, 13 and 14 are presented in figures. Each figure represents a set of variables that are

related to one another and have an effect on the readability of a reading text. They are also the main variables adopted in the readability formulas reviewed in the first chapter. The variables are set as the following:

- The first set: S, ASL and AWL count.
- The second set: UW and RW counts.
- The third set: SSW, DSW and PSW counts.
- The fourth set: W, SY and C counts.

II.2.1. First Year MST Reading Texts' Word Counts

Published and adopted in 2016, 1MST *'My Book of English'* is composed of a pre-sequence and 5 sequences of different topics that teach the very basic words, expressions and language forms for 1MS learners. Each sequence includes a subsequence entitled 'I read and do' which includes one to two short reading texts that aim at developing the beginning learner's reading skill. Table 10 includes the word counts of 1MST reading texts.

Table 10. First year MST reading texts' word counts.

Texts	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11
Page	41	41	59	60	66	80	85	90	116	116	139
S-count	5	2	9	9	8	30	20	6	15	8	19
W-count	31	17	55	49	66	178	180	40	168	63	176
SY-count	37	21	70	66	86	180	187	63	239	82	254
C-count	111	54	208	193	271	520	580	186	714	249	777
ASL	6	9	6	7	8	6	9	5	11	8	9
AWL	4	3	4	4	4	3	3	5	4	4	4
ASS	7	11	8	7	11	6	9	11	16	10	13
ASW	1	1	1	1	1	1	1	2	1	1	1
ACS	22	27	23	21	34	17	29	31	48	31	41
UW-count/ %	24	10	38	31	27	99	107	22	78	33	117
	77%	59%	69%	63%	41%	56%	59%	55%	46%	52%	66%
RW-count/ %	7	7	17	18	39	79	73	18	90	30	59
	23%	41%	31%	37%	59%	44%	41%	45%	54%	48%	34%
SSW-count/ %	24	9	46	41	55	149	148	28	123	53	110
	78%	53%	84%	84%	83%	84%	82%	70%	73%	84%	63%
DSW-count/ %	6	8	5	4	10	23	21	8	29	7	43
	19%	47%	9%	8%	15%	13%	12%	20%	17%	11%	24%
PSW-count/ %	1	0	4	4	1	6	11	4	16	3	23
	3%	0%	7%	8%	2%	3%	6%	10%	10%	5%	13%
AS/100W	119	124	127	135	130	101	104	158	142	130	144
AS/50W	60	62	64	67	65	51	52	79	71	65	72
AC/100W	358	318	378	394	411	292	322	465	425	395	441
AC/50W	179	159	189	197	205	146	161	233	213	198	221

Table 10 figures out that no length gradation is noticed among the reading texts. Seven texts are less than 100 words while four texts are more than 100 words. A sharp increase in the text length is noticed from text 5 (66 words) to text 6 (180 words).

Figure 2. First year MST reading texts' linear development of S, ASL and AWL counts.

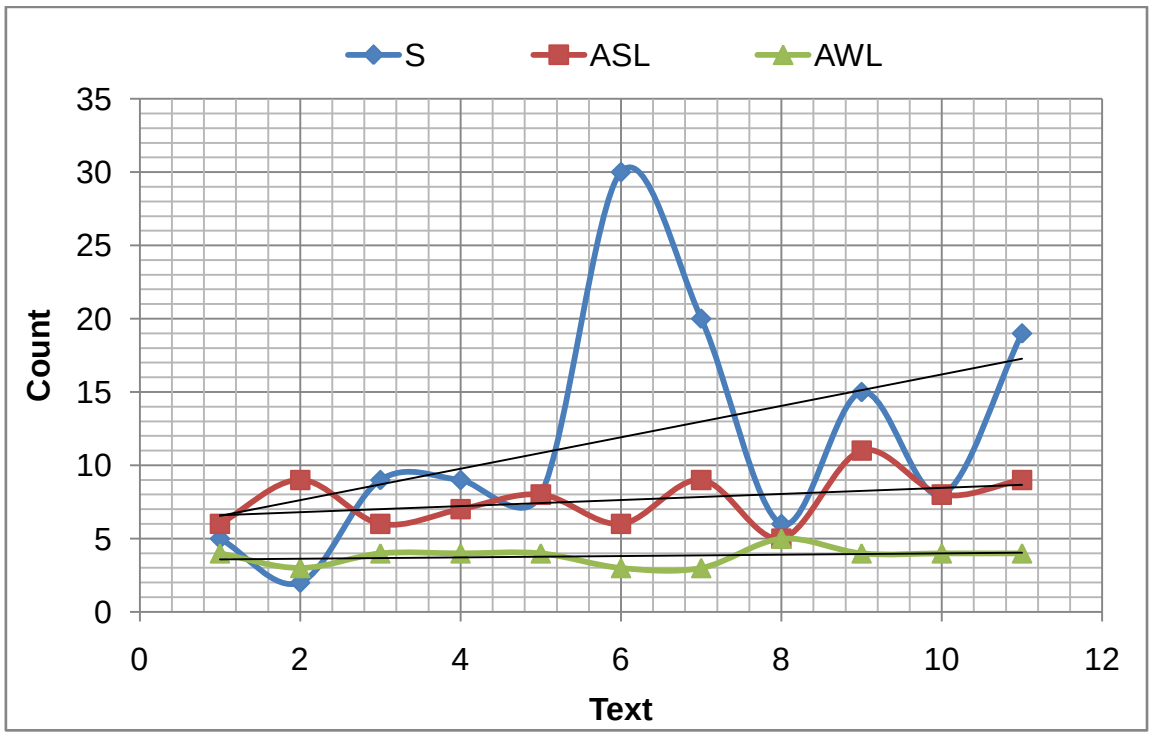


Figure 2 indicates that no length gradation was adopted in 1MST reading texts for the S and ASL counts. It also reveals that no big difference in AWL counts is noticed among the texts. Additionally, no accordance in linear development is noticed among the S, ASL and AWL counts as some texts have high S count but low ASL count (Texts 6 and 7) while others have lower S count but higher ASL (Texts 2 and 7). The same pattern is noticed for ASL and AWL counts where the latter is the same in some texts with different ASL counts (Texts 3,4,5,9,10, and 11). The figure confirms that the variables of S, ASL and AWL show no consistency which make of them unreliable variables to adopt in designing a readability formula. Current readability formulas evaluate a short

text with long sentences as more difficult than a long text with short sentences which is not always the case.

Figure 3. First year MST reading texts' linear development of UW and RW counts.

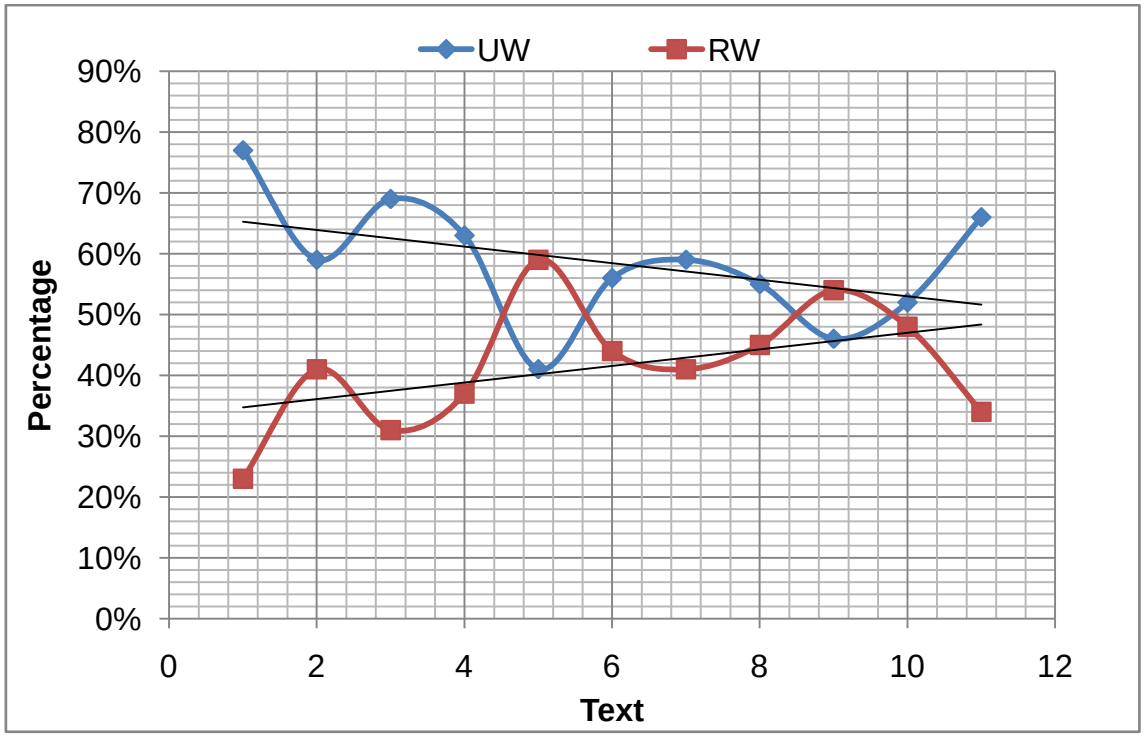


Figure 3 shows that the linear development of the RW percentage goes up while the one of the UW percentage goes down. Most of the texts have higher UW count while just two texts (5,9) have higher RW percentages. The variable of word frequency is adopted in different readability formulas as a good indicator for text readability (Dale and Chall 1948, Burmouth 1966, Dale and Chall 1995). A non consistency is noticed for the variables of UW and RW counts in 1MST reading texts.

Figure 4. First year MST reading texts' linear development of W, SY and C counts.

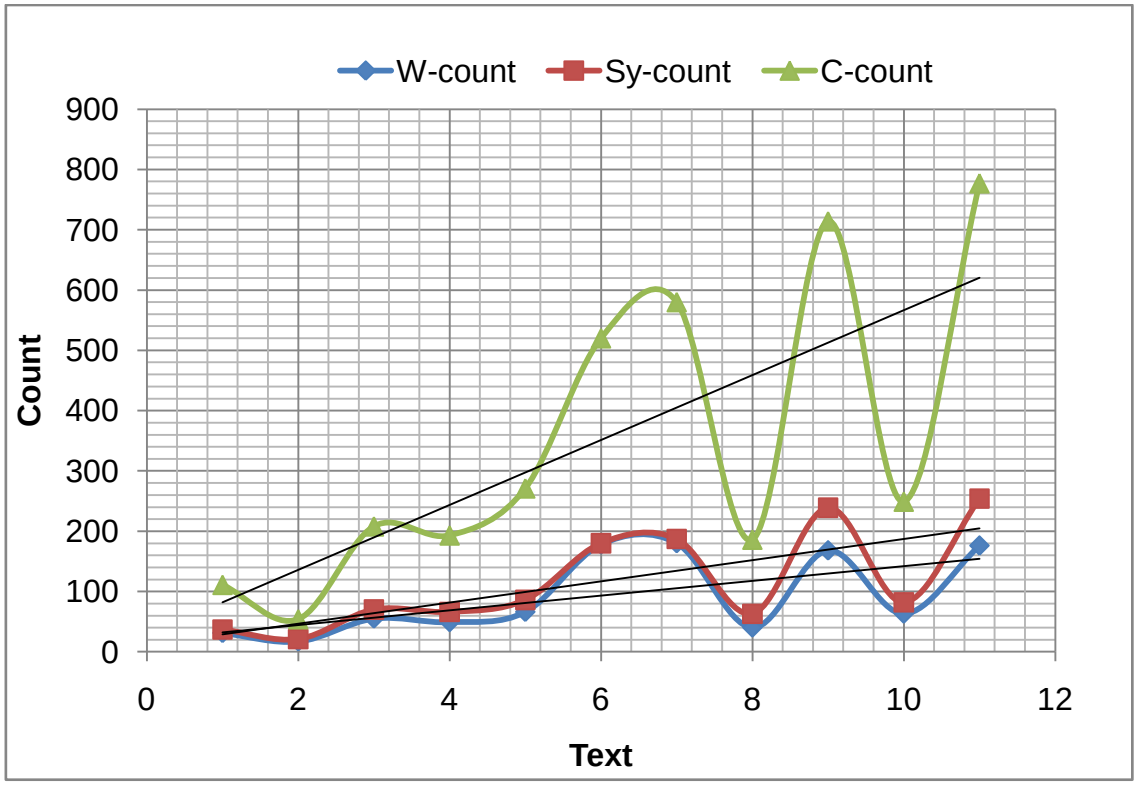


Figure 4 shows accordance between the linear developments of W, SY and C counts. No much difference is noticed among the W and SY counts as most of the texts have more than 70% of SSW words. The W, SY and C counts are among the main variables adopted in the existing readability formulas as reviewed in the first chapter. The accordance between their linear development shown in figure 4 is possibly one of the reasons of the practicality of the adoption of the variables in most of the formulas. Such accordance will be further examined and discussed for 2MST, 3MST and 4MST reading texts' word counts. The consistency between SY and C counts is very high as shown in Figure 4.

Figure 5. First year MST reading texts' linear development of SSW, DSW and PSW counts

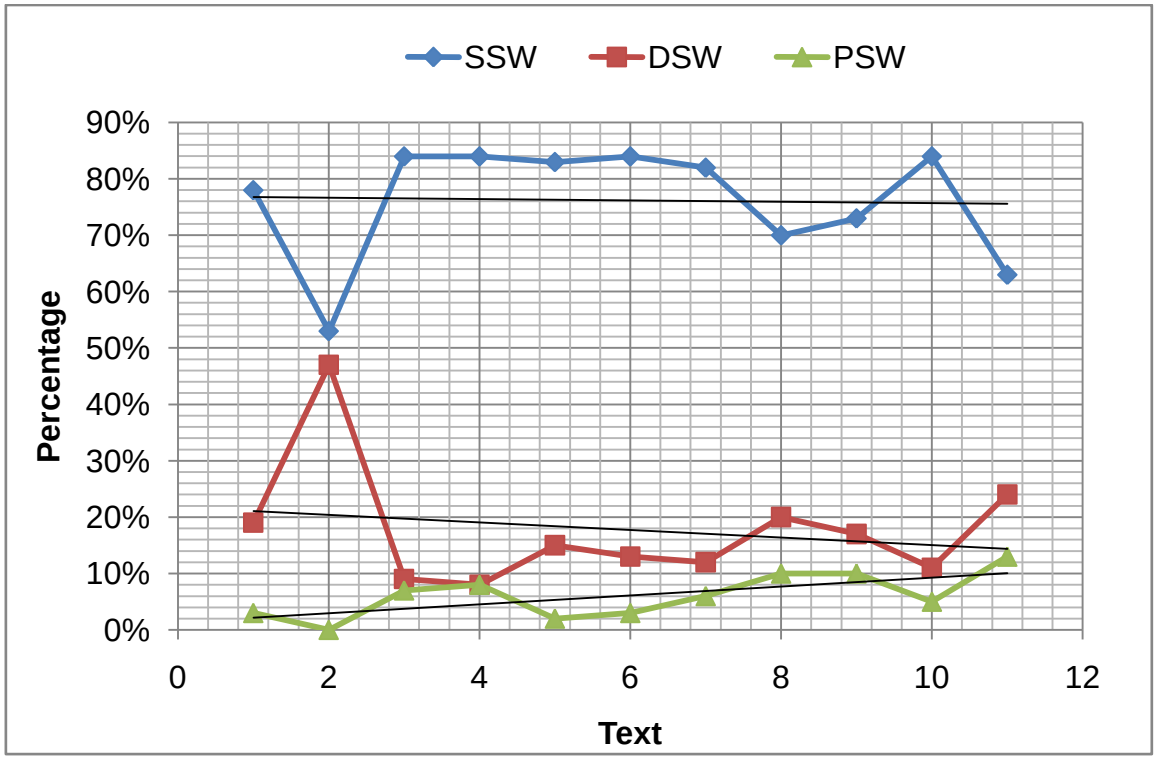


Figure 5 shows a steady linear development for SSW percentages. The linear development of DSW percentage goes down while the one of PSW percentage goes up. The counts of the SSW are the highest for all the texts whereas the PSW counts are the lowest. Except for one text (11), all the texts have less than 10% of PSW. This is mainly due to the choice of 1MST writers for not adopting texts that contain high polysyllabic word count which affects the difficulty level of a text.

III.2.2. Second Year MST Reading Texts' Word Counts

2MST 'My Book of English' was published and adopted in 2017. It is composed of 4 sequences of different topics. Each sequence includes 10 subsequences among which two are entitled 'I read and do' and 'I read for pleasure'. Table 11 includes the word counts of 2MST reading texts of these 2 sub-sequences.

Table 11. Second year MST reading texts' word counts.

Texts	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14
Page	37	44	68	74	94	98	132	133	134	136	143	143	144	144
S-count	21	20	18	12	22	18	15	18	19	24	6	7	8	5
W-count	165	171	236	180	227	249	173	207	205	215	96	109	84	92
SY-count	226	239	318	298	355	356	252	308	290	317	184	173	123	152
C-count	642	715	1000	877	1062	1047	795	924	881	951	515	528	373	444
ASL	8	9	13	15	10	14	12	12	11	9	16	16	11	19
AWL	4	4	4	5	5	4	5	5	4	4	5	5	4	5
ASS	11	12	18	25	16	20	17	17	15	13	31	25	15	30
ASW	1	1	1	2	2	1	1	1	1	1	2	2	1	2
ACS	31	36	56	73	48	58	53	51	46	40	86	75	47	89
UW-count/ %	104	100	138	116	144	157	116	139	127	145	59	85	60	64
	63%	58%	58%	64%	63%	63%	67%	67%	62%	67%	61%	78%	71%	70%
RW-count/ %	61	71	98	64	83	92	57	68	78	70	37	24	24	28
	37%	42%	42%	36%	37%	37%	33%	33%	38%	33%	39%	22%	29%	30%
SSW-count/ %	122	127	178	108	148	180	119	146	145	144	59	67	59	57
	74%	74%	75%	60%	65%	72%	69%	71%	71%	67%	61%	61%	70%	62%
DSW-count/ %	37	25	49	48	49	52	35	37	39	42	14	29	17	18
	22%	15%	21%	27%	22%	21%	20%	18%	19%	20%	15%	27%	20%	20%
PSW-count/ %	6	19	9	24	30	17	19	24	21	29	23	13	8	17
	4%	11%	4%	13%	13%	7%	11%	12%	10%	13%	24%	12%	10%	18%
AS/100W	137	140	135	166	156	143	146	149	141	147	192	159	146	165
AS/50W	68	70	67	83	78	71	73	74	71	74	96	79	73	83
AC/100W	389	418	424	487	468	420	460	446	430	442	536	484	444	483
AC/50W	195	209	212	244	234	210	230	223	215	221	268	242	222	241

Table 11 shows that the 14 reading texts of 2MST are not graded according to their length. This confirms the previous finding for 1MST reading texts that no length gradation criteria were adopted in textbook writing.

Figure 6. Second year MST reading texts' linear development of S, ASL and AWL counts.

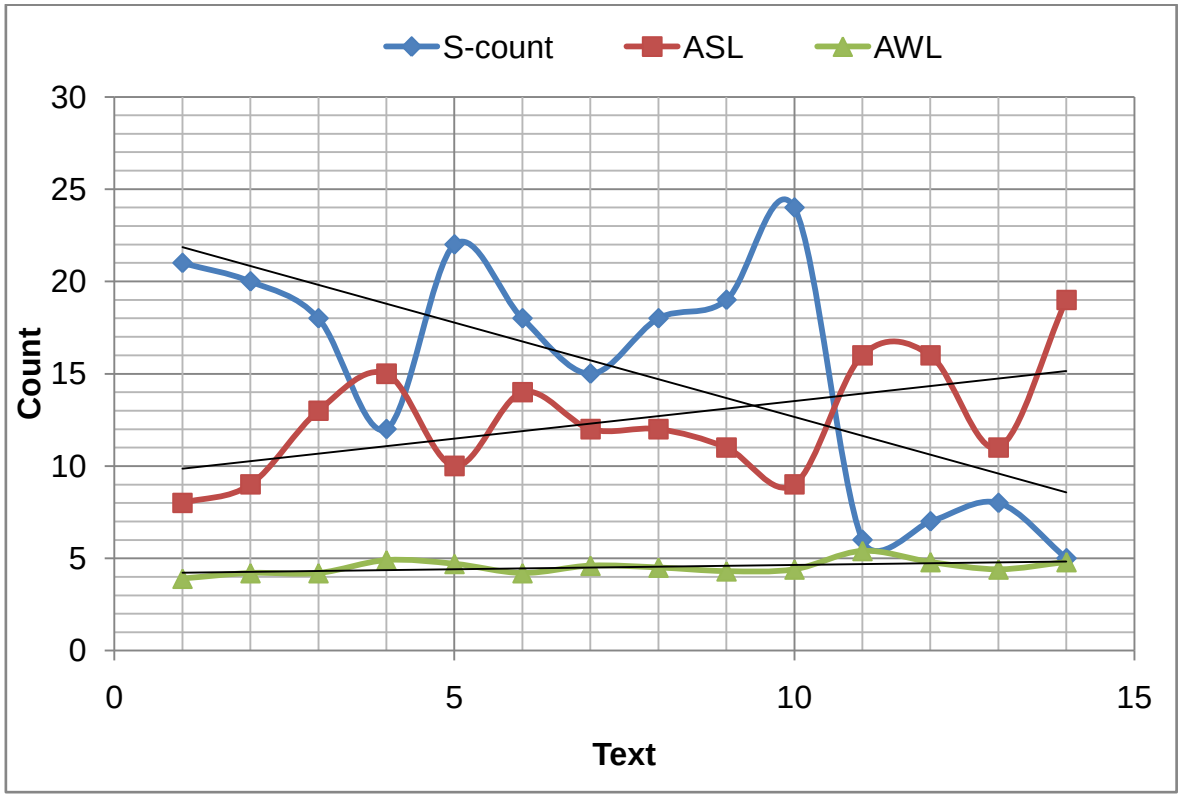


Figure 6 illustrates that no length gradation was adopted in 2MST reading texts' for the S and ASL counts. No big difference is noticed in AWL counts (4-5) among the texts. The linear developments of the S and ASL counts show no accordance. Some texts have high S counts but low ASL counts (texts 1,5,10) while others have very low S counts but the highest ASL (texts 11,12,14) among the texts. While a steady linear development is noticed for the AWL counts, the ASL counts go up and down along their linear development. The non-accordance in the linear development of the variables of S, ASL and AWL doesn't help adopting the variables in predicting the readability of a text compared to the linear development of the variables of W, SY and C counts.

Figure 7. Second year MST reading texts' linear development of UW and RW counts.

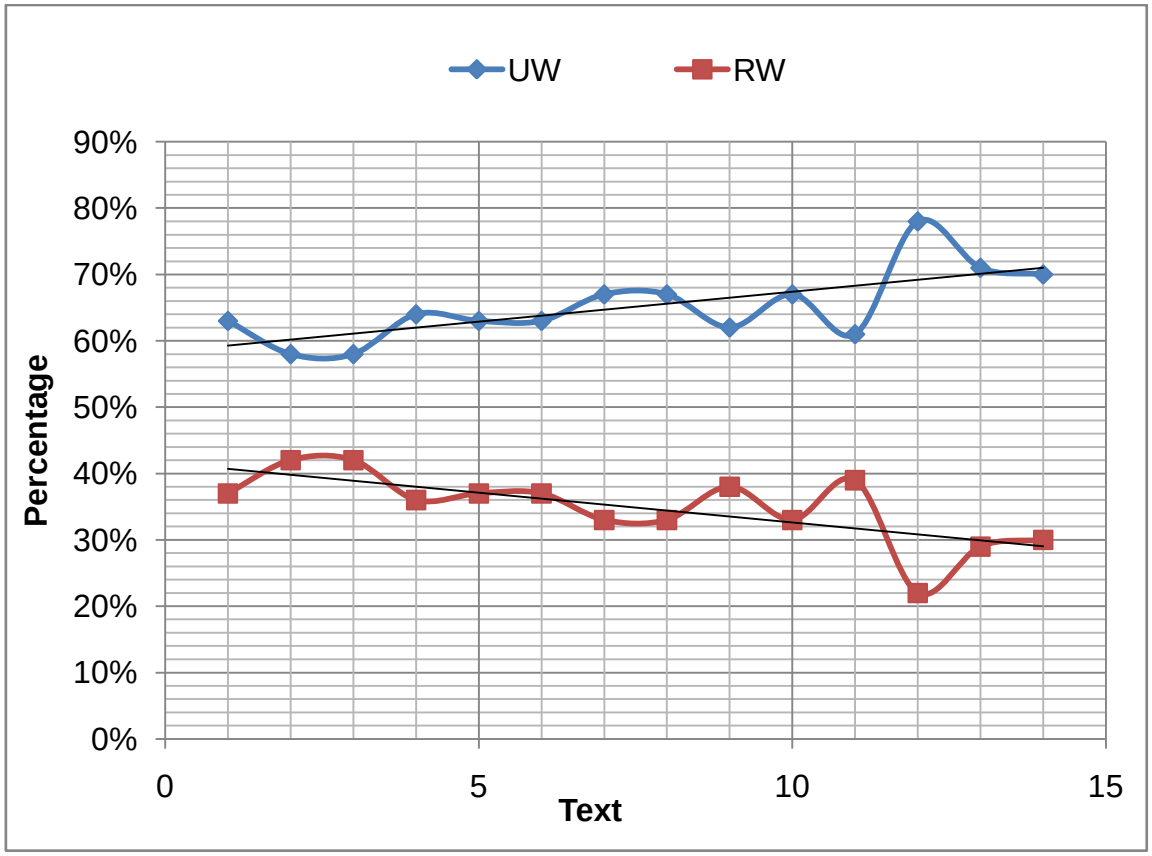


Figure 7 demonstrates a rising linear development of the UW percentage and a falling linear development of RW percentage. All 2MST reading texts have higher UW counts compared to the RW counts. No accordance is observed between the linear development of UW and RW counts. The higher percentage of UW in 2MST reading texts compared to RW percentage will be further analysed in this chapter to examine the effect of the word frequency variable on the readability prediction of a text using different readability formulas.

Figure 8. Second year MST reading texts' linear development of SSW, DSW, and PSW counts.

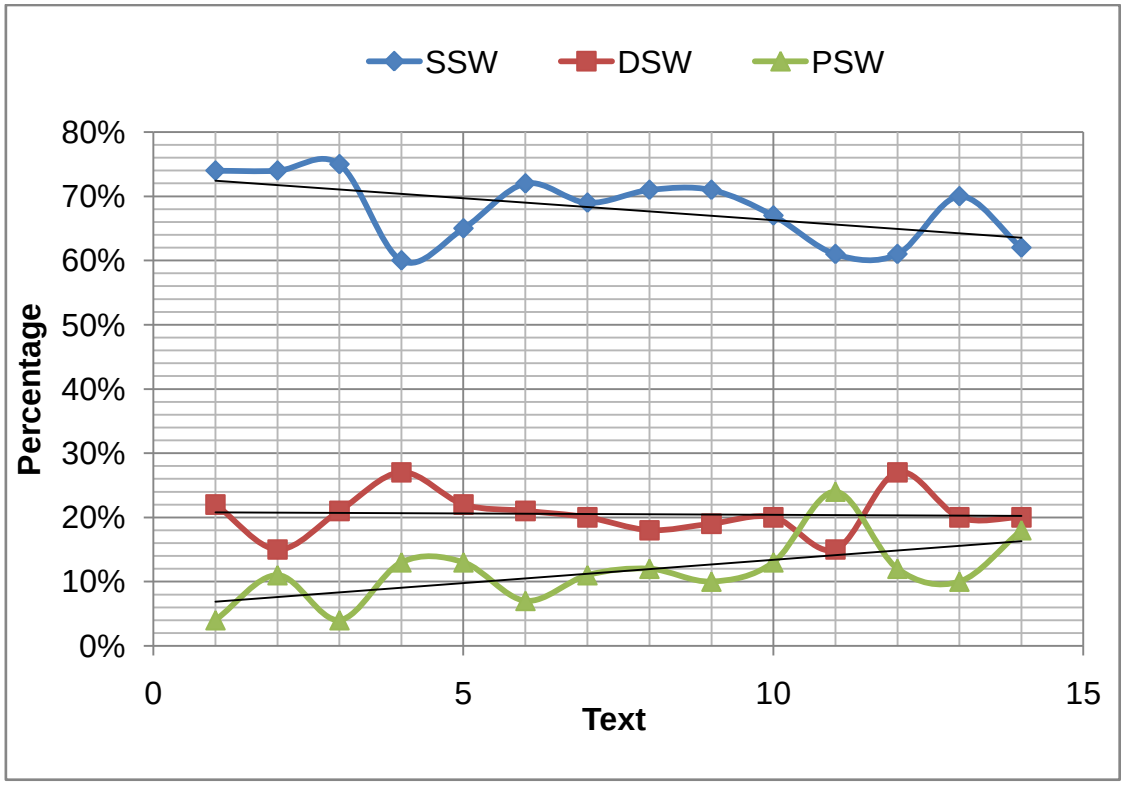


Figure 8 demonstrates that all the texts have more than 60% of SSW. Except one text (11), all the texts' PSW counts are lower than the DSW counts. The figure also shows a falling linear development of SSW counts, a steady linear development of DSW, and a rising linear development of PSW counts. The low PSW count in 2MST reading texts confirms the finding for 1MST reading texts about the writer's choice to use fewer PSWs is mainly due to textbook writers' awareness of the effect of polysyllabic word count on the text readability.

Figure 9. Second year MST reading texts' linear development of W, SY and C counts.

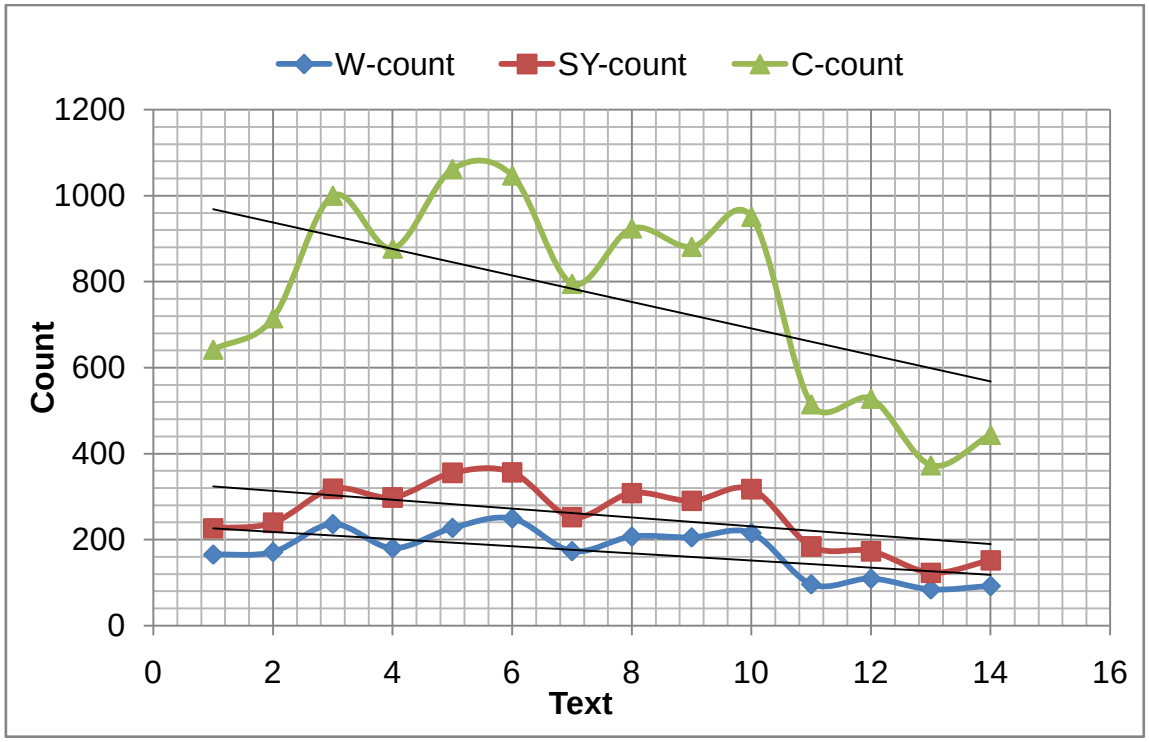


Figure 9 illustrates a clear accordance among the linear developments of W, SY and C counts. Due to the high percentage of SSW counts (>60%) of all the texts, the W and SY counts go side by side with no big difference in their linear developments. The consistency observed between the linear development of W, SY and C counts confirms the finding for the same counts of 1MST reading texts.

II.2.3. Third Year MST Reading Texts' Word Counts

Published and adopted in 2018, third year MST 'My Book of English' is composed of 4 sequences of different topics. Each sequence includes 10 subsequences among which two are entitled 'I read and do' and 'I read for pleasure'. Tables 12 and 13 include the word counts of 3MST reading texts of these 2 sub-sequences.

Table 12. Third year MST reading texts' word counts (Part1).

Texts	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17
Page	30	31	32	34	35	43	45	66	73	74	82	99	99	110	139	140	146
S-count	8	10	13	10	8	10	10	9	9	7	13	7	3	10	15	16	9
W-count	113	144	181	130	134	96	141	121	187	215	181	107	99	203	243	232	164
SY-count	171	211	265	194	210	110	190	187	281	320	265	156	162	268	389	384	340
C-count	487	601	785	583	632	356	558	537	824	972	785	471	459	887	1229	1101	959
ASL	14	14	14	13	17	10	14	13	21	31	14	15	33	21	16	15	18
AWL	4	4	4	4	5	4	4	4	4	5	4	4	5	4	5	5	6
ASS	21	21	20	19	26	11	19	21	31	46	20	22	54	27	26	24	38
ASW	2	1	1	1	2	1	1	2	2	1	1	1	2	1	2	2	2
ACS	61	60	60	58	79	36	56	60	92	139	57	67	153	89	82	69	107

Table 13. Third year MST reading texts' word counts (Part2).

Texts	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17
UW-count/ %	87	104	128	94	85	64	95	88	118	131	116	81	76	102	152	163	113
	77%	72%	71%	72%	63%	67%	67%	73%	63%	61%	64%	76%	77%	50%	63%	70%	69%
RWcount/ %	26	40	53	36	49	32	46	33	69	84	65	26	23	101	91	69	51
	23%	28%	29%	28%	37%	33%	33%	27%	37%	39%	36%	24%	23%	50%	37%	30%	31%
SSW-count/ %	71	104	126	85	85	88	104	70	124	141	125	71	66	154	156	132	81
	63%	72%	70%	65%	63%	92%	74%	58%	66%	66%	69%	66%	67%	76%	64%	57%	49%
DSW-count/ %	29	27	36	29	30	7	26	36	41	51	30	24	21	36	59	55	33
	26%	19%	20%	22%	22%	7%	18%	30%	22%	24%	17%	22%	21%	18%	24%	24%	21%
PSW-count/ %	13	13	19	16	19	1	11	15	22	23	26	12	12	13	28	45	50
	12%	9%	10%	12%	14%	1%	8%	12%	12%	11%	14%	11%	12%	6%	12%	19%	30%
AS/100W	151	147	146	149	157	115	135	155	150	149	140	146	164	132	160	166	207
AS/50W	76	73	73	75	78	57	67	77	75	74	70	73	82	66	80	83	104
AC/100W	431	417	434	448	472	371	396	444	441	452	407	440	464	437	506	475	585
AC/50W	215	209	217	224	236	185	198	222	220	226	204	220	232	218	253	237	292

Tables 12 and 13 shows that third year MST contains 17 reading texts that ranges from 96 (T6) to 243 (T15) words. It also demonstrates that third year MST writers adopted no criteria in grading the texts according to their length which is the same case for first and second year MST reading texts.

Figure 10. Third year MST reading texts' linear development of S, ASL and AWL counts.

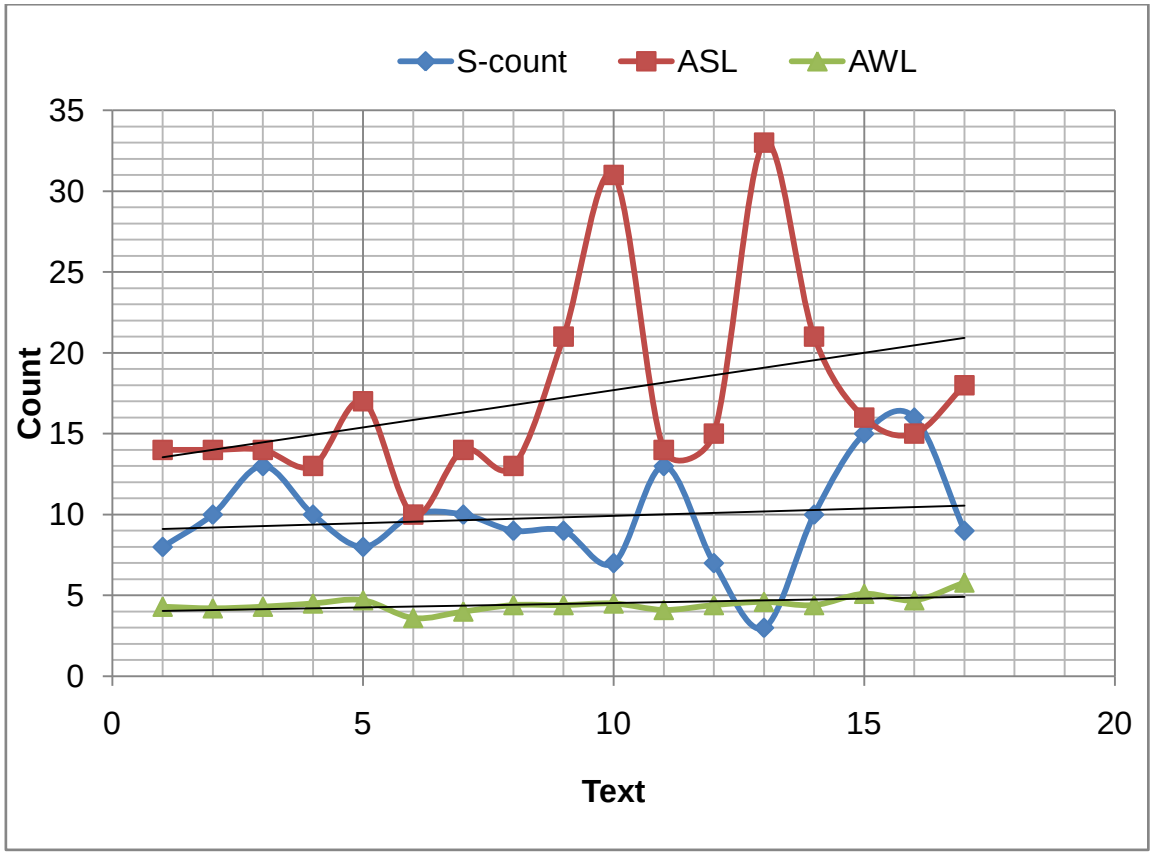


Figure 10 illustrates no consistency for the S and ASL counts' linear development of 3MST reading texts. It also shows a steady linear development of AWL count (4 to 6). Texts 5, 9, 10, 12, 14 and 17 have low S count but high ASL count. The linear development of AWL and ASL counts go up and down through the texts. No correlation between the linear development of the variables of S, ASL and AWL is noticed which is the same case for 1MST and 2MST reading texts.

Figure 11. Third year MST reading texts' linear development of UW and RW counts.

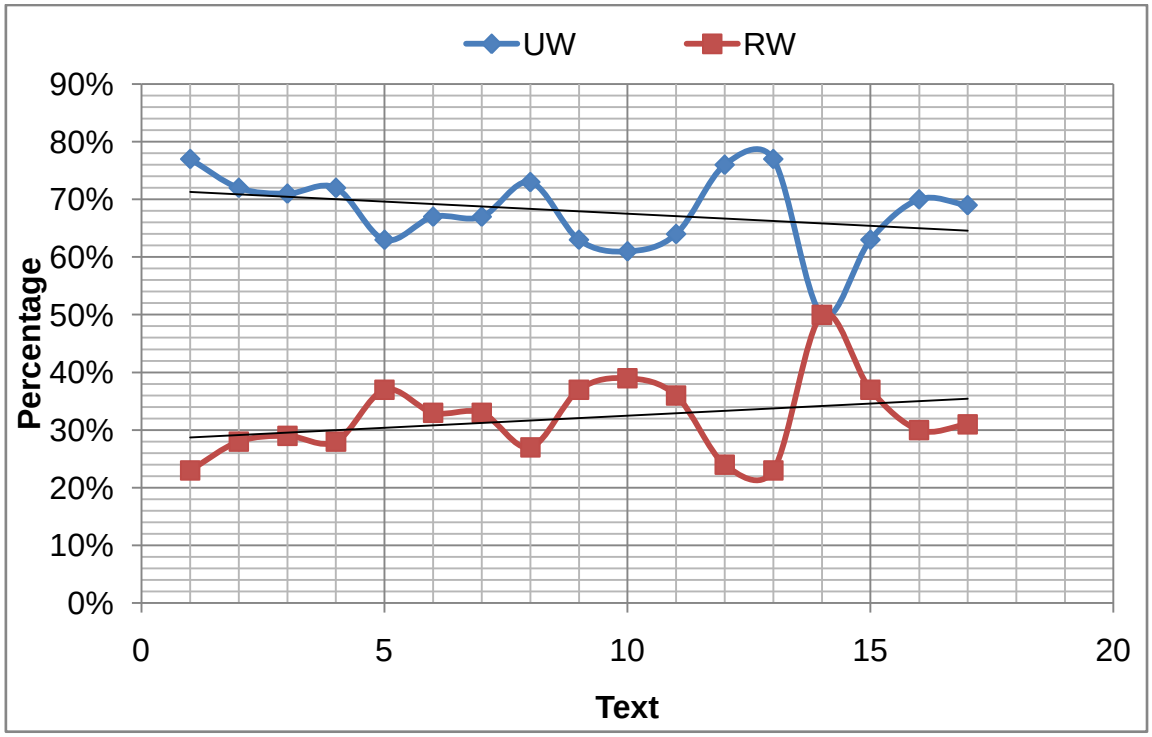


Figure 11 shows a falling linear development of the UW percentage and a rising linear development of RW percentage. All 3MST reading texts have higher UW counts compared to the RW counts except one text (14) in which the RW count is equal to the UW count.

Figure 12. Third year MST reading texts' linear development of SSW, DSW and PSW counts.

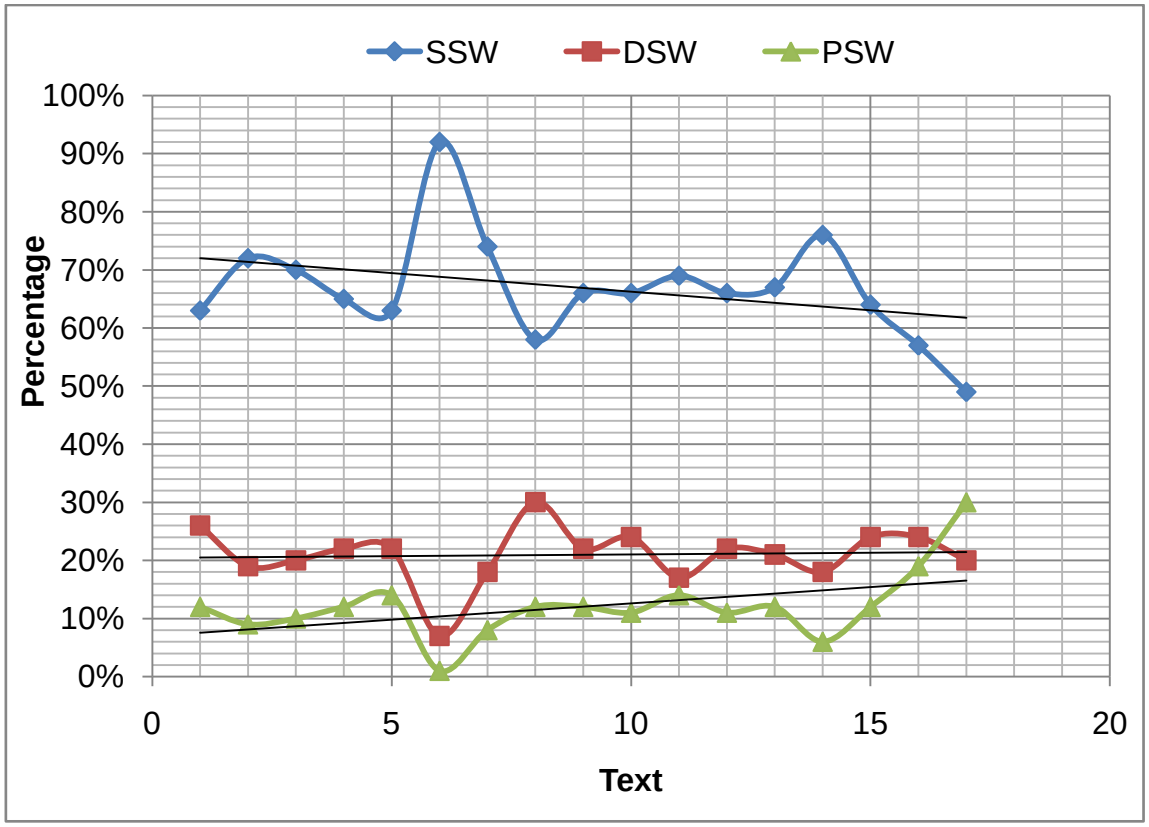


Figure 12 illustrates that half the words of all third year MST reading texts are monosyllabic. Except for Text 17, all the texts' PSW counts are lower than the DSW counts. The figure shows a falling linear development of SSW counts, a steady linear development of DSW, and a rising linear development of PSW counts. The results in this figure confirm previous results about 1MST and 2MST reading texts on the textbook writers' choice to use texts with very low polysyllabic word count.

Figure 13. Third year MST reading texts' linear development of W, SY and C counts.

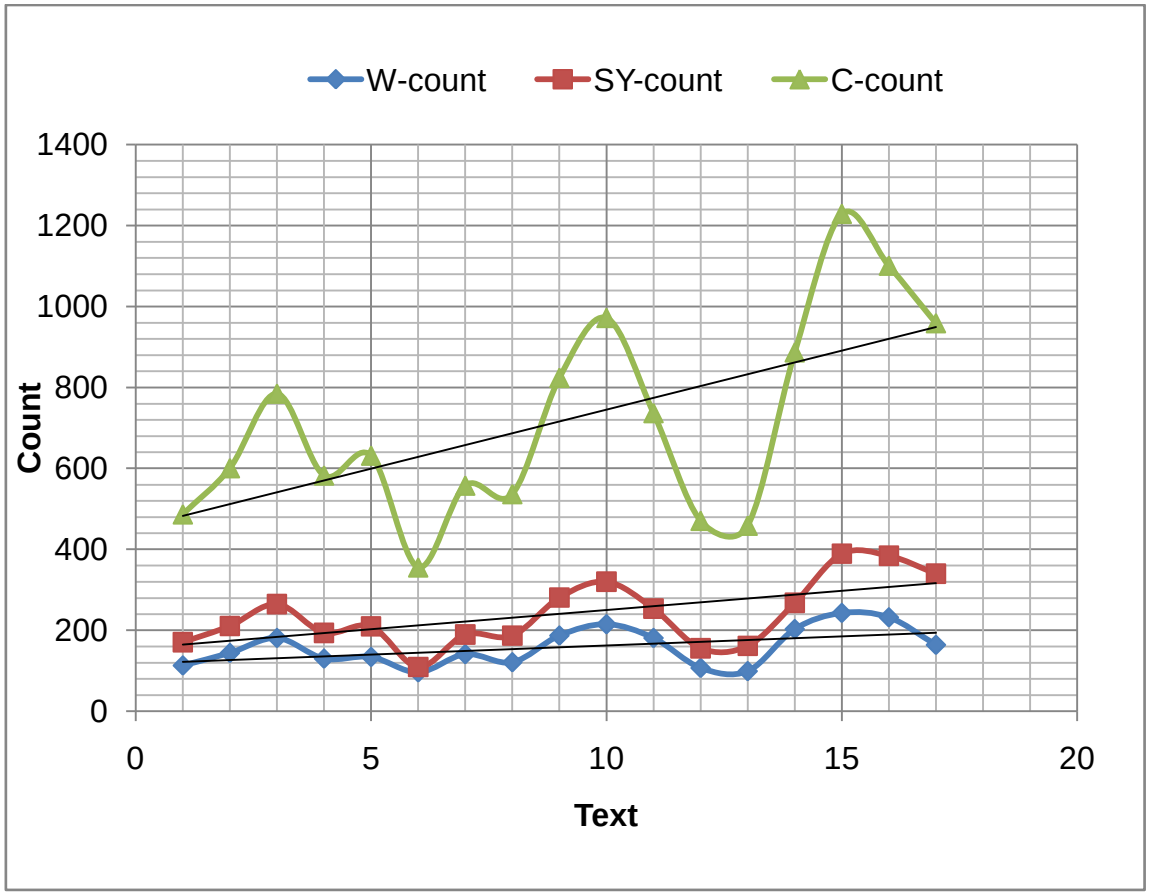


Figure 13 illustrates a consistent rising linear development for W, SY and C counts. Such consistency is mainly due to the high percentage of the SSW counts which exceed 50% for most of the texts. The linear development pattern of W, SY and C counts for 1MST and 2MST reading texts is repeated for 3MST reading texts.

II.2.4. Fourth Year MST Reading Texts' Word Counts

Fourth year MST 'My Book of English' was published and adopted in 2019. It is composed of 3 sequences of different topics. Each sequence includes 12 subsequences among which two are

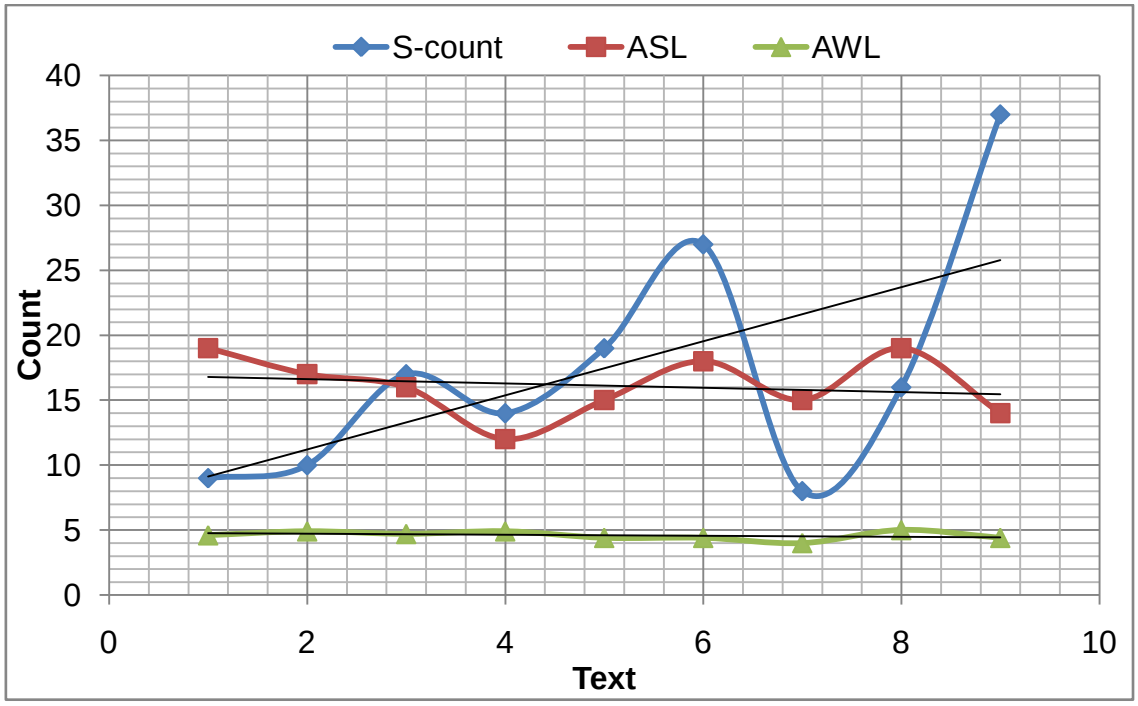
entitled ‘I read and do’ and ‘I read for pleasure’. Table 14 includes the word counts of 3MST reading texts of these 2 sub-sequences.

Table 14. Fourth year MST reading texts’ word counts.

Texts	T1	T2	T3	T4	T5	T6	T7	T8	T9
Page	40	41	44	46	80	82	115	118	120
S-count	9	10	17	14	19	27	8	16	37
W-count	175	165	271	170	285	476	120	302	526
SY-count	265	265	443	282	430	686	153	507	773
C-count	801	811	1286	828	1248	2118	474	1506	2326
ASL	19	17	16	12	15	18	15	19	14
AWL	5	5	5	5	4	4	4	5	4
ASS	29	27	26	20	23	25	19	32	21
ASW	2	2	2	2	1	1	1	2	1
ACS	89	81	76	59	66	78	59	94	63
UW-count/ %	121	112	181	113	179	259	73	163	277
	69%	68%	67%	66%	63%	54%	61%	54%	53%
RW-count/ %	54	53	90	57	106	217	47	139	249
	31%	32%	33%	34%	37%	46%	39%	46%	47%
SSW-count/ %	115	101	155	107	196	334	99	187	359
	65%	61%	57%	63%	69%	70%	83%	62%	68%
DSW-count/ %	31	36	79	38	60	89	14	66	99
	18%	22%	29%	22%	21%	19%	12%	22%	19%
PSW-count/ %	29	28	37	25	29	53	7	49	68
	17%	17%	14%	15%	10%	11%	6%	16%	13%
ACSY/ 100W	151	161	163	166	151	144	128	168	147
ACSY/ 50W	76	80	82	83	75	72	64	84	73
ACC/ 100W	458	492	475	487	438	445	395	499	442
ACC/ 50W	229	246	237	244	219	222	198	249	221

Table 14 shows that 9 reading texts are included in fourth year MST with a range of 120 (T7) to 526 words (T9) of text length. The texts are not graded according to their length.

Figure 14. Fourth year MST reading texts' linear development of S, ASL and AWL counts



.

Figure 14 shows no accordance between the linear development of S and ASL counts which go up and down through the texts. It also demonstrates a steady linear development of AWL counts with an average of 4 to 5. The S counts of four texts (1,2,7,8) are lower than their ASL counts.

Figure 15. Fourth year MST reading texts' linear development of UW and RW counts.

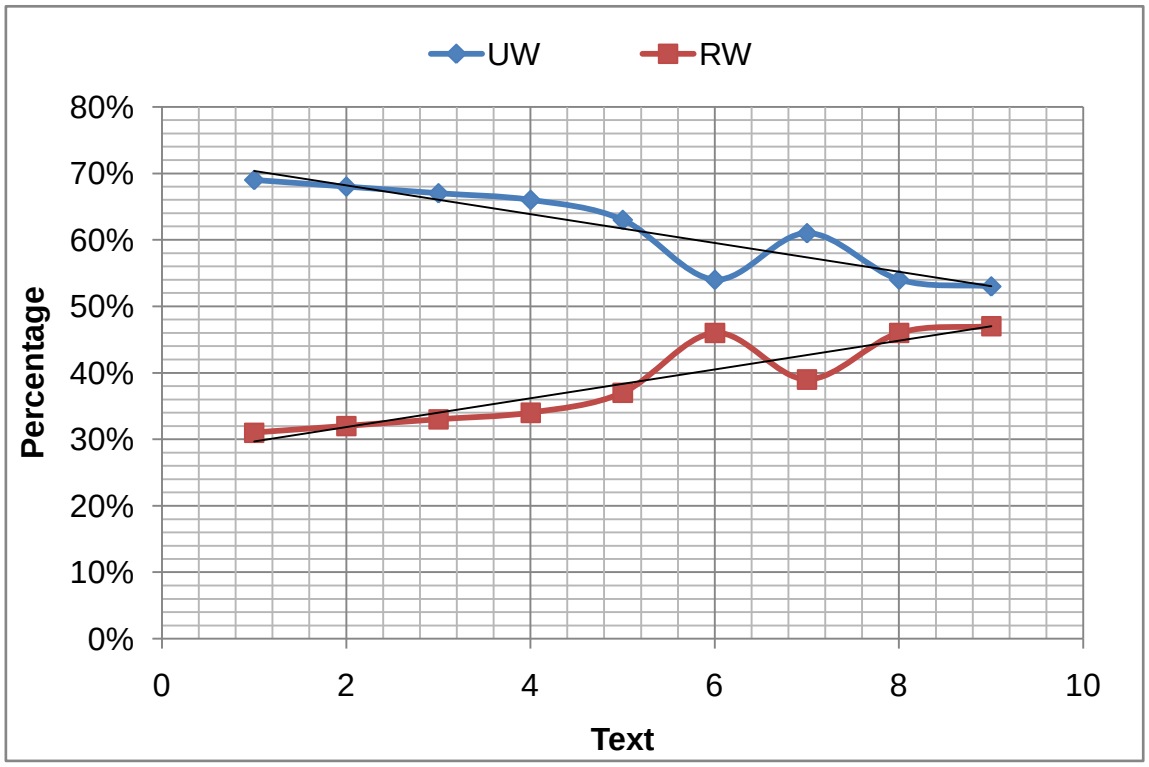


Figure 15 illustrates a falling linear development of the UW percentage and a rising linear development of RW percentage. UW counts are higher than the RW counts in all 4MST reading texts which is the case for 1MST, 2MST and 3MST reading texts as shown and discussed previously.

Figure 16. Fourth year MST reading texts' linear development of SSW, DSW, and PSW counts.

Figure 16 demonstrates that all the texts have more than 50% of SSW. The PSW counts of all the texts are lower than the DSW counts. While the SSW counts go up through their linear development, both DSW and PSW counts show a falling linear development. The results in Figure 16 match the results for 1MST, 2MST and 3MST reading texts on the variable of polysyllabic word count which was taken into consideration by middle school textbook writers in the selection of the MSTs reading texts. This variable will be further examined in this chapter to confirm its effect on the text readability.

Figure 17. Fourth year MST reading texts' linear development of W, SY and C counts.

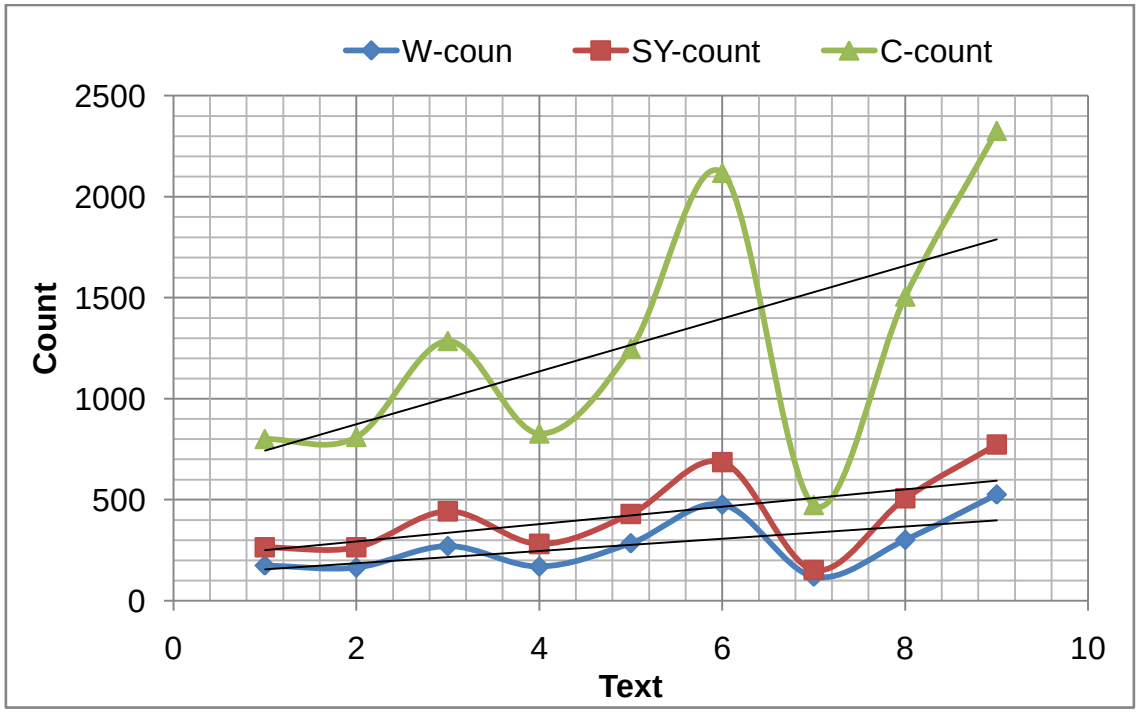


Figure 17 shows a consistent accordance between the linear developments of W, SY and C counts. The W and SY counts go side by side with no big difference in their linear development because of the high percentage of SSW counts (>50%) of all the texts.

II.3. Readability of MSTs Reading Texts

Three readability formulas are used in the analysis of the readability for MST reading texts: Fog Index (FI), Automated Readability Index (ARI), and Flesch-Kincaid Readability Formula (FKRF). These formulas are selected among the other formulas for the few similarities between their target contexts and the Algerian EFL teaching context. Each formula provides a readability score (S), an estimated school grade (G), and the approximate age (A) of the potential target readers of the text. Additionally, a readability average, which

results from the average of the scores of the three readability formulas, is provided for each text including the score, the estimated school grade, the approximate age, and the school level (Sch.). The latter includes kindergarten (K), preschooling (P), elementary school (E), middle school (M), high school (H), and college level (C).

It should be noted that these formulas are devised for native learners of English in the US who start studying English in schools at an early age (4 to 6) compared to Algerian learners who start studying English as a foreign language when they are 11 to 12 years old. Therefore, texts which are scored as middle school level texts and above, i.e., grades from 6 and above should be considered as texts beyond the level of the Algerian middle school learners being elementary learners of English.

The three readability formulas adopted in this analysis provide readability scores just for texts of more than 100 words which is a precondition for most of the readability formulas in the literature. The readability scores of less than 1 corresponds to either kindergarten or preschooling grades. The readability scores 1 to 5 correspond to the elementary school grades 1 to 5. The readability scores 6 to 9 correspond to the middle school grades 6 to 9. The readability scores 10 to 12 correspond to the high school grades 10 to 12. The readability scores of 13 and more correspond to college level. Additionally, an analysis of the readability scores of the texts in relation to their word counts (AWL, ASL, ASW, SSW, DSW, PSW) is done to spot the word count(s) that has/have a direct effect on the scores.

II.3.1. First Year MST Reading Texts' Readability

Table 15 includes the estimated readability scores for 1MST reading texts.

Table 15. Readability scores for 1MST reading texts. T: Text, TP: Textbook Page.

T	TP	Readability Scores									ReadabilityAverage			
		FI			ARI			FKRF						
		S	G	A	S	G	A	S	G	A	S	G	A	Sch.
1	41	<100 W			<100 W			<100 W			<100 W			
2	41	<100 W			<100 W			<100 W			<100 W			
3	59	<100 W			<100 W			<100 W			<100 W			
4	60	<100 W			<100 W			<100 W			<100 W			
5	66	<100 W			<100 W			<100 W			<100 W			
6	80	3.7	3	8/9	4.7	4	9/10	1	K	5/6	3	3	8/9	E
7	85	5.2	5	10/11	-1.8	P	5/6	2.5	2	6/7	2	1/2	6/7	E
8	90	<100 W			<100 W			<100 W			<100 W			
9	116	8.1	8	13/14	4.2	4	9/10	5.6	5	10/11	6	6	11/12	M
10	116	<100 W			<100 W			<100 W			<100 W			
11	139	6.4	6	11/12	4	4	9/10	6.2	6	11/12	6	6	11/12	M

Table 15 shows that 7 texts coloured in yellow are less than 100 words, something which makes it impossible to provide readability scores for them. Two texts (6, 7) coloured in green are scored as elementary school texts, while two texts (9,11) coloured in blue are scored as middle school texts. Figures 18 and 19 include an analysis of the readability scores of the texts in relation to their word counts.

Figure 18. Effect of ASL, AWL and ASW counts on 1MST reading texts' readability scores

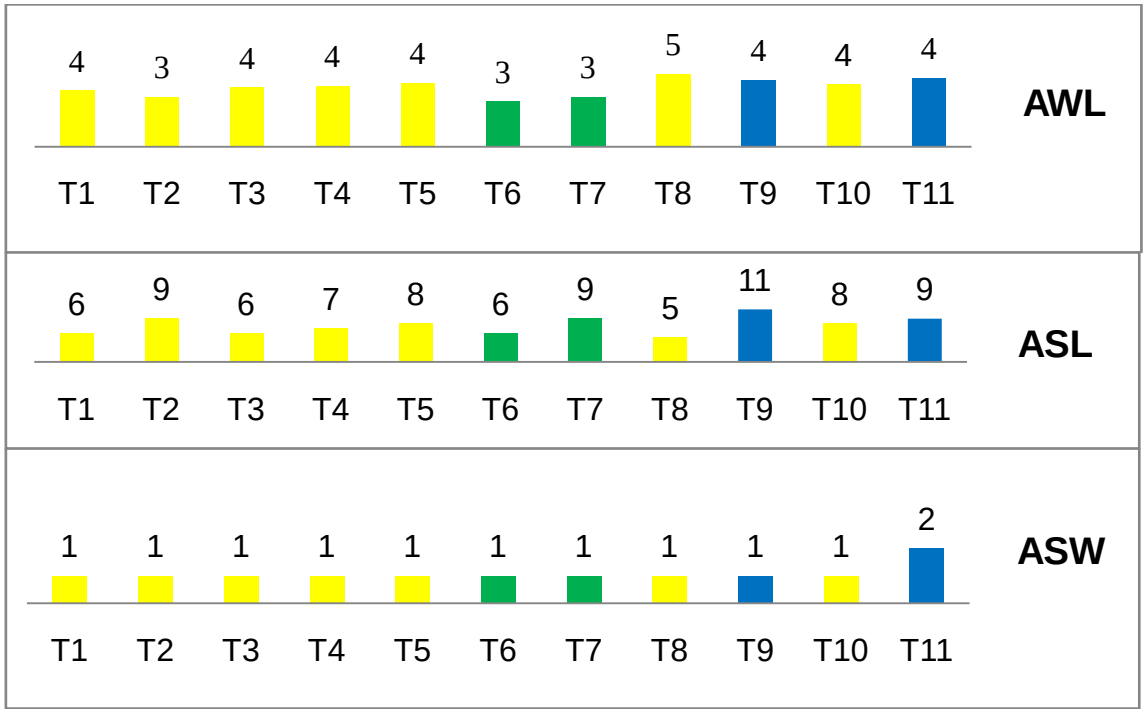


Figure 18 illustrates that Texts 6 and 7, which are scored as elementary school texts, have low AWL, ASL and ASW. By contrast, Texts 9 and 11 that are scored as middle school texts have higher AWL, ASL (except for T11), and ASW (except for T9).

Figure 19. Effect of SSW, DSW and PSW counts on 1MST reading texts'readability scores.

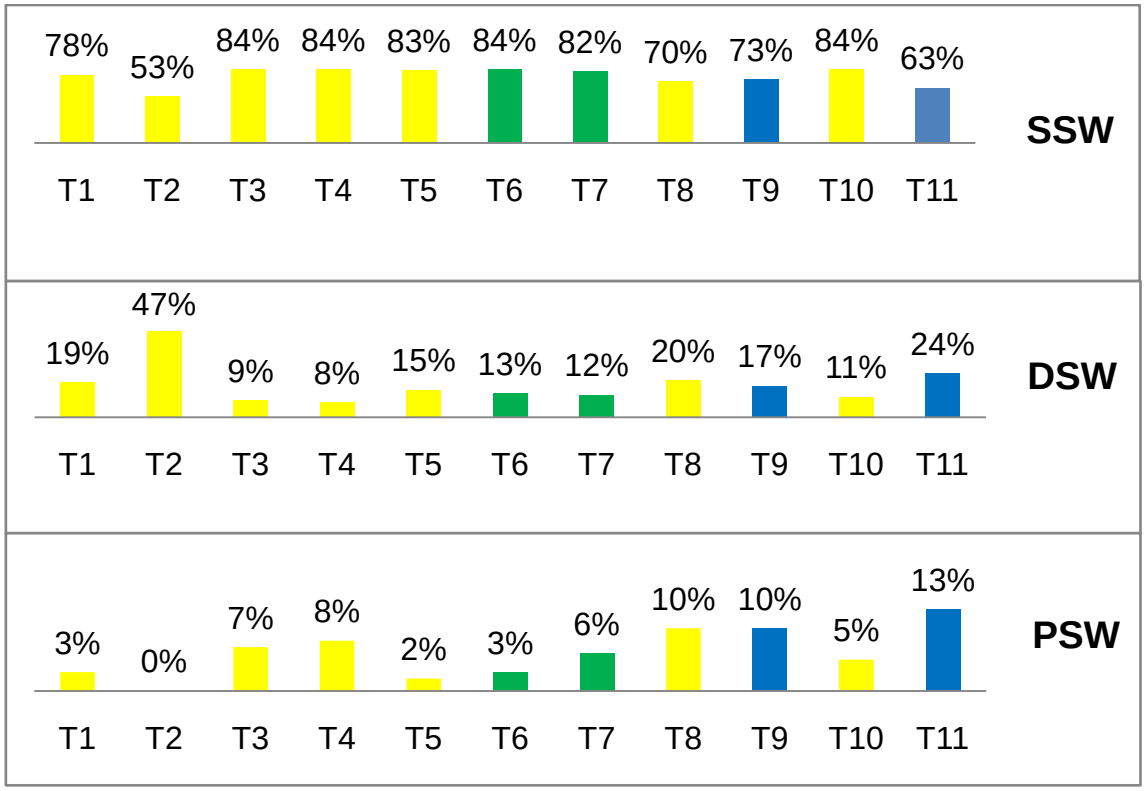


Figure 19 shows that elementary school texts (6,7) have high percentage of SSW and low percentage of DSW and PSW compared to middle school texts (9,11) which have a lower percentage of SSW and higher percentage of DSW and PSW. This implies that SY-count affects the estimated readability provided by the formulas for the reading texts. The lower the SY-count, the lower the readability is, and vice versa.

II.3.2. Second Year MST Reading Texts' Readability

Table 16 includes the estimated readability scores for 2MST reading texts.

Table 16. Readability scores for 2MST reading texts. T: Text, TP: Textbook Page.

		Readability Scores									Readability Average			
		FI			ARI			FKGL						
T	TP	S	G	A	S	G	A	S	G	A	S	G	A	Sch.
1	37	4.1	4	9/10	0.8	1	6/7	3.1	3	8/9	2.67	2	6/7	E
2	44	7.6	7	12/13	2.5	2	7/8	4.4	4	9/10	4.83	4	9/10	E
3	68	6.4	6	11/12	5.1	5	10/11	4.8	4	9/10	5.43	5	10/11	E
4	74	11.1	11	16/17	9	9	14/15	9.3	9	14/15	9.8	9	13/15	H
5	94	8.7	8	13/14	5.8	5	10/11	6.3	6	11/12	6.93	6	11/12	M
6	98	7.9	7	12/13	5.3	5	10/11	5.8	5	10/11	6.33	6	11/12	M
7	132	7.4	7	12/13	6	6	11/12	6.6	6	11/12	6.67	6	11/13	M
8	133	7.9	7	12/13	5.3	5	10/11	6.5	6	11-12	6.57	6	11/13	M
9	134	6.3	6	11/13	4.2	4	9/10	5.7	5	10	5.4	5	10/11	E
10	136	6.7	6	11/13	3.9	3	8/9	5.5	5	10	5.37	5	10/11	E
11	143	13.5	C	+18	11.8	11	16/17	11.9	11	16/17	12.4	12	17/18	H
12	143	9.9	9	14/15	9.2	9	14/15	8.5	8	13/14	9.20	9	13/15	H
13	144	<100 W			<100 W			<100 W			<100 W			
14	144	<100 W			<100 W			<100 W			<100 W			

Table 16 demonstrates that no readability scores are provided for 2 texts (13,14) because of their less-than-100-word length. Texts 1,2,3,9, and 10 are scored as elementary school texts, whereas texts 5,6,7 and 8 are scored as middle school texts. Three texts (4,11,12) are scored as high school texts. Figures 19 and 20 include an analysis of the readability scores of the texts in relation to their word counts.

Figure 20. Effect of ASL, AWL and ASW counts on2MST reading texts' readability scores.

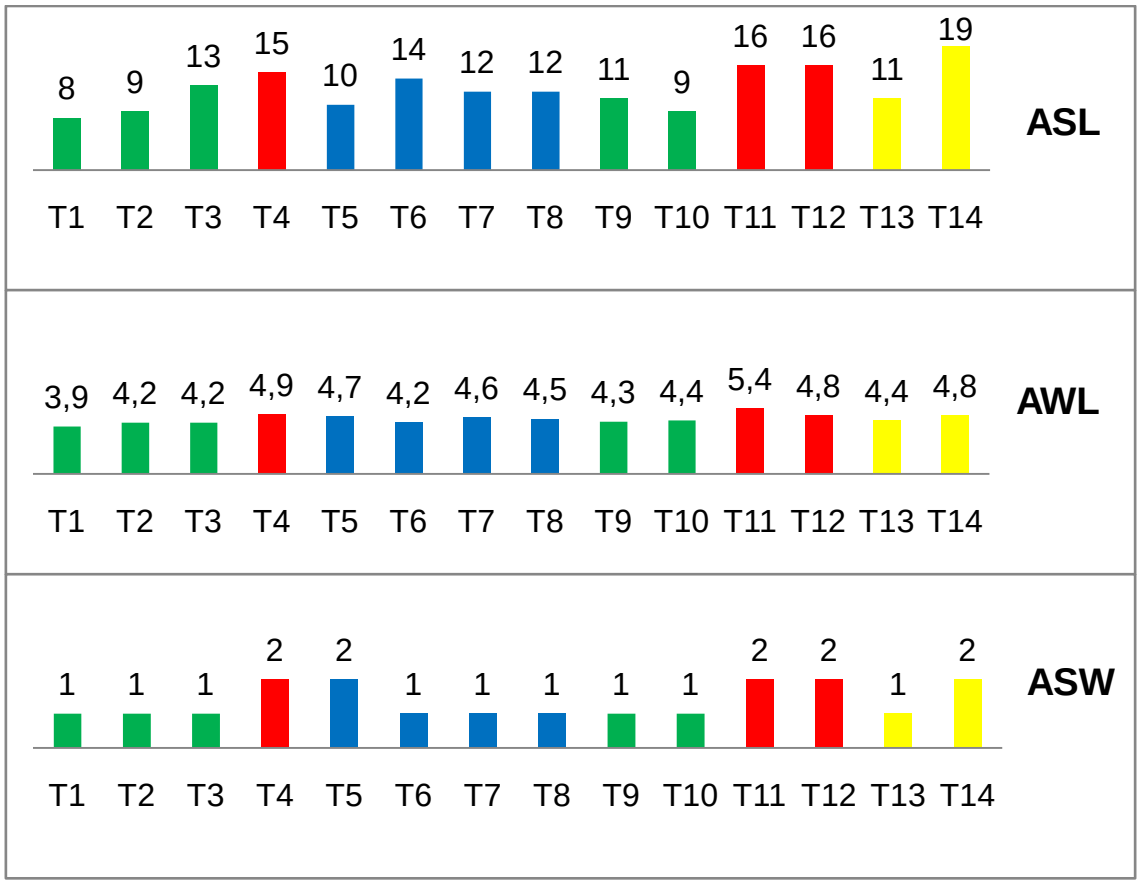


Figure 20 illustrates that high school texts (4,11,12) have the highest ASL, AWL and ASW. Middle school texts (5,6,7,8) have higher ASL and AWL compared to those of elementary school texts (1,2,3). No difference is noticed for the count of ASW for both elementary and middle school texts except for Text 5.

Figure 21. Effect of SSW, DSW and PSW counts on2MST reading texts' readability scores.

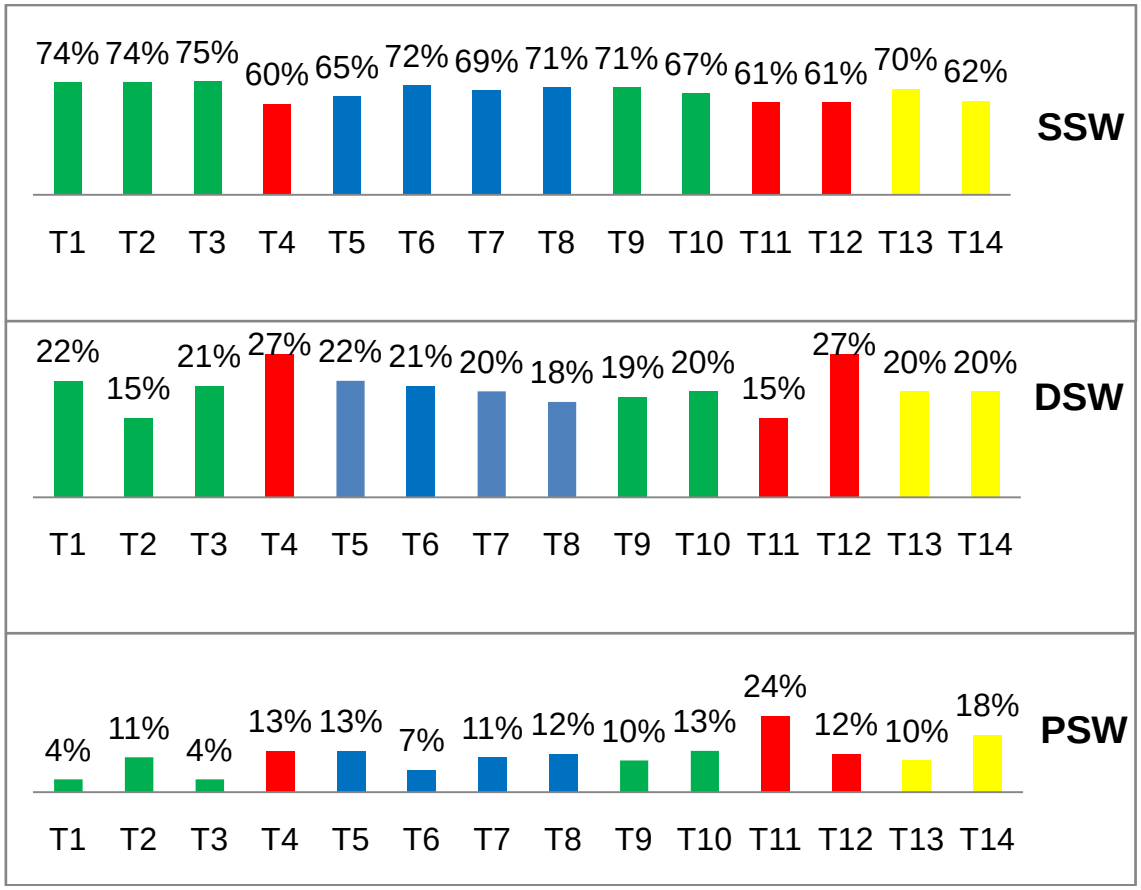


Figure 21 shows that the texts coloured in green (1,2,3,9,10) have the highest percentage of SSW and a very low percentage of PSW. The texts coloured in red (4,11,12) have the lowest counts of SSW and the highest counts of DSW (except for T11). Text 11 has the highest PSW count while no big difference is noticed between the other two red coloured texts (4,12), the blue coloured texts (5,7,8), and the green coloured texts (2,9,10).

II.3.3. Third Year MST Reading Texts' Readability

Table 17 includes the estimated readability scores for 1MST reading texts.

Table 17. Readability scores for 3MST reading texts. T: Text, TP: Textbook Page.

		Readability Scores												
		FI			ARI			FKGL			Readability Average			
T	P	S	G	A	S	G	A	S	G	A	S	G	A	Sch.
1	30	8.1	8	13/14	5.9	5	10/11	8.3	8	13/14	7.4	7	12/13	M
2	31	8.5	8	13/14	5.4	5	10/11	7.2	7	1213	7.0	7	12/13	M
3	32	8.9	8	13/14	6	6	11/12	7.3	7	12/13	7.4	7	12/13	M
4	34	8.9	8	13/14	6.2	6	11/12	7.4	7	12/13	7.5	7	12/13	M
5	35	8.5	8	13/14	9.2	9	14/15	9.3	9	14/15	9.0	9	14/15	H
6	43	<100 W			<100 W			<100 W			<100 W			
7	45	7.9	7	12/13	4.3	4	9/10	6.4	6	11/12	6.2	6	11/12	M
8	66	8	8	13/14	6.2	6	11/12	8.2	8	13/14	7.5	7	12/13	M
9	73	11.7	11	16/17	9.7	9	14/15	10.4	10	15/16	10.6	10	15/16	H
10	74	16	C	+18	15.2	C	+18	13.8	C	+18	15.0	C	+18	C
11	82	8	8	13/14	4.7	4	9/10	7.7	7	12/13	6.8	6	11/12	M
12	99	9.9	9	14/15	6.9	6	11/12	7.9	7	12/13	8.2	8	13/14	M
13	99	<100 W			<100 W			<100 W			<100 W			
14	110	12.7	12	17/18	11.8	11	16/17	9.9	9	14/15	11.5	11	16/17	H
15	139	10.9	10	15/16	10.5	10	15/16	9	9	14/15	10.1	10	15/16	H
16	140	10.3	10	15/16	8.2	8	13/14	9.9	9	14/15	9.5	9	14/15	H
17	146	16.8	C	+18	15.2	C	+18	15.5	C	+18	15.8	C	+18	C

Table 17 demonstrates that no readability scores are provided for two texts for not meeting the precondition of the number of 100 words. Eight texts (1,2,3,4,7,8,11,12) are scored as middle school texts, five (5,9,12,14,15,16) as high school texts, and two (10,17) as college level texts. Figures 22 and 23 include an analysis of the readability scores of the texts in relation to their word counts.

Figure 22. Effect of ASL, AWL and ASW counts on3MST reading texts' readability scores.

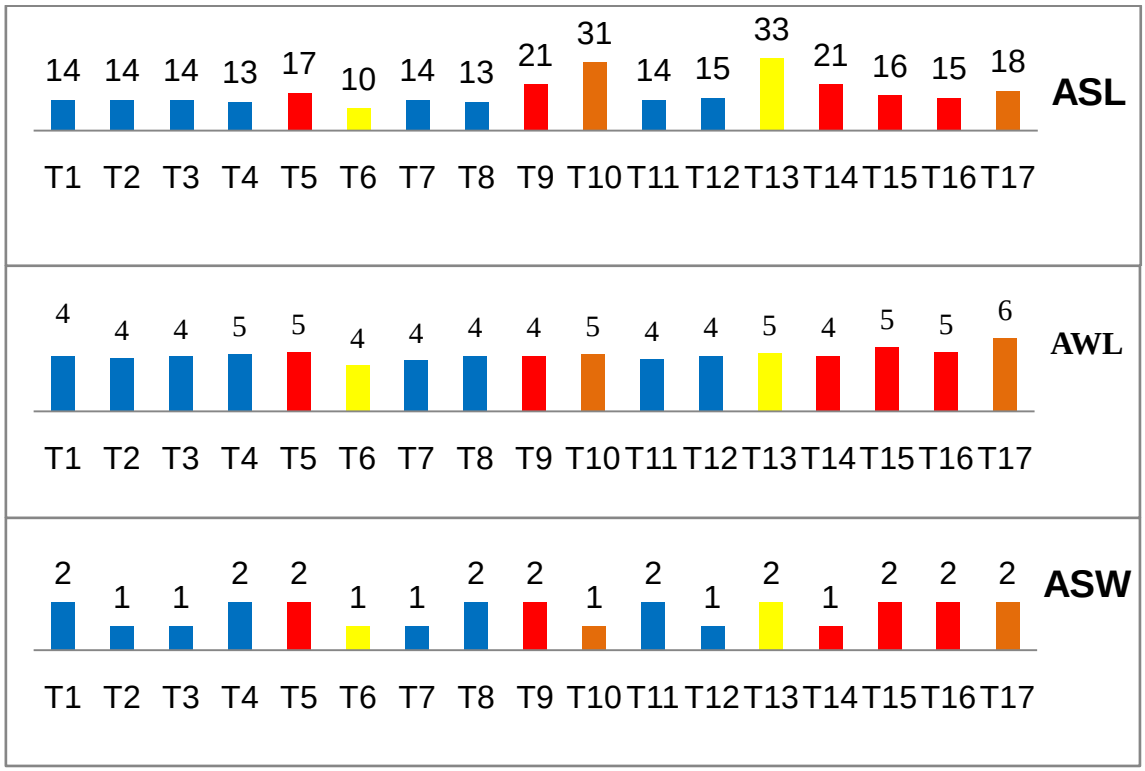


Figure 22 illustrates that college level texts (10,17) have the highest ASL count followed by high school level texts (5,9,14,15,16) and middle school texts (1,2,3,4,7,8,11,12) successively. One college text (17) has the highest AWL while the other texts' counts range from 4 to 5. The ASW count for both college level and high school texts is 2 except for two texts (10,14). The ASW count for four middle school texts (1,4,8,11) is 2, and 1 for the other four texts (2,3,7,12).

Figure 23. Effect of SSW, DSW and PSW counts on3MST reading texts' readability scores.

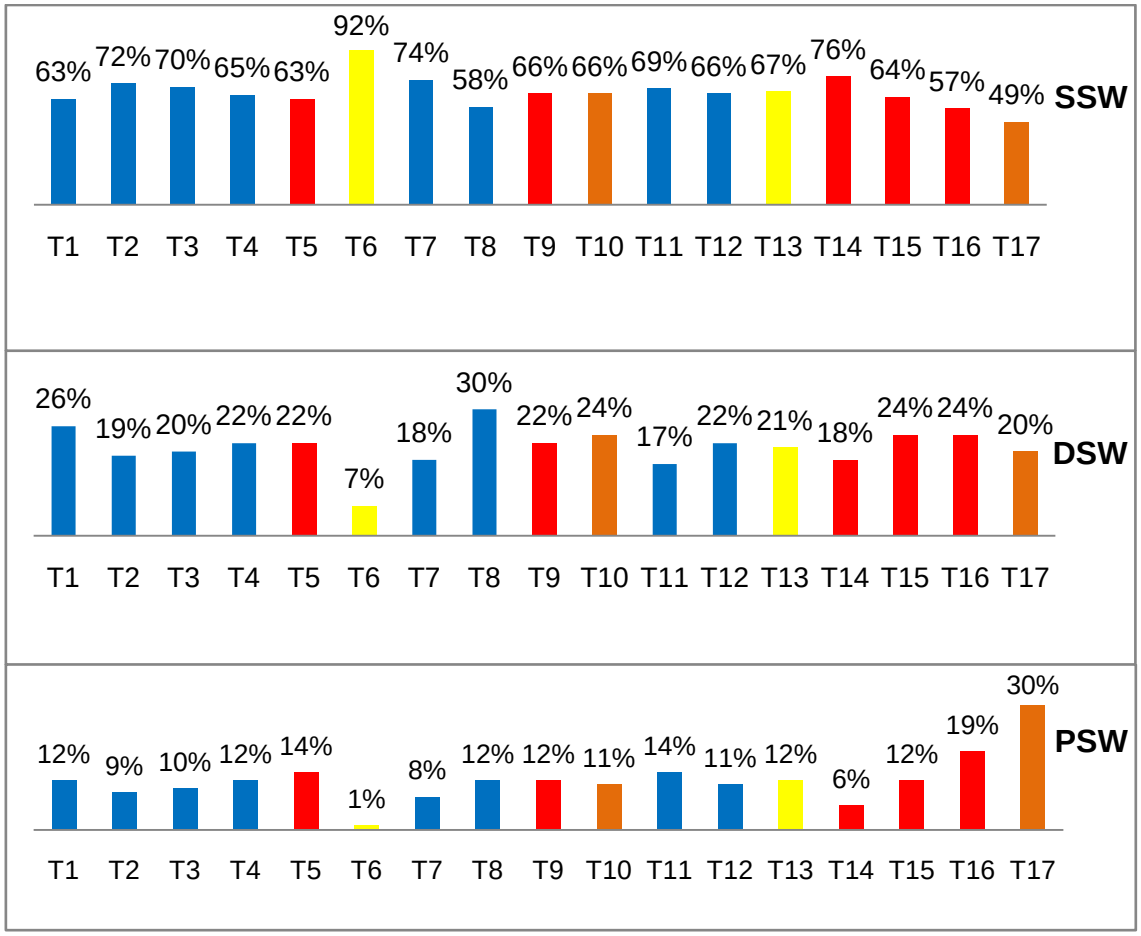


Figure 23 shows that one college level text (17) has the lowest SSW count and the highest PSW followed by a high school text. SSW percentage for the texts coloured in blue range from 58 to 74%. One high school text (14) makes an exception with the lowest PSW count and the highest SSW count. The middle school text (8) that has the lowest PSW count has the highest DSW count (30%).

II.3.4.Fourth Year MST Reading Texts' Readability

Table 18 includes the estimated readability scores for 1MST reading texts.

Table 18. Readability scores for 4MST reading texts. T: Text, TP: Textbook Page.

		Readability Scores												
		FI			ARI			FKGL			Readability Average			
T	P	S	G	A	S	G	A	S	G	A	S	G	L	Sch.
1	40	12.3	12	17/18	9.9	9	14/15	11,1	11	17/18	11.1	11	16/17	H
2	41	10,2	10	15/16	10	10	15/16	10,3	10	16/17	10.2	10	15/16	H
3	44	8.9	8	13/14	8.9	8	13/14	10.2	10	16/17	9.3	9	14/15	H
4	46	9.1	9	14/15	7.6	7	12/13	7.7	7	12/13	8.1	8	13/14	M
5	80	9.1	9	14/15	6.7	6	11/12	7.4	7	12/13	7.7	7	12/13	M
6	82	9.9	9	14/15	8.3	8	13/14	8.4	8	13/14	8.9	8	13/14	M
7	115	8.3	8	13/14	4.7	4	9/10	5.2	5	10/11	6.1	6	11/12	M
8	118	13.6	C	+18	11.5	11	16/17	10.8	10	16/17	12.0	12	17/18	H
9	120	10.2	10	15/16	6.5	6	11/12	7.6	7	12/13	8.1	8	13/14	M

Table 18 shows that five texts (4,5,6,7,9) are scored as middle school texts, and four texts as college level texts (1,2,3,8). Figures 24 and 25 include an analysis of the readability scores of the texts in relation to their word counts.

Figure 24. Effect of ASL, AWL and ASW counts on4MST reading texts' readability scores.

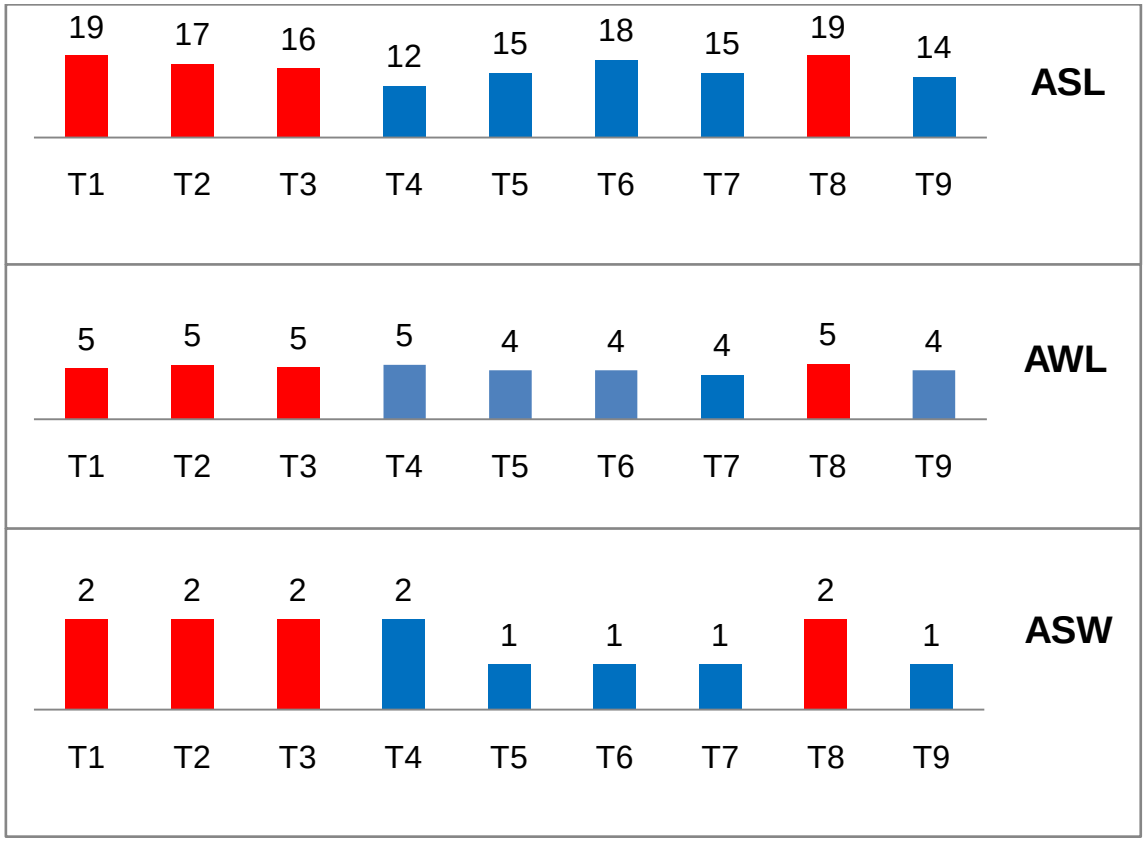


Figure 24 illustrates that the highest ASL, AWL and ASW counts are of the high school texts (1,2,3,8). One middle school text (12) has the same AWL and ASW as the high school texts but the lowest ASL.

Figure 25. Effect of SSW, DSW and PSW counts on4MST reading texts' readability scores.

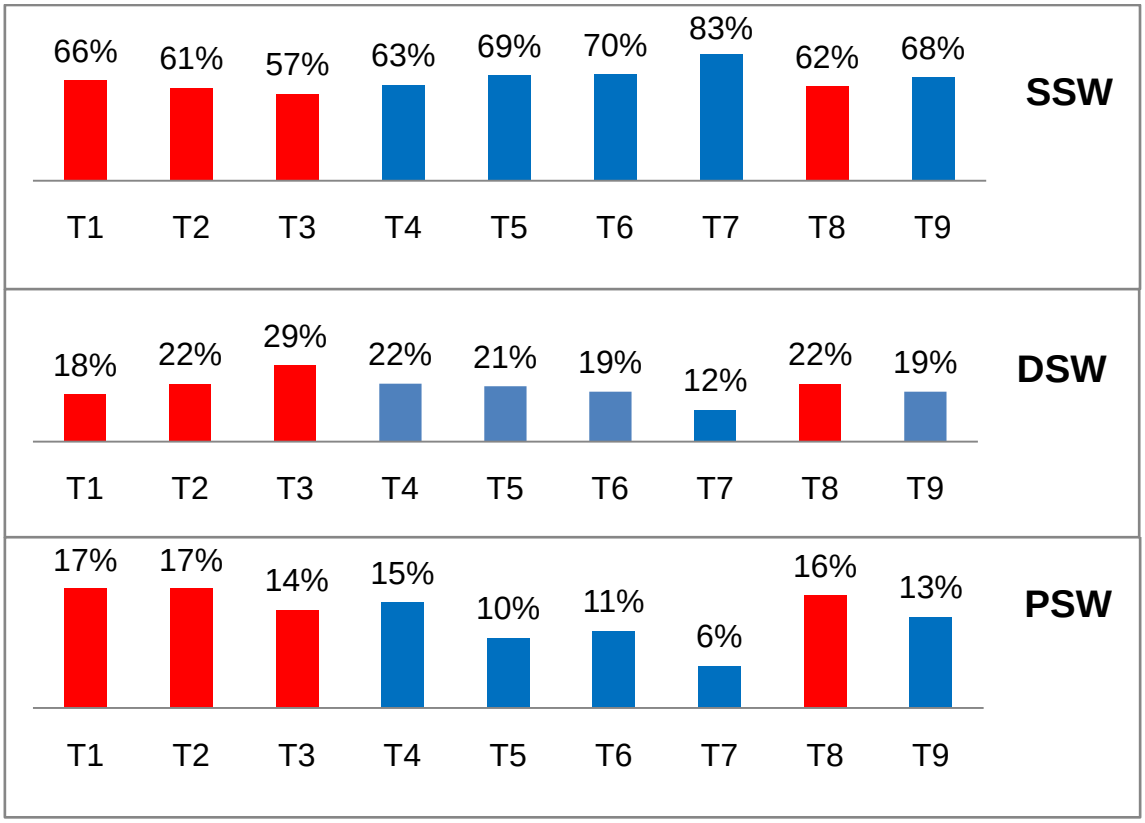


Figure 25 illustrates that middle school texts (5,6,7,9), except for Text 4, have lower PSW counts and higher SSW counts compared to high school texts (1,2,3,8). Text 3 has the highest DSW count (29%) and the lowest SSW (57%). The highest SSW count (83%) and the lowest DSW and PSW counts (12% and 6% respectively) are noticed for Text 7. No big difference is noticed for the DSW counts among the texts except for Texts 3 and 7.

II.4. Target School Level of MSTs Reading Texts

Table 19 contains the readability scores of MSTs reading texts of all levels.

Table 19. Readability scores of MSTs reading texts of all levels.

Level	Texts <100 words		Elementary school level		Middle school level		High school level		College level		Total	
	N	P	N	P	N	P	N	P	N	P	N	P
1MST	7	63.63%	2	18.18%	2	18.18%	0	0	0	0	11	100%
2MST	2	14.28%	5	35.71%	4	28.57%	3	21.42	0	0	14	100%
3MST	2	11.76%	0	0	8	47.05%	5	29.41%	2	11.76%	17	100%
4MST	0	0	0	0	5	55.55%	4	44.44%	0	0%	9	100%
Total	11	21.56%	7	13.72%	19	37.25%	12	23.52%	2	3.92%	51	100%

Table 19 illustrates that the readability formulas used in evaluating the MSTs reading texts of all levels scored the texts for different levels. 21.56% of the texts could not be evaluated for not meeting the length requirement of 100 words. Just 7 MST reading texts are scored as elementary level texts, which are theoretically considered as compatible texts with the Algerian elementary learners of English as explained earlier[7]. 19 texts are scored as middle school texts, 12 as high school texts, and two as college level texts.

II.5. Conclusion

The analysis of Algerian MSTs reading texts reveals fluctuations in their linear development through the reading texts in terms of their length, linguistic counts and readability. First, no readability criteria were adopted in the selection of MSTs reading texts. Second, the linguistic variable of S, ASL and AWL counts are not consistent in their linear development through the reading texts of all middle school levels. Third, the reading texts of the four MSTs have high UW count than RW count which induces that the word frequency variable was not given much importance by the textbook writers though it is one of the main variables adopted by some readability experts in their readability formulas (Dale and Chall 1948; Burmouth 1966; Dale and Chall 1995). Fourth, MSTs writers selected reading texts with low polysyllabic word count which is a very important linguistic variable in deciding the readability level of a reading text. Fifth, the variables of W, SY and C counts show high consistent accordance in their linear development through the reading texts of all MSTs. Sixth, MSTs reading texts which are scored as elementary school texts have low AWL, ASL and ASW counts which explains the effect these linguistic variables have on the readability level of a reading text making of them ones of the main variables adopted in the different existing readability formulas as discussed in the literature. Seventh, a positive correlation is noticed between the variables of

[7] See page 61.

AWL, ASL and ASW counts and the variable of SSW, DSW and PSW counts. The higher the polysyllabic word count variable is, the higher the AWL, ASL and ASW counts are. Hence, the variables of W, SY and C counts will be scrutinized in chapter three to identify the best linguistic variable to adopt in the BNP Readability Formulas for Algerian middle school EFL learners.

CHAPTER THREE

Training of BNP Readability Formulas for Algerian Middle School EFL Learners

Chapter Three

Training of BNP Readability Formulas for Algerian Middle School EFL Learners

Chapter Three

Training of BNP Readability Formulas for Algerian Middle School EFL Learners

III.1. Introduction

This chapter includes the description of the study participants and data collection process. It also deals with the training of the collected data[8] to develop overall individual LRMs for the four middle school levels and their categories of learners. The training results are analysed to identify the best variables to adopt in BNP Readability Formulas.

III.2. Study Participants and Data Collection

The study data was collected from different middle schools in three Algerian cities namely Oran, Tiaret, and Relizane. Some practitioner teachers who have been teaching English for more than 10 years accepted to take part in the study during 2018/19 and 2019/20 school years. Teachers had to select a sample of participants among their learners according to their school achievement in English. The participants were carefully selected to represent the target research population. They were categorized into four groups (CAs) according to their English average (CA1: 16-20; CA2: 13-15.99; CA3: 10-12.99; CA4: 0-9.99). First year middle school learners were categorized by their teachers on the basis of their participation, in-class activities, and tests during the first trimester of the school year. Teachers were provided with reading time

[8] Refers to the data used to develop (train, teach) BNP readability models.

sheets for each level. Texts to be read by learners were selected from the official middle school English textbooks. Each participant read the selected texts during English classes through the school year. 34 middle school learners from the four middle school levels participated in the study.

Table 20. Study participants' profile.

Level		**1MSL**	**2MSL**	**3MSL**	**4MSL**
Gender	**M**	5	4	4	4
	F	5	4	4	4
Age		11/2	12/3	13/4	14/5
CA	**1**	2	2	2	2
	2	2	2	2	2
	3	3	2	2	2
	4	3	2	2	2
Total		**10**	**8**	**8**	**8**

Table 20 includes information on the investigated sample. Participants' ages represent the standard age of most Algerian middle school learners. Two participants were selected from each category except for the third and fourth categories of 1MS which include 3 participants each.

III.3. Data Analysis and Discussion

III.3.1. Data Corpus

The reading texts of the study are selected from the institutional middle school textbooks for two reasons. First, to involve the classroom teachers who participated in the study in the selection process. Teachers were asked to select a number of textbook reading texts (TRTs) taking into consideration two main characteristics: (a) length, to use texts of different length, and (b) topics, so that the selected texts are of different topics and spread through the textbook units. Second, to get the target readers' reading time in an ordinary classroom setting, where learners read the TRTs rather than texts on separate papers. Table 21includes the linguistic characteristics of the sample TRTs.

Table 21. Word counts of sample MST reading texts.

1MSL					**2MSL**				
T	**W**	**SY**	**C**	**PSW%**	**T**	**W**	**SY**	**C**	**PSW%**
1	31	37	111	3	**1**	165	226	642	4
2	17	21	54	0	**2**	236	318	1000	4
3	55	70	208	7	**3**	249	356	1047	7
4	49	66	193	8	**4**	207	308	924	12
5	66	86	271	2	**5**	96	184	515	24
6	40	63	186	10					
7	168	239	733	10					
8	63	82	249	5					
3MSL					**4MSL**				
1	113	171	487	12	**1**	165	265	811	17
2	130	194	583	9	**2**	285	430	1248	10
3	144	211	601	10	**3**	476	686	2118	11
4	181	265	785	12	**4**	302	507	1506	16
5	215	320	972	11	**5**	526	773	2326	13
6	243	389	1229	12					

Table 21 shows that 8 TRTs were read by 1MS participants. 7 texts are less than 100 words long, while all the texts contain less than 10% of PSW. Among the 5 TRTs selected for 2MSL participants, a text is less than 100 words with 24% of PSW, 1 text is less than 200 words, and 3 texts are less than 300 words. The PSW percentage of the first 4 texts ranges from 4 to 12. For 3MSL, 6 TRTs were selected for the participants, 4 of them are less than 200 words, while 2 are less than 300 words. The PSW percentage of the texts ranges from 9 to 12. A text among the 5 TRTs selected for 4MS is less than 200 words, 1 is less than 300 words, 1 is less than 400 words, 1 is less than 500 words, and the last one is less than 600 words. The PSW percentage of the texts ranges from 10 to 20.

III.3.2. Linear Regression Models

W-count, SY-count, C-count and PSW-count are provided for each text. These linguistic characteristics of the sample TRTs will be used in training and testing linear regression models (LRMs). The variables are selected among others for many reasons. First, ASL and AWL, which are computed using the W-count and C-count, are the main variables of the existing readability formulas adopted for their positive correlations with the difficulty level of the text. Second, in addition to their efficiency in predicting the readability level of a text (School Renaissance Institute 2000), they are measurable compared to other non-measurable text characteristics. Third, some readability experts classify English words according to their frequency of use: the less frequent a word, the more difficult it is; thus, most of the less frequent listed words are polysyllabic words (Thorndike 1921; Thorndike and Lorge 1944; Spache 1953). This explains why the SY/PSW-count/percentage variable is adopted in some readability formulas (Gunning 1952; Dale-Chall 1995; Solomon 2007).

The machine learning software WEKA[9] was used to develop LRMs for MSLs and their CAs. The training data included the W-counts, SY-counts and C-counts of the sample TRTs. The data was grouped according to the MSL as well as the CA of the participants. Available target variables were the reading time in seconds (RTS) and, derived from it, the average reading time per word (ARTW), average reading time per syllable (ARTSY), and average reading time per character (ARTC) for each participant. The models were developed using the three variables of W-count, SY-count and C-count and their corresponding ART to compare the differences in ERT. The models were trained on a 10-fold cross-validation mode and evaluated using the correlation coefficient (*r*) as well as the root mean squared error[10] (RMSE) between observed and predicted reading times.

III.3.2.1 Overall LRMs

Three experiments are done for the overall LRMs. First, we train LRMs based on the number of words, syllables, and characters specifically for each year of instruction. We then verify the plausibility of the selected model by generating predictions for new texts that have the same number of words, but differ in the percentage of polysyllabic words. Based on the assumption that longer words are harder to read, we expect to see longer reading times for texts with more polysyllabic words and verify that the model predicts this pattern. Finally, we show that we need prediction models that are specific to each

[9] WEKA is developed by the Machine Learning group at the University of Waikato and is available free of charge from https://www.cs.waikato.ac.nz/ml/weka/.

[10]The square root of the average squared error of the regression. It measures the overall accuracy of the trained model to compare it to other trained models.

learner ability cohort in order to accurately estimate the time needed by a mixed-ability group to read a text in the classroom.

III.3.2.1.1. Overall LRMs' Training

Our first experiment compares the appropriateness of the three simple predictor variables number of words, number of syllables and number of characters for the task of predicting observed reading times. We train separate linear regression models for each of the four years of instruction, since learners' reading speed depends on their foreign language proficiency. Tables 22, 23, 24, 25 and 26 include the training data for the four middle school levels and their categories.

Table 22. First year MS training data (Part 1).

T	W	SY	C	CA	P	RTS	ARTW	ARTSY	ARTC
1	31	37	111	1	1	15	0.484	0.405	0.135
					2	16	0.516	0.432	0.144
				2	3	16	0.516	0.432	0.144
					4	37	1.194	1	0.333
				3	5	42	1.355	1.135	0.378
					6	45	1.452	1.216	0.405
					7	55	1.774	1.486	0.495
				4	8	59	1.903	1.595	0.532
					9	77	2.484	2.081	0.694
					10	85	2.742	2.297	0.766
2	17	21	54	1	1	13	0.765	0.619	0.241
					2	19	1.118	0.905	0.352
				2	3	21	1.235	1	0.389
					4	23	1.353	1.095	0.426
				3	5	24	1.412	1.143	0.444
					6	29	1.706	1.381	0.537
					7	30	1.765	1.429	0.556
				4	8	40	2.353	1.905	0.741
					9	44	2.588	2.095	0.815
					10	45	2.647	2.143	0.833
3	55	70	208	1	1	31	0.564	0.443	0.149
					2	33	0.6	0.471	0.159
				2	3	69	1.255	0.986	0.332
					4	72	1.309	1.029	0.346
				3	5	82	1.491	1.171	0.394
					6	90	1.636	1.286	0.433
					7	108	1.964	1.543	0.519
				4	8	112	2.036	1.6	0.538
					9	116	2.109	1.657	0.558
					10	131	2.382	1.871	0.63
4	49	66	193	1	1	22	0.449	0.333	0.114
					2	24	0.49	0.364	0.124
				2	3	33	0.673	0.5	0.171
					4	49	1	0.742	0.254
				3	5	56	1.143	0.848	0.29
					6	59	1.204	0.894	0.306
					7	82	1.673	1.242	0.425
				4	8	96	1.959	1.455	0.497
					9	108	2.204	1.636	0.56
					10	117	2.388	1.773	0.606

Table 23. First year MS training data (Part 2).

T	W	SY	C	CA	P	RTS	ARTW	ARTSY	ARTC
5	66	86	271	1	1	74	1.121	0.860	0.273
					2	75	1.136	0.872	0.277
				2	3	111	1.682	1.291	0.41
					4	138	2.091	1.605	0.509
				3	5	142	2.152	1.651	0.524
					6	158	2.394	1.837	0.583
					7	161	2.439	1.872	0.594
				4	8	173	2.621	2.012	0.638
					9	177	2.682	2.058	0.653
					10	194	2.939	2.256	0.716
6	40	63	186	1	1	54	1.350	0.857	0.290
					2	56	1.400	0.889	0.301
				2	3	58	1.450	0.921	0.312
					4	73	1.825	1.159	0.392
				3	5	81	2.025	1.286	0.435
					6	105	2.625	1.667	0.565
					7	108	2.700	1.714	0.581
				4	8	139	3.475	2.206	0.747
					9	140	3.500	2.222	0.753
					10	146	3.650	2.317	0.785
7	168	239	733	1	1	247	1.470	1.033	0.337
					2	279	1.661	1.167	0.381
				2	3	323	1.923	1.351	0.441
					4	453	2.696	1.895	0.618
				3	5	484	2.881	2.025	0.66
					6	499	2.970	2.088	0.681
					7	500	2.976	2.092	0.682
				4	8	512	3.048	2.142	0.698
					9	524	3.119	2.192	0.715
					10	526	3.131	2.201	0.718
8	63	82	249	1	1	74	1.175	0.902	0.297
					2	104	1.651	1.268	0.418
				2	3	108	1.714	1.317	0.434
					4	164	2.603	2	0.659
				3	5	174	2.762	2.122	0.699
					6	179	2.841	2.183	0.719
					7	191	3.032	2.329	0.767
				4	8	192	3.048	2.341	0.771
					9	194	3.079	2.366	0.779
					10	202	3.206	2.463	0.811

Table 24. Second year MS training data.

T	W	SY	C	CA	P	RTS	ARTW	ART SY	ARTC
1	165	226	642	1	1	193	1.170	0.854	0.301
					2	201	1.218	0.889	0.313
				2	3	215	1.303	0.951	0.335
					4	229	1.388	1.013	0.357
				3	5	257	1.558	1.137	0.4
					6	262	1.588	1.159	0.408
				4	8	344	2.085	1.522	0.536
					9	308	1.867	1.363	0.48
2	236	318	1000	1	1	271	1.148	0.852	0.271
					2	288	1.220	0.906	0.288
				2	3	301	1.275	0.947	0.301
					4	315	1.335	0.991	0.315
				3	5	339	1.436	1.066	0.339
					6	372	1.576	1.170	0.372
				4	7	463	1.962	1.456	0.463
					8	491	2.081	1.544	0.491
3	249	356	1047	1	1	280	1.124	0.787	0.267
					2	296	1.189	0.831	0.283
				2	3	312	1.253	0.876	0.298
					4	326	1.309	0.916	0.311
				3	5	357	1.434	1.003	0.341
					6	383	1.538	1.076	0.366
				4	7	472	1.896	1.326	0.451
					8	497	1.996	1.396	0.475
4	207	308	924	1	1	277	1.338	0.899	0.3
					2	291	1.406	0.945	0.315
				2	3	309	1.493	1.003	0.334
					4	325	1.570	1.055	0.352
				3	5	349	1.686	1.133	0.378
					6	373	1.802	1.211	0.404
				4	7	464	2.242	1.506	0.502
					8	477	2.304	1.549	0.516
5	96	184	515	1	1	168	1.750	0.913	0.326
					2	173	1.802	0.94	0.336
				2	3	175	1.823	0.951	0.34
					4	178	1.854	0.967	0.346
				3	5	189	1.969	1.027	0.367
					6	209	2.177	1.136	0.406
				4	7	284	2.958	1.543	0.551
					8	301	3.135	1.636	0.584

Table 25. Third year MS training data.

T	W	SY	C	CA	P	RTS	ARTW	ARTSY	ARTC
1	113	171	487	1	1	92	0.814	0.538	0.189
					2	107	0.947	0.626	0.22
				2	3	132	1.168	0.772	0.271
					4	145	1.283	0.848	0.298
				3	5	178	1.575	1.041	0.366
					6	192	1.699	1.123	0.394
				4	7	223	1.973	1.304	0.458
					8	235	2.08	1.374	0.483
2	130	194	583	1	1	113	0.869	0.582	0.194
					2	135	1.038	0.696	0.232
				2	3	167	1.285	0.861	0.286
					4	178	1.369	0.918	0.305
				3	5	216	1.662	1.113	0.37
					6	222	1.708	1.144	0.381
				4	7	256	1.969	1.32	0.439
					8	277	2.131	1.428	0.475
3	144	211	601	1	1	119	0.826	0.564	0.198
					2	130	0.903	0.616	0.216
				2	3	149	1.035	0.706	0.248
					4	162	1.125	0.768	0.27
				3	5	214	1.486	1.014	0.356
					6	219	1.521	1.038	0.364
				4	7	272	1.889	1.289	0.453
					8	287	1.993	1.36	0.478
4	181	265	785	1	1	157	0.867	0.592	0.2
					2	171	0.945	0.645	0.218
				2	3	203	1.122	0.766	0.259
					4	211	1.166	0.796	0.269
				3	5	257	1.42	0.97	0.327
					6	271	1.497	1.023	0.345
				4	7	319	1.762	1.204	0.406
					8	335	1.851	1.264	0.427
5	215	320	972	1	1	191	0.888	0.597	0.197
					2	205	0.953	0.641	0.211
				2	3	239	1.112	0.747	0.246
					4	258	1.2	0.806	0.265
				3	5	298	1.386	0.931	0.307
					6	312	1.451	0.975	0.321
				4	7	351	1.633	1.097	0.361
					8	370	1.721	1.156	0.381
6	243	389	1229	1	1	225	0.926	0.578	0.183
					2	236	0.971	0.607	0.192
				2	3	268	1.103	0.689	0.218
					4	277	1.14	0.712	0.225
				3	5	333	1.37	0.856	0.271
					6	346	1.424	0.889	0.282
				4	7	413	1.7	1.062	0.336
					8	427	1.757	1.098	0.347

Table 26. Fourth year MS training data.

T	W	SY	C	CA	P	RTS	ARTW	ARTSY	ARTC
1	165	265	811	1	1	171	1.036	0.645	0.211
					2	177	1.073	0.668	0.218
				2	3	193	1.170	0.728	0.238
					4	212	1.285	0.8	0.261
				3	5	251	1.521	0.947	0.309
					6	262	1.588	0.989	0.323
				4	8	287	1.739	1.083	0.354
					9	301	1.824	1.136	0.371
2	285	430	1248	1	1	282	0.989	0.656	0.226
					2	293	1.028	0.681	0.235
				2	3	340	1.193	0.791	0.272
					4	351	1.232	0.816	0.281
				3	5	431	1.512	1.002	0.345
					6	449	1.575	1.044	0.36
				4	7	511	1.793	1.188	0.409
					8	528	1.853	1.228	0.423
3	476	686	2118	1	1	410	0.861	0.598	0.194
					2	416	0.874	0.606	0.196
				2	3	469	0.985	0.684	0.221
					4	474	0.996	0.691	0.224
				3	5	559	1.174	0.815	0.264
					6	566	1.189	0.825	0.267
				4	7	702	1.475	1.023	0.331
					8	721	1.515	1.051	0.34
4	302	507	1506	1	1	297	0.983	0.586	0.197
					2	309	1.023	0.609	0.205
				2	3	352	1.166	0.694	0.234
					4	364	1.205	0.718	0.242
				3	5	439	1.454	0.866	0.292
					6	455	1.507	0.897	0.302
				4	7	499	1.652	0.984	0.331
					8	503	1.666	0.992	0.334
5	526	773	2326	1	1	431	0.819	0.558	0.185
					2	453	0.861	0.586	0.195
				2	3	491	0.933	0.635	0.211
					4	511	0.971	0.661	0.22
				3	5	594	1.129	0.768	0.255
					6	608	1.156	0.787	0.261
				4	7	779	1.481	1.008	0.335
					8	787	1.496	1.018	0.338

Table 27. Linear regression models for the four learner years based on words, characters and syllables.

Level	N	V1	V2-Mean		Overall LRMs	*r*	RMSE
Y1	80	W	ARTW	1.952	ERT= (2.4245 x W) + (54.2911 x ARTW) –122.6929	0.96	**33**
		SY	ARTSY	1.458	ERT= (1.7345 x SY) + (72.8195 x ARTSY) –118.6968	0.96	33.06
		C	ARTC	0.492	ERT= (0.5764 x C) + (210.8408 x ARTC) –116.8006	0,96	33.66
Y2	40	W	ARTW	1.681	ERT= (1.7783 x W) + (161.7829 x ARTW) –303.1264	0.94	33.22
		SY	ARTSY	1.111	ERT= (1.0985 x SY) + (273.0461 x ARTSY) –301.3609	0.98	**17.76**
		C	ARTC	0.378	ERT= (0.3804 x C) + (792.4276 x ARTC) –305.6891	0,97	20.12
Y3	48	W	ARTW	1.369	ERT= (1.3444 x W) + (156.4254 x ARTW) – 212.9387	0.97	**17.64**
		SY	ARTSY	0.911	ERT=(0.8608 x SY) + (233.8766x ARTSY) –204.3972	0.97	18.75
		C	ARTC	0.307	ERT= (0.2787 x C) + (683.6585 x ARTC) –195.1134	0.96	21.19
Y4	40	W	ARTW	1.275	ERT= (1.234 x W) + (334.5605 x ARTW) – 428.6095	0.96	40.20
		SY	ARTSY	0.827	ERT= (0.8168 x SY) + (514. 8797x ARTSY) –429.5547	0.97	**36.22**
		C	ARTC	0.275	ERT= (0.2686 x C) + (1531. 7886x ARTC) –421.2003	0.97	36.75

Table 27 shows the number of training instances per year. For each year of instruction, we train three separate models: One based on the number characters in the text, one on the number of words, and one on the number of syllables.

The results show very good positive correlations among the variables of each overall LRM (r = 0.94-0.98). In two cases, the word-based models show the lowest RMSE, in two cases the syllable-based models have the lowest error. When the syllable-based models do not yield the lowest RMSE, they are numerically very close to the best performance.

Lorge (1944) classifies the polysyllabic word count/percentage in a text as one of the measures of the variable of "vocabulary load" in a text "used as a predictor in every study of readability" (405), which explains the reason why it is used in some readability formulas with other variables (Gunning 1952; Kincaid et al. 1975; Klare 1975) or as a sole variable (McLaughlin 1969; Solomon 2007). Therefore, it is not surprising that the syllable-based measure should perform well. However, the number of syllables in a text is harder to determine in practice than the number of words or characters and is therefore not the ideal measure for a robust, easy-to-use tool for teachers and school book designers.

III.3.2.1.2. Effect of Polysyllabic Word Count on the Plausibility of the Overall LRMs

The first experiment showed that we can train LRMs on the aggregated reading time data for each year of instruction and reliably predict the reading times for specific texts. We still need to differentiate between the three input variables and identify the one that is most useful for robust automated predictions in the field.

Hence, we analyze the overall LRM predictions for texts of different lengths and different polysyllabic word percentages to (1) study the effect of polysyllabic word count in a text on the plausibility of the overall LRMs in

providing estimated reading times, and (2) identify the best variables to adopt among the three variables ARTW, ARTSY and ARTC.

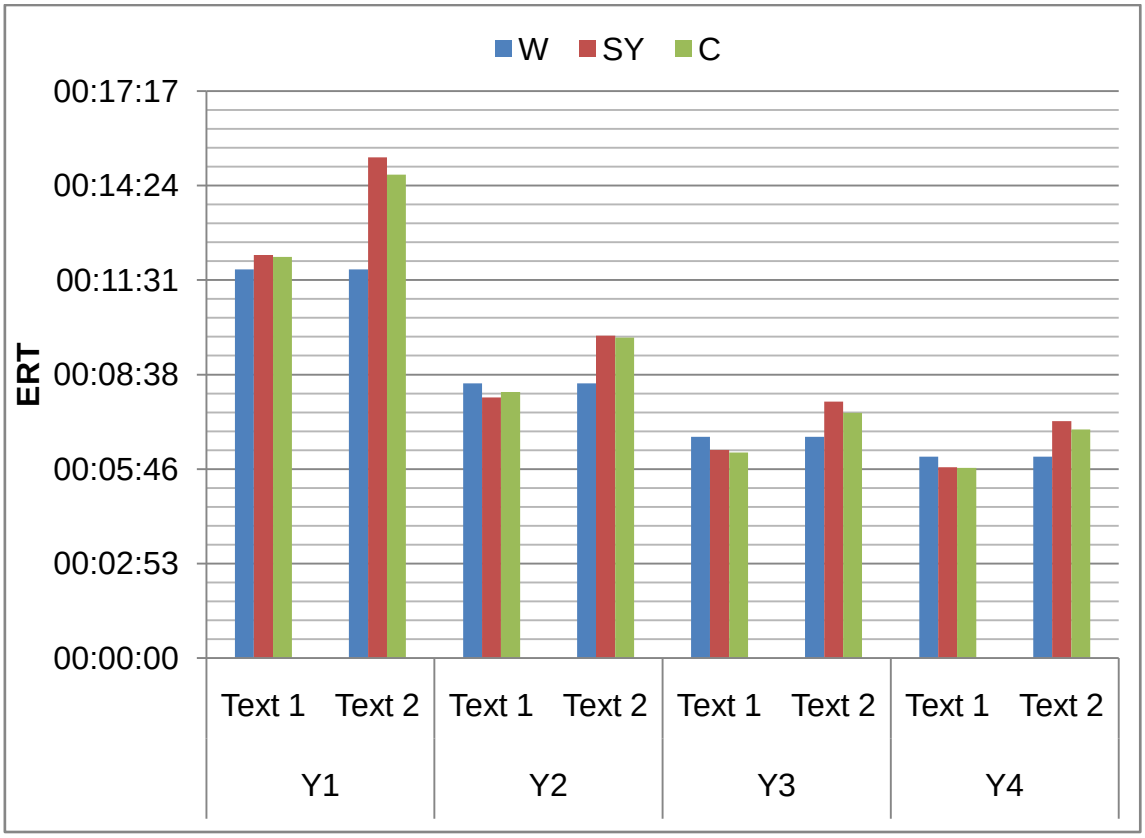
As illustrated in Table 28, two sample texts (STs) of the same word count and different polysyllabic word-percentages, and subsequently, different syllable counts and character counts, are selected from two different online sources to test the overall LRMs to examine the effect of the variable of polysyllabic word count in their plausibility. Note that we do not have observed reading times for these texts; we are interested in the match between hypothesized patterns and model predictions to test the models' plausibility. We expect that the word-based models will make the same reading time predictions for Text 1 and Text 2, and that the predictions of the syllable-based model will differ between the two texts. We also expect that the predictions of the character-based models will differ between the texts, since polysyllabic words are longer and contain more characters than monosyllabic words. We do not know, however, how large the gap in predicted reading times will be between the syllable- and character-based models.

The testing results are presented in Figure 26.

Table 28. Sample texts with different amounts of polysyllabic words.

	Text1	**Text2**
% polysyllabic words	7	22
Word count	300	300
Syllable count	432	535
Character count	1295	1556

Figure 26. Plausibility check of the year-specific LRMs for sample texts with different amounts of polysyllabic words.



The results in figure 26 show at first glance that the four LRMs capture increasing reading speeds for advanced learners. Further, as expected, the word-based models predict the same reading times for both texts in all cases. In contrast, an increase of the estimated reading time per syllable as well as the estimated reading time per character is noticed for Text 2 as compared to Text 1 for all models. The estimated reading times for Text 1 show a gap of no more than ½ minute between the word-based, syllable-based and character-based models – all models predict essentially the same reading time. Compare this to a gap of up to 4 minutes for Text 2, between the word-based models on one side and the syllable- and character-based models on the other side. The figure also shows a high similarity of the estimated reading times from the syllable- and character-based models, especially for Text 1.Note that we cannot determine how well these predictions fit reality due to the lack of empirical

reading time data for Texts 1 and 2; we can however conclude that the error will be very similar for both models.

The experimental results confirm the expected result that a longer reading time is estimated for a text with a higher polysyllabic word count. In contrast, the syllable-based and character-based overall LRMs provide different estimated reading times for texts of different polysyllabic word counts and the gaps between their estimated reading times are very low. Experiment 1 indicated that syllable-based models are robust and accurate. Experiment 2 confirms that for unseen texts, the gap in predicted reading times for syllable- and character-based models is very small. Therefore, the focus on the next training phases will be on the syllable and character-based models.

III.3.2.1.3. Observed and Predicted Data of Overall LRMs

The LRMs presented so far predict estimated reading times for average-ability readers, due to their use of the average reading speed across all participants for a set of texts. However, these estimated reading times may be too short or too long for a specific category of readers. Hence, an examination of the observed and predicted data for the syllable-based and character-based LRMs and their errors for all years of instruction is done to check the plausibility of the LRMs for the different categories of readers. The observed data and their corresponding predicted data are graded from the lowest to the highest. The reading time in the tables and graphs is presented in seconds.

III.3.2.1.3.1. First Year Overall LRMs' Observed and Predicted Data

III.3.2.1.3.1.a. First Year Syllable-based Overall LRM's Observed and Predicted Data

Table 29 and Figure 27 include the observed and predicted data for the overall syllable-based LRM and their errors for 1MSL.

Table 29. Observed and predicted data of first year overall syllable-based LRM.

N	OD	PD	E	N	OD	PD	E	N	OD	PD	E
1	13	-35	-48	**28**	59	61	2	**55**	139	147	8
2	15	-23	-38	**29**	59	61	2	**56**	140	153	13
3	16	-28	-44	**30**	69	73	4	**57**	142	152	10
4	16	-28	-44	**31**	72	78	6	**58**	146	160	14
5	19	-17	-36	**32**	73	74	1	**59**	158	165	7
6	21	-12	-33	**33**	74	85	11	**60**	161	165	4
7	22	18	-4	**34**	74	93	19	**61**	164	168	4
8	23	-1	-24	**35**	75	100	25	**62**	173	179	6
9	24	21	-3	**36**	77	98	21	**63**	174	177	3
10	24	0	-24	**37**	81	84	3	**64**	177	181	4
11	29	14	-15	**38**	82	85	3	**65**	179	180	1
12	30	20	-10	**39**	82	88	6	**66**	191	194	3
13	31	35	4	**40**	85	116	31	**67**	192	196	4
14	33	30	-3	**41**	90	96	6	**68**	194	197	3
15	33	40	7	**42**	96	101	5	**69**	194	193	-1
16	37	19	-18	**43**	104	114	10	**70**	202	202	0
17	40	59	19	**44**	105	112	7	**71**	247	380	133
18	42	28	-14	**45**	108	114	6	**72**	279	405	126
19	44	66	22	**46**	108	120	12	**73**	323	418	95
20	45	33	-12	**47**	108	114	6	**74**	453	432	-21
21	45	77	32	**48**	108	114	6	**75**	484	433	-51
22	49	55	6	**49**	111	124	13	**76**	499	436	-63
23	54	51	-3	**50**	112	120	8	**77**	500	438	-62
24	55	54	-1	**51**	116	125	9	**78**	512	440	-72
25	56	56	0	**52**	117	125	8	**79**	524	460	-64
26	56	54	-2	**53**	131	138	7	**80**	526	449	-77
27	58	57	-1	**54**	138	147	9				

Figure 27. Observed and predicted data of first year overall syllable-based LRM.

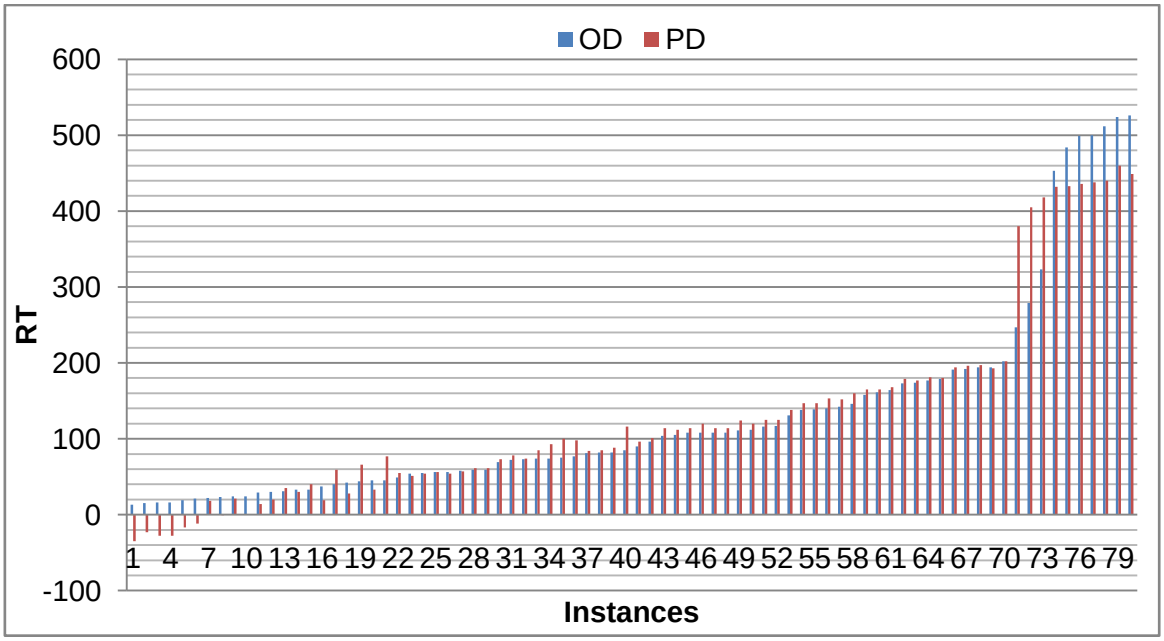


Table 29 and Figure 27 show small negative errors at the low (-48) and high (-77) end of the data for first year overall syllable-based LRM predicted data. This means that reading times for the fastest and the slowest readers is underestimated. In contrast, the reading time estimates match the observed data in the middle of the graph very well, except for some isolated cases of overestimating reading times.

III.3.2.1.3.1.b. First Year Character-based Overall LRM's Observed and Predicted Data

Table 30 and Figure 28 include the observed and predicted data for the overall character-based LRM and their errors for 1MSL.

Table 30. Observed and predicted data of first year character-based overall LRM.

N	OD	PD	E	N	OD	PD	E	N	OD	PD	E
1	13	-33	-46	**28**	59	60	1	**55**	139	144	5
2	15	-23	-38	**29**	59	59	0	**56**	140	149	9
3	16	-27	-43	**30**	69	72	3	**57**	142	151	9
4	16	-27	-43	**31**	72	76	4	**58**	146	156	10
5	19	-12	-31	**32**	73	72	-1	**59**	158	165	7
6	21	-6	-27	**33**	74	86	12	**60**	161	163	2
7	22	17	-5	**34**	74	97	23	**61**	164	165	1
8	23	5	-18	**35**	75	105	30	**62**	173	175	2
9	24	19	-5	**36**	77	94	17	**63**	174	173	-1
10	24	7	-17	**37**	81	82	1	**64**	177	177	0
11	29	22	-7	**38**	82	83	1	**65**	179	176	-3
12	30	30	0	**39**	82	86	4	**66**	191	188	-3
13	31	34	3	**40**	85	112	27	**67**	192	191	-1
14	33	29	-4	**41**	90	94	4	**68**	194	191	-3
15	33	38	5	**42**	96	99	3	**69**	194	190	-4
16	37	18	-19	**43**	104	113	9	**70**	202	197	-5
17	40	74	34	**44**	105	109	4	**71**	247	384	137
18	42	27	-15	**45**	108	112	4	**72**	279	411	132
19	44	82	38	**46**	108	118	10	**73**	323	422	99
20	45	32	-13	**47**	108	112	4	**74**	453	434	-19
21	45	94	49	**48**	108	112	4	**75**	484	435	-49
22	49	53	4	**49**	111	125	14	**76**	499	437	-62
23	54	50	-4	**50**	112	117	5	**77**	500	440	-60
24	55	52	-3	**51**	116	122	6	**78**	512	441	-71
25	56	55	-1	**52**	117	122	5	**79**	524	462	-62
26	56	52	-4	**53**	131	136	5	**80**	526	450	-76
27	58	55	-3	**54**	138	146	8				

Figure 28. Observed and predicted data of first year character-based overall LRM.

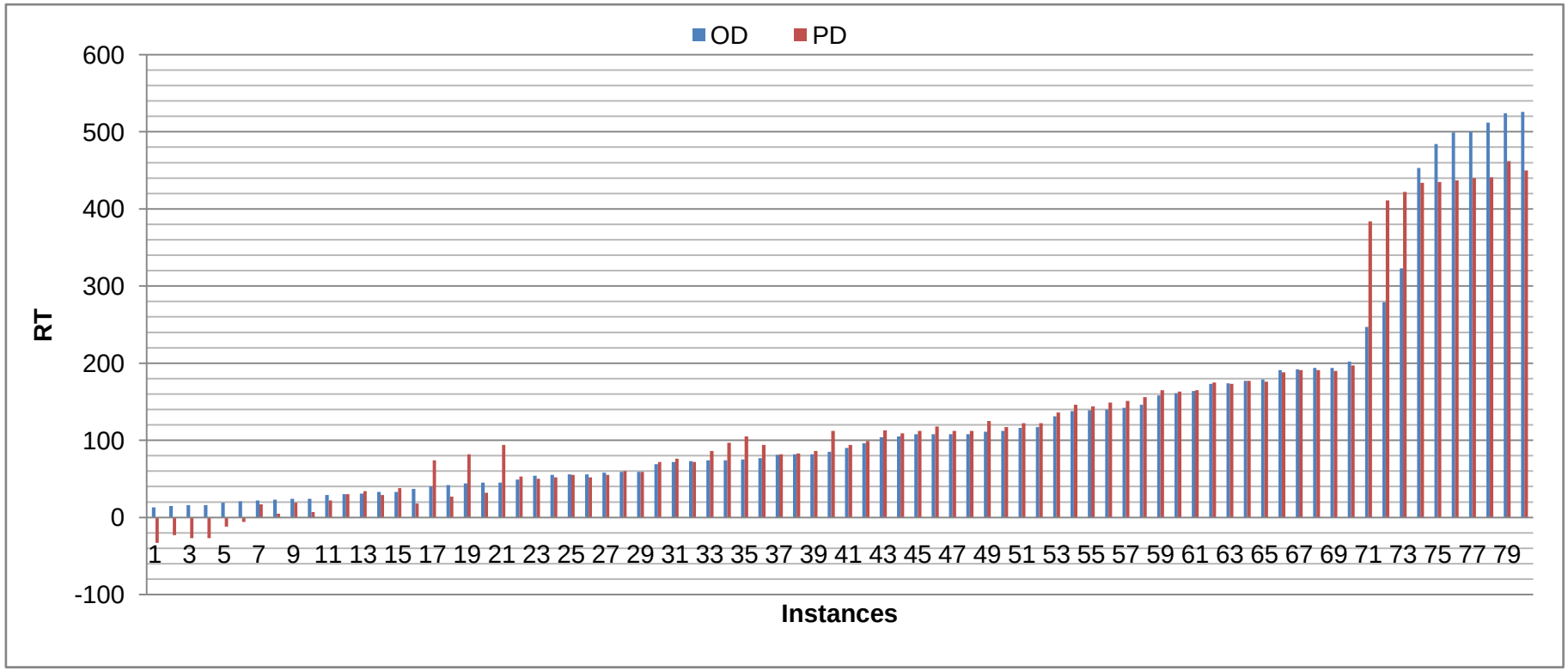


Table 29 and Figure 28 demonstrate that the same pattern of syllable-based models is repeated for character-based models. Small negative errors at the low (-46) and high (-76) end of the data for first year character-based overall LRM predicted data. By contrast, the estimated data match the observed data of middle instances with some exceptional cases of overestimating and underestimating reading times.

III.3.2.1.3.2. Second Year Overall LRMs' Observed and Predicted Data

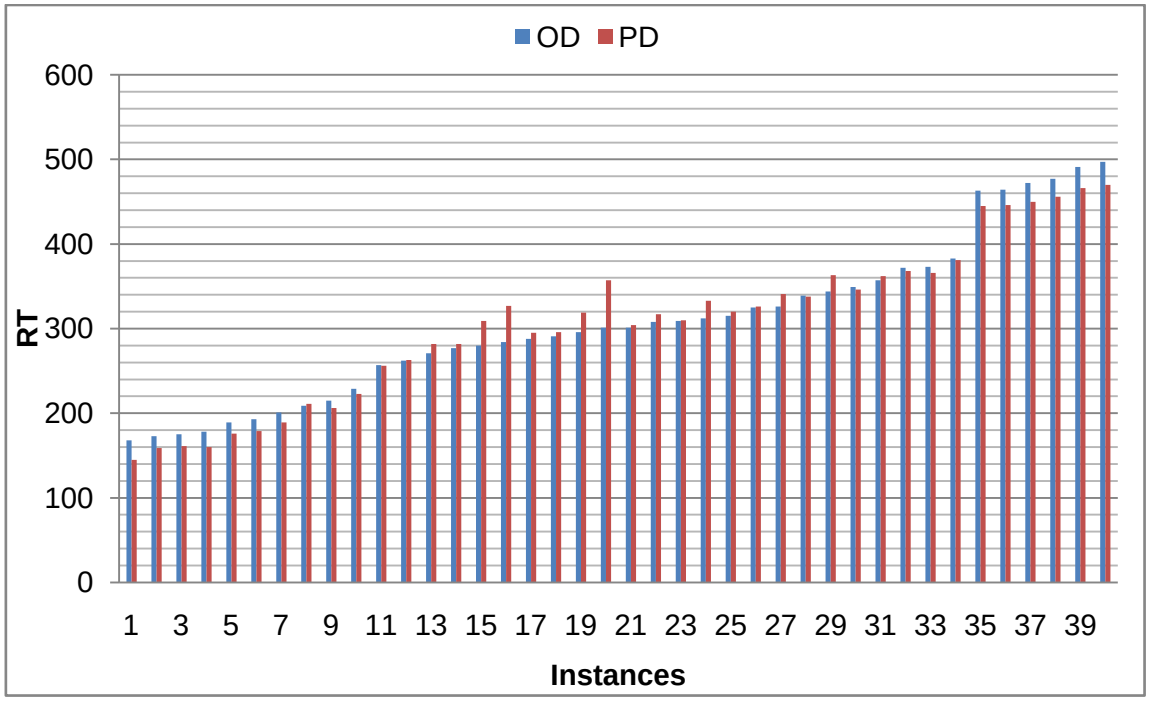
III.3.2.1.3.2.a. Second Year Syllable-based Overall LRM's Observed and Predicted Data

Table 31 and Figure 29 include the observed and predicted data for the overall syllable-based LRM and their errors for 2MSL.

Table 31. Observed and predicted data of second year syllable-based overall LRM.

N	OD	PD	E	N	OD	PD	E
1	168	145	-23	**21**	301	304	3
2	173	159	-14	**22**	308	317	9
3	175	161	-14	**23**	309	310	1
4	178	160	-18	**24**	312	333	21
5	189	176	-13	**25**	315	320	5
6	193	179	-14	**26**	325	326	1
7	201	189	-12	**27**	326	341	15
8	209	211	2	**28**	339	338	-1
9	215	206	-9	**29**	344	363	19
10	229	223	-6	**30**	349	346	-3
11	257	256	-1	**31**	357	362	5
12	262	263	1	**32**	372	368	-4
13	271	282	11	**33**	373	366	-7
14	277	282	5	**34**	383	381	-2
15	280	309	29	**35**	463	445	-18
16	284	327	43	**36**	464	446	-18
17	288	295	7	**37**	472	450	-22
18	291	296	5	**38**	477	456	-21
19	296	319	23	**39**	491	466	-25
20	301	357	56	**40**	497	470	-27

Figure 29. Observed and predicted data of second year syllable-based overall LRM.



Both Table 31 and Figure 29 show small negative errors at the low (-1 to -23) and high (-1 to -27) end of the data for second year syllable-based overall LRM predicted data. The predicted reading time, however, match the observed data in the middle of the graph very well, except for very few cases of overestimating reading times.

III.3.2.1.3.2.b. Second Year Character-based Overall LRM's Observed and Predicted Data

Table 32 and Figure 30 include the observed and predicted data for the overall character-based LRM and their errors for 2MSL.

Table 32. Observed and predicted data of second year character-based overall LRM.

N	OD	PD	E	N	OD	PD	E
1	168	143	-25	**21**	301	310	9
2	173	158	-15	**22**	308	317	9
3	175	160	-15	**23**	309	309	0
4	178	159	-19	**24**	312	332	20
5	189	176	-13	**25**	315	326	11
6	193	176	-17	**26**	325	326	1
7	201	186	-15	**27**	326	340	14
8	209	213	4	**28**	339	343	4
9	215	203	-12	**29**	344	364	20
10	229	221	-8	**30**	349	345	-4
11	257	254	-3	**31**	357	361	4
12	262	261	-1	**32**	372	371	-1
13	271	292	21	**33**	373	364	-9
14	277	283	6	**34**	383	380	-3
15	280	308	28	**35**	463	441	-22
16	284	332	48	**36**	464	441	-23
17	288	303	15	**37**	472	448	-24
18	291	297	6	**38**	477	451	-26
19	296	319	23	**39**	491	460	-31
20	301	364	63	**40**	497	468	-29

Figure 30. Observed and predicted data of second year character-based overall LRM.

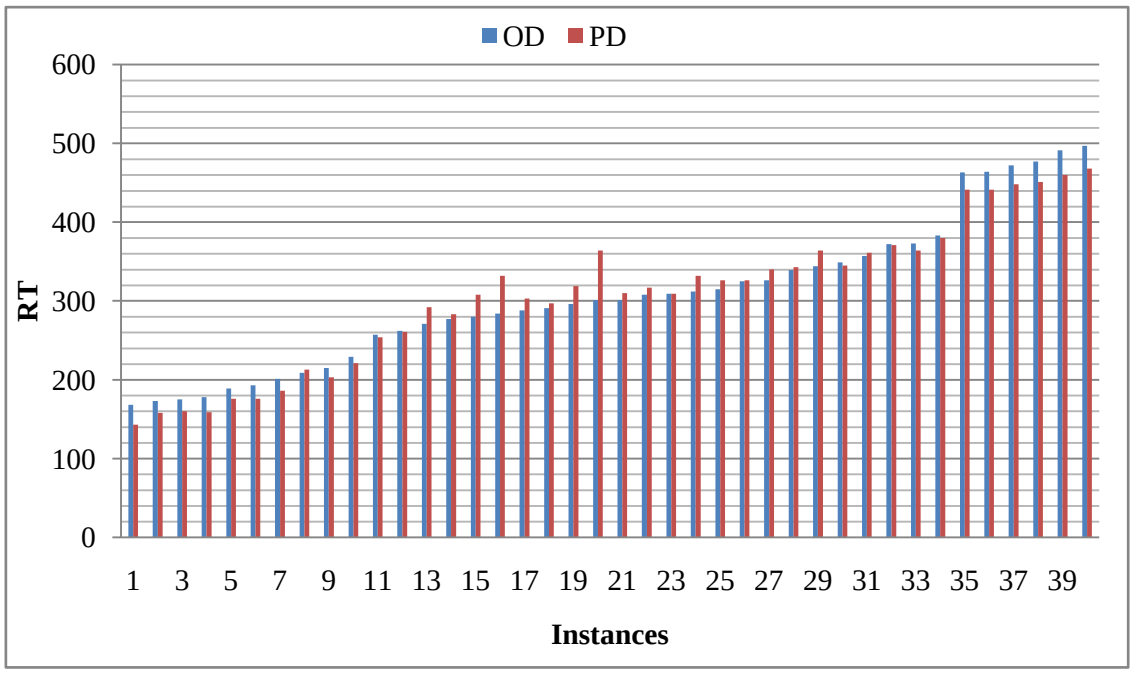


Table 32 and Figure 30 illustrate small negative errors at the low (-1 to -25) and high (-29 to -1) end of the data for second year character-based overall LRM predicted data. By contrast, the estimated reading time match the observed ones for the middle instances of the data with two exceptions of overestimating reading times (48, 63).

III.3.2.1.3.3. Third Year Overall LRMs' Observed and Predicted Data

III.3.2.1.3.3.a. Third Year Syllable-based Overall LRM's Observed and Predicted Data

Table 33 and Figure 31 include the observed and predicted data for the overall syllable-based LRM and their errors for 3MSL.

Table 33. Observed and predicted data of third year syllable-based overall LRM.

N	OD	PD	E	N	OD	PD	E
1	92	62	-30	**25**	223	250	27
2	107	86	-21	**26**	225	269	44
3	113	97	-16	**27**	235	268	33
4	119	104	-15	**28**	236	278	42
5	130	116	-14	**29**	239	244	5
6	132	122	-10	**30**	256	268	12
7	135	125	-10	**31**	257	251	-6
8	145	141	-4	**32**	258	259	1
9	149	140	-9	**33**	268	294	26
10	157	158	1	**34**	271	263	-8
11	162	156	-6	**35**	272	282	10
12	167	163	-4	**36**	277	298	21
13	171	174	3	**37**	277	299	22
14	178	186	8	**38**	287	292	5
15	178	177	-1	**39**	298	286	-12
16	191	214	23	**40**	312	296	-16
17	192	206	14	**41**	319	304	-15
18	203	202	-1	**42**	333	329	-4
19	205	222	17	**43**	335	320	-15
20	211	211	0	**44**	346	340	-6
21	214	214	0	**45**	351	324	-27
22	216	222	6	**46**	370	337	-33
23	219	220	1	**47**	413	374	-39
24	222	230	8	**48**	427	387	-40

Figure 31. Observed and predicted data of third year syllable-based overall LRM.

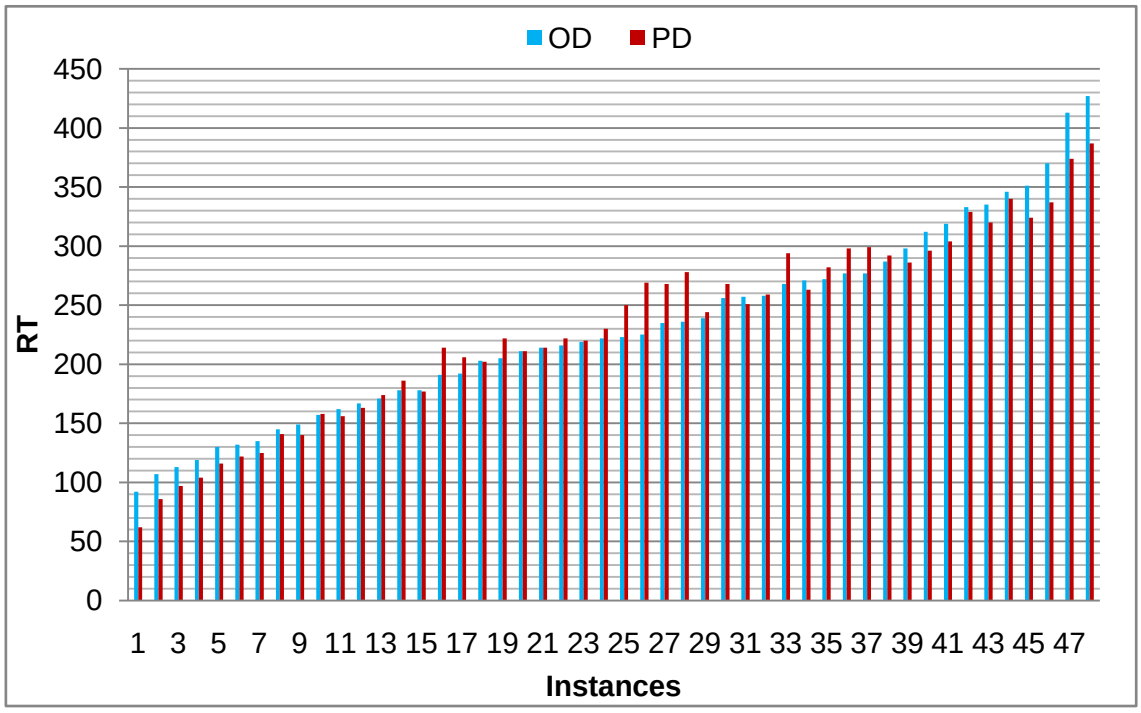


Table 33 and Figure 31 show small negative errors at the low (-32 to -1) and high (-40 to -4) end of the data for third year syllable-based overall LRM predicted data. However, the reading time estimates match the observed data in the middle of the graph very well, except for some cases of overestimating reading times.

III. 3.2.1.3.3.b. Third Year Character-based Overall LRM's Observed and Predicted Data

Table 34 and Figure 32 include the observed and predicted data for the overall character-based LRM and their errors for 3MSL.

Table 34. Observed and predicted data of third year character-based overall LRM

N	OD	PD	E	N	OD	PD	E
1	92	63	-29	25	223	257	34
2	107	88	-19	26	225	278	53
3	113	99	-14	27	235	276	41
4	119	102	-17	28	236	284	48
5	130	115	-15	29	239	241	2
6	132	125	-7	30	256	264	8
7	135	126	-9	31	257	248	-9
8	145	144	-1	32	258	256	-2
9	149	140	-9	33	268	301	33
10	157	156	-1	34	271	259	-12
11	162	157	-5	35	272	287	15
12	167	162	-5	36	277	293	16
13	171	172	1	37	277	304	27
14	178	191	13	38	287	296	9
15	178	176	-2	39	298	282	-16
16	191	214	23	40	312	291	-21
17	192	210	18	41	319	300	-19
18	203	200	-3	42	333	331	-2
19	205	221	16	43	335	316	-19
20	211	209	-2	44	346	343	-3
21	214	215	1	45	351	318	-33
22	216	220	4	46	370	331	-39
23	219	221	2	47	413	372	-41
24	222	227	5	48	427	386	-41

.

Figure 32. Observed and predicted data of third year character-based overall LRM.

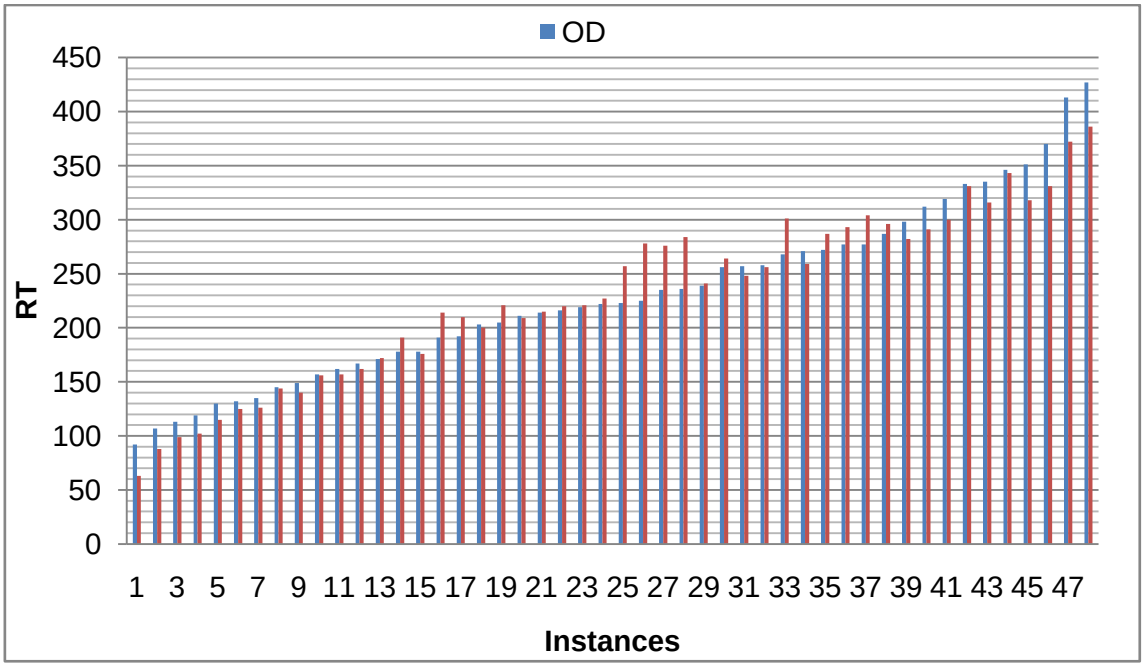


Table 34 and Figure 32 demonstrate small negative errors at the low (-29 to -1) and high (-41 to -1) end of the data for third year character-based overall LRM predicted data. In contrast, the estimated reading time go with the observed data in the middle of the graph very well, except for some cases of overestimating reading times with a positive error of 33 to 48.

III.3.2.1.3.4. Fourth Year Overall LRMs' Observed and Predicted Data

III. 3.2.1.3.4.a. Fourth Year Syllable-based Overall LRM's Observed and Predicted Data

Table 35 and Figure 33 include the observed and predicted data for the overall syllable-based LRM and their errors for 4MSL.

Table 35. Observed and predicted data of fourth year syllable-based overall LRM.

N	OD	PD	E	N	OD	PD	E
1	171	108	-63	21	439	428	-11
2	177	121	-56	22	449	459	10
3	193	162	-31	23	453	503	50
4	212	203	-9	24	455	446	-9
5	251	274	23	25	469	485	16
6	262	298	36	26	474	485	11
7	282	259	-23	27	491	528	37
8	287	353	66	28	499	492	-7
9	293	265	-28	29	503	494	-9
10	297	279	-18	30	511	547	36
11	301	375	74	31	511	543	32
12	309	298	-11	32	528	560	32
13	340	329	-11	33	559	547	-12
14	351	341	-10	34	566	549	-17
15	352	342	-10	35	594	603	9
16	364	355	-9	36	608	606	-2
17	410	441	31	37	702	653	-49
18	416	443	27	38	721	658	-63
19	431	494	63	39	779	706	-73
20	431	436	5	40	787	719	-68

Figure 33. Observed and predicted data of fourth year syllable-based overall LRM.

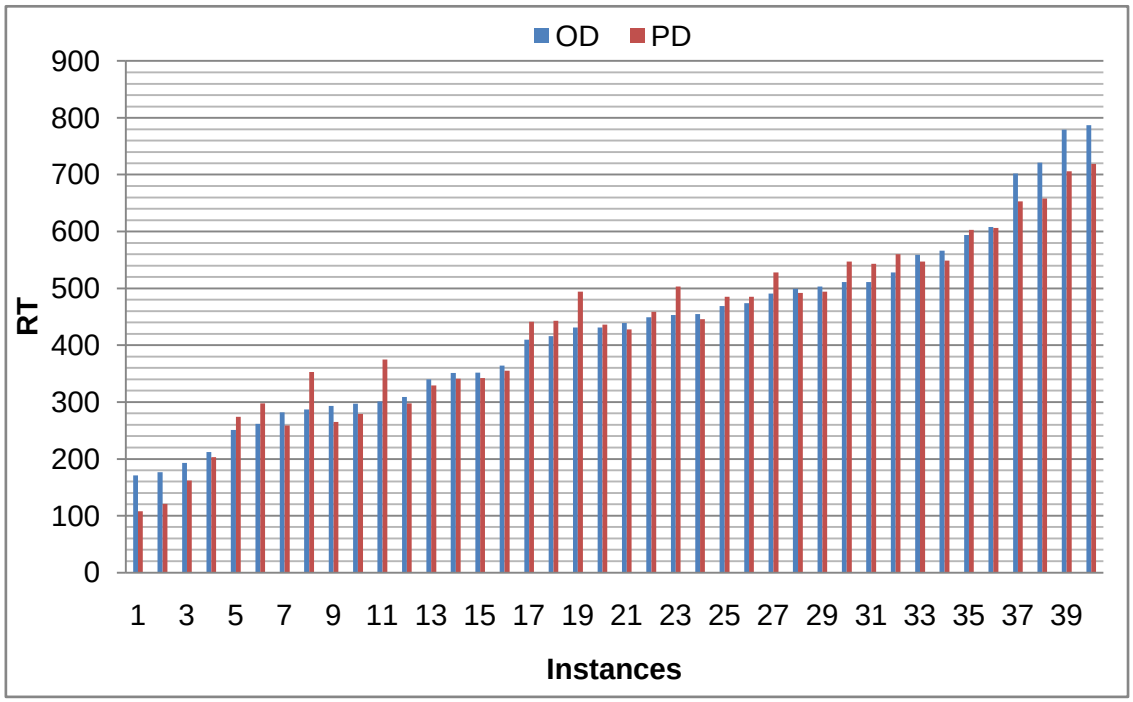


Table 35 and Figure 33 show small negative errors and at the low (-63 to -9) and high (-73 to -2) end of the data with some very low negative errors in the middle of the graph for fourth year syllable-based overall LRM predicted data. In contrast, some isolated cases of overestimating reading times are noticed in the middle of the graph.

III.3.2.1.3.4.b. Fourth Year Character-based Overall LRM's Observed and Predicted Data

Table 36 and Figure 34 include the observed and predicted data for the overall character-based LRM and their errors for 4MSL.

Table 36. Observed and predicted data of fourth year character-based overall LRM.

N	OD	PD	E	N	OD	PD	E
1	171	109	-62	**21**	439	428	-11
2	177	120	-57	**22**	449	465	16
3	193	161	-32	**23**	453	501	48
4	212	199	-13	**24**	455	446	-9
5	251	269	18	**25**	469	489	20
6	262	292	30	**26**	474	490	16
7	282	260	-22	**27**	491	526	35
8	287	347	60	**28**	499	491	-8
9	293	267	-26	**29**	503	494	-9
10	297	277	-20	**30**	511	546	35
11	301	367	66	**31**	511	551	40
12	309	298	-11	**32**	528	571	43
13	340	330	-10	**33**	559	549	-10
14	351	344	-7	**34**	566	550	-16
15	352	342	-10	**35**	594	599	5
16	364	355	-9	**36**	608	602	-6
17	410	448	38	**37**	702	651	-51
18	416	449	33	**38**	721	654	-67
19	431	492	61	**39**	779	701	-78
20	431	441	10	**40**	787	714	-73

Figure 34. Observed and predicted data of fourth year character-based overall LRM

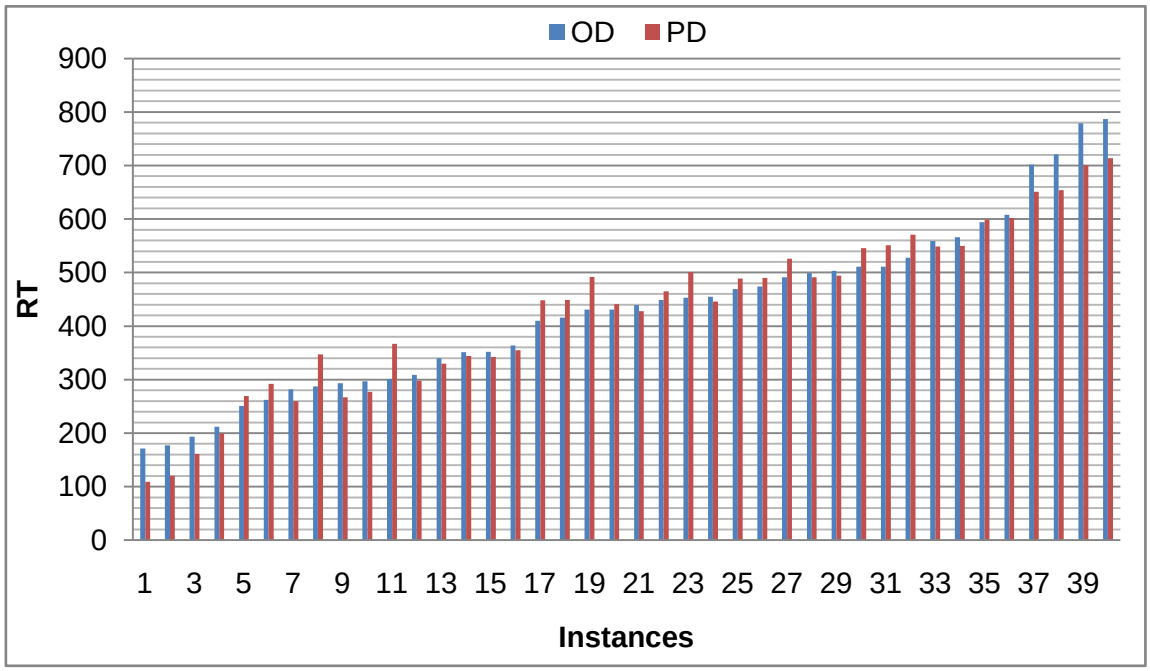


Table 36 and Figure 34 shows small negative error at the low (-62 to -13) and high end (-73 to -6) with some very low negative errors in the middle of the graph for fourth year character-based overall LRM predicted data. In contrast, some cases of overestimating reading times are also observed for the middle instances of the predicted data.

The examination of the observed and predicted data for overall LRMs shows that the same pattern is repeated for syllable-based and character-based models for the four years of instruction. Thus, it confirms that they work well for the average-ability readers. However, too low and too high predictions are observed for low instances, which are observed for low-ability readers, and high instances, which are observed for high-ability readers. Therefore, we now turn to developing individual LRMs for each category of readers of the same year of instruction.

III.3.2.2. Individual LRMs

Individual LRMs are trained for each learner category in each year (ranging from 1 to 4, according to the student's ability)[11]. The number of instances available for training shrinks, in this case, but we gain more fine-grained models of the reading times at the high and low ends, which are consistently underestimated by the overall model, as shown above.

III.3.2.2.1. First Year Categories Individual LRMs' Training

Table 37 includes the individual LRMs for first year middle school categories.

[11] See page 104.

Table 37. Individual LRMs of first year categories of learners.

CA	Ins.	V1	V2		LRM	*r*	RMSE
1	16	SY	ARTSY	0.733	ERT = 1.0457 x (SY + 64.2153) x (ARTSY – 63.2293)	0.98	12.38
		C	ARTC	0.249	ERT = 0.3463 x (C + 185.4177) x (ARTC – 62.0577)	0,98	**11.98**
2	16	SY	ARTSY	1.15	ERT = 1.5015 x (SY + 74.5648) x (ARTSY –100.766)	0.95	33.46
		C	ARTC	0.386	ERT = 0.4967 x (C + 223.3422) x (ARTC – 101.3559)	0,95	**32.99**
3	24	SY	ARTSY	1.57	ERT = 1.9791 x (SY + 62.8511) x (ARTSY – 117.6683)	0.99	13.08
		C	ARTC	0.528	ERT = 0.6489 x (C + 195.7637) x (ARTC – 120.8358)	0.99	**10.83**
4	24	SY	ARTSY	2.040	ERT = 2.1603 x (SY + 65.2117) x (ARTSY– 139.2529)	0.99	**5.45**
		C	ARTC	0.690	ERT = 0.7165 x (C + 172.8332) x (ARTC – 125.9143)	0.99	6.75

Table 37 demonstrates that both individual syllable-based and character-based models are developed for the four categories of first year using the SY-count and C-count variables and their corresponding ART (ARTSY, ARTC) for

each participant in each category. First year models for the first and second categories of learners were developed from 16 instances, while 24 instances were trained to develop the third and fourth categories models. The results show a very good positive correlation among the LRMs' variables (r = 0.95-0.99). The lowest RMSEs are noticed for the fourth category models, while the highest are for the second category models. The first, second and third category character-based models have the lowest RMSEs, whereas the fourth category syllable-based model has the lowest RMSE with no much difference with the one of the character-based model.

III.3.2.2.2.Second Year Categories Individual LRMs' Training

Table 38 includes the individual LRMs for second year middle school categories.

Table 38. Individual LRMs of second year categories of learners.

CA	Ins.	V1	V2		LRM	*r*	RMSE
1	10	SY	ARTSY	0.882	ERT = 0.8952 x (SY + 316.1701) x (ARTSY – 284.1534)	0.99	**4.08**
		C	ARTC	0.30	ERT = 0.3135 x (C + 902.8845) x (ARTC – 285.855)	0.99	5.24
2	10	SY	ARTSY	0.967	ERT = 0.9536 x (SY + 316.8987) x (ARTSY – 303.4177)	0.99	**2.37**
		C	ARTC	0.329	ERT = 0.3396 x (C + 956.5228) x (ARTC– 326.4739)	0.99	2.83
3	10	SY	ARTSY	1.11	ERT = 1.0861 x (SY + 291.7883) x (ARTSY – 317.7882)	0.99	**6.93**
		C	ARTC	0.378	ERT = 0.3797 x (C + 857.5144) x (ARTC – 328.6899)	0.99	7.6
4	10	SY	ARTSY	1.5	ERT = 1.4879 x (SY + 274.0752) x (ARTSY – 410.8933)	0.99	**11.38**
		C	ARTC	0.505	ERT = 0.5007 x (C + 703.686) x (ARTC – 358.5641)	0.98	12.25

As shown in Table 38, second year training data includes 10 instances for each category of learners. A very good positive correlation is noticed for syllable-based and character-based models of the categories (*r* = 0.98-0.99). The lowest RMSEs are of the syllable-based models for all categories with no much difference between them and the ones of character-based models.

III.3.2.2.3. Third Year Categories Individual LRMs

Table 39 includes the individual LRMs for third year middle school categories.

Table 39. Individual LRMs of third year categories of learners.

CA	Ins.	V1	V2		LRM	*r*	RMSE
1	12	SY	ARTSY	0.607	ERT = 0.5982 x (SY + 211.6006) x (ARTSY – 126.1908)	0.99	**3.07**
		C	ARTC	0.204	ERT = 0.1941 x (C + 671.9616) x (ARTC – 131.0749)	0.99	4.21
2	12	SY	ARTSY	0.782	ERT = 0.7371 x (SY + 218.8329) x (ARTSY – 162.5595)	0.99	**5.91**
		C	ARTC	0.263	ERT = 0.2432 x (C + 712.2978) x (ARTC – 177.29)	0.98	8.47
3	12	SY	ARTSY	1.01	ERT = 0.9212 x (SY + 213.5401) x (ARTSY – 198.766)	0.99	**6.85**
		C	ARTC	0.34	ERT = 0.2965 x (C + 628.5916) x (ARTC – 189.2485)	0.97	11.6
4	12	SY	ARTSY	1.24	ERT = 1.1303 x (SY + 214.6042) x (ARTSY – 245.7108)	0.99	**7.16**
		C	ARTC	0.42	ERT = 0.3524 x (C + 563.8412) x (ARTC – 196.8003)	0.98	11

Table 39 demonstrates that individual LRMs were developed from 12 instances for each category of third year learners. A very good positive correlation is noticed for all the models (*r* = 0.97-0.99). The syllable-based

model RMSEs are the lowest for all categories with very low differences among the syllable-based and character-based models.

III.3.2.2.4. Fourth Year Categories Individual LRMs

Table 40 includes the individual LRMs for first year middle school categories.

Table 40. Individual LRMs of fourth year categories of learners.

CA	Ins.	V1	V2		LRM	*r*	RMSE
1	10	SY	ARTSY	0.619	ERT = 0.6162 x (SY + 515.6182) x (ARTSY – 323.344)	0.99	7.31
		C	ARTC	0.206	ERT = 0.2003 x (C + 1421.0975) x (ARTC – 290.0477)	0.99	**5.58**
2	10	SY	ARTSY	0.722	ERT = 0.70 x (SY + 480.9281) x (ARTSY – 344.519)	0.99	10.16
		C	ARTC	0.24	ERT = 0.2289 x (C+ 1389.9964) x (ARTC – 325.0492)	0.99	**8.07**
3	10	SY	ARTSY	0.894	ERT = 0.8816 x (SY + 530.1822) x (ARTSY – 481.7507)	0.99	12.88
		C	ARTC	0.298	ERT = 0.2842 x (C + 1471.1005) x (ARTC – 431.9652)	0.99	**10.94**
4	10	SY	ARTSY	1.07	ERT = 1.0517 x (SY + 456.7454) x (ARTSY – 487.156)	0.99	6.91
		C	ARTC	0.357	ERT = 0.3445 x (C + 1315.1448) x (ARTC – 459.0464)	0.99	**4.99**

Table 40 illustrates that 10 instances were trained for each fourth-year category of learners. Avery good positive correlation for all the models (r = 0.99). The lowest RMSEs are noticed for character-based models with very low differences among them and the syllable-based models.

III.4. Conclusion

WEKA training and prediction results demonstrated that the overall LRMs predictions are too low compared to low-ability readers and too high compared to high-ability readers, which induced the development of individual LRMs for each middle school level category. In addition, very high positive correlations and low RMSEs are noticed for the character-based LRMs. Furthermore, a consistency is observed through the estimated reading times of the character and syllable-based LRMs despite the polysyllabic word-count differences in the sample texts compared to the estimated reading times predicted by the word-based LRMs. Moreover, the character-based LRMs estimate quite similar reading times to the ones estimated by the syllable-based LRMs. In addition, determining the number of characters in a text is much simpler than determining the number of syllables. This is relevant to our goal of providing robustly automated reading time predictions for new texts to serve teachers in the field**.** Besides, variance in estimated reading times across the middle school levels and their categories confirm that the higher the middle school level, the shorterthe estimated reading time is; and the lower the target reader's level of English, the longer the estimated reading time is. Hence, the character count, as a linguistic characteristic of the evaluated text, and the average reading time per character, as a target reader's characteristic, are proved to be the best variables to adopt in BNP Readability Formulas to get the approximate estimated reading times of texts for the Algerian middle school EFL learners.

CHAPTER FOUR

BNP Readability Formulas Testing and Teachers' Experimentations

Chapter Four

BNP Readability Formulas Testing

and Teachers' Experimentations

Chapter Four

BNP Readability Formulas Testing

and Teachers' Experimentations

IV.1. Introduction

LRMs are tested on texts of different length and amounts PSW-percentage to evaluate their efficiency in providing compatible ERTs to the target middle school EFL learners. The gaps between the ERTs (ERTGs) are also analysed to examine the ERT increase across MSLs and CAs. Additionally, the results of the teachers' experimentations are discussed to identify the extent to which BNP readability formulas match the Algerian middle school EFL context.

IV.2. BNP Readability Formulas Testing

IV.2.1. Estimated Reading Times for Texts of Different Length

Six categories of texts (TCs) are selected to test BNP Readability Formulas. Each category of texts contains two sample texts (STs) of the same word length but different amounts of PSW percentage, and subsequently, different C-counts (CC). The purpose behind such categorization of texts is to confirm the findings of in the third chapter on the efficiency of C-count variable in determining the ERTs of texts of different length compared to the of W-count variable.

Table 41. Sample texts' counts.

TCs	STs	PSW-%	SY-count	C-count
100-W	1	7	148	429
	2	22	182	538
150-W	1	8	219	676
	2	25	283	821
200-W	1	7	285	890
	2	21	377	1076
250-W	1	9	355	1085
	2	26	460	1322
300-W	1	7	432	1295
	2	22	535	1556
350-W	1	7	493	1481
	2	26	615	1779

Table 41 shows that 6 text categories are selected to test the character-based LRMs. Each category contains two sample texts (STs) of different PSW-percentage (ST1= 7-9%, ST2 = 21-26%), and subsequently, different SY-count and C-count for the same W-count. The testing results are presented in tables 42 and 43.

Table 42. ERTs of 100-W, 150-W and 200-W Sample Texts.

CA	100-W Texts									
	ST1					ST2				
	CC	ERT				CC	ERT			
		1MS	2MS	3MS	4MS		1MS	2MS	3MS	4MS
1	429	02:13	02:00	01:29	01:29	538	02:50	02:34	01:50	01:50
2		03:18	02:14	01:54	01:47		04:12	02:51	02:21	02:12
3		04:21	02:38	02:32	02:08		05:32	03:20	03:04	02:39
4		05:01	03:32	03:11	02:38		06:19	04:26	03:50	03:16
CA	150-W Texts									
	ST1					ST2				
	CC	ERT				CC	ERT			
		1MS	2MS	3MS	4MS		1MS	2MS	3MS	4MS
1	676	03:38	03:17	02:17	02:18	821	04:29	04:02	02:45	02:47
2		05:21	03:38	02:54	02:43		06:33	04:27	03:30	03:16
3		07:01	04:12	03:45	03:19		08:35	05:07	04:28	04:00
4		07:58	05:35	04:38	04:03		09:42	06:48	05:29	04:53
CA	200-W Texts									
	ST1					ST2				
	CC	ERT				CC	ERT			
		1MS	2MS	3MS	4MS		1MS	2MS	3MS	4MS
1	890	04:52	04:24	02:59	03:01	1076	05:57	05:22	03:35	03:38
2		07:07	04:50	03:46	03:32		08:39	05:54	04:32	04:15
3		09:20	05:33	04:48	04:19		11:21	06:44	05:44	05:12
4		10:31	07:22	05:54	05:17		00:12:44	08:56	06:59	06:21

Table 43. ERTs of 250-W, 300-W and 350-W sample texts.

CA	250-W Texts									
	ST1					ST2				
	CC	ERT				CC	ERT			
		1MS	2MS	3MS	4MS		1MS	2MS	3MS	4MS
1	1085	06:00	05:25	03:37	03:40	1322	07:22	06:39	04:23	04:27
2		08:44	05:57	04:34	04:17		10:41	07:17	05:32	05:11
3		11:27	06:47	05:46	05:15		14:00	08:17	06:56	06:22
4		12:51	09:00	07:02	06:24		15:41	10:59	08:26	07:46
CA	300-W Texts									
	ST1					ST2				
	CC	ERT				CC	ERT			
		1MS	2MS	3MS	4MS		1MS	2MS	3MS	4MS
1	1295	07:13	06:31	04:17	04:22	1556	08:43	07:53	05:08	05:14
2		10:28	07:08	05:25	05:05		12:38	08:37	06:28	06:05
3		13:43	08:07	06:48	06:14		16:32	09:46	08:06	07:29
4		15:21	10:45	08:16	07:37		18:28	12:56	09:48	09:07
CA	350-W Texts									
	ST1					ST2				
	CC	ERT				CC	ERT			
		1MS	2MS	3MS	4MS		1MS	2MS	3MS	4MS
1	1481	08:17	07:29	04:53	04:59	1779	10:00	09:03	05:51	05:59
2		12:00	08:11	06:10	05:48		14:28	09:52	07:23	06:56
3		15:44	09:18	07:44	07:07		18:57	11:11	09:12	08:32
4		17:34	12:18	09:22	08:41		21:08	14:48	11:07	10:23

.

The results in Tables 42 and 43 illustrate that the lowest ERTs are noticed for CA1 while the highest are for CA4 of all MSLs. An increase of the ERT is noticed for the second sample texts of each category compared to the first sample texts.

IV.2.2. Estimated Reading Time Gaps

IV.2.2.1. ERTGs across Levels

ERTG is analysed using the C-models to examine the ERT increase across MSLs and CAs. Tables 44 and 45 include ERTGs across MSLs in minutes (m) and seconds (s) computed by subtracting the ERT of a level from the ERT of its preceding level. For instance, 1/2MS ERTG is computed by subtracting 2MS ERT from 1MS ERT. The ERTGs for each sample text category are illustrated in figures 35 and 36.

CA	TCs	100-W		150-W		200-W	
	STs	1	2	1	2	1	2
	CCs	429	538	676	821	890	1076
1	1/2MS	00:13	00:16	00:21	00:26	00:28	00:35
	2/3MS	00:29	00:44	01:00	01:17	01:25	01:47
	3/4MS	0	0	-1s	-2s	-2s	-3s
2	1/2MS	01:04	01:21	01:43	02:06	02:16	02:46
	2/3MS	00:20	00:30	00:43	00:57	1m4s	01:22
	3/4MS	00:07	00:09	00:11	00:13	00:14	00:17
3	1/2MS	01:43	02:12	02:49	03:28	03:47	04:37
	2/3MS	00:07	00:16	00:27	00:39	00:45	01:01
	3/4MS	00:23	00:25	00:26	00:28	00:29	00:31
4	1/2MS	01:29	1:53	02:22	02:54	03:09	03:49
	2/3MS	00:20	00:37	00:57	01:19	01:29	01:56
	3/4MS	00:33	00:34	00:35	00:36	00:37	00:38

Table 44. ERTGs of 100-W, 150-W and 200-W sample texts across MSLs

Figure 35. ERTGs across MSLs for STs1.

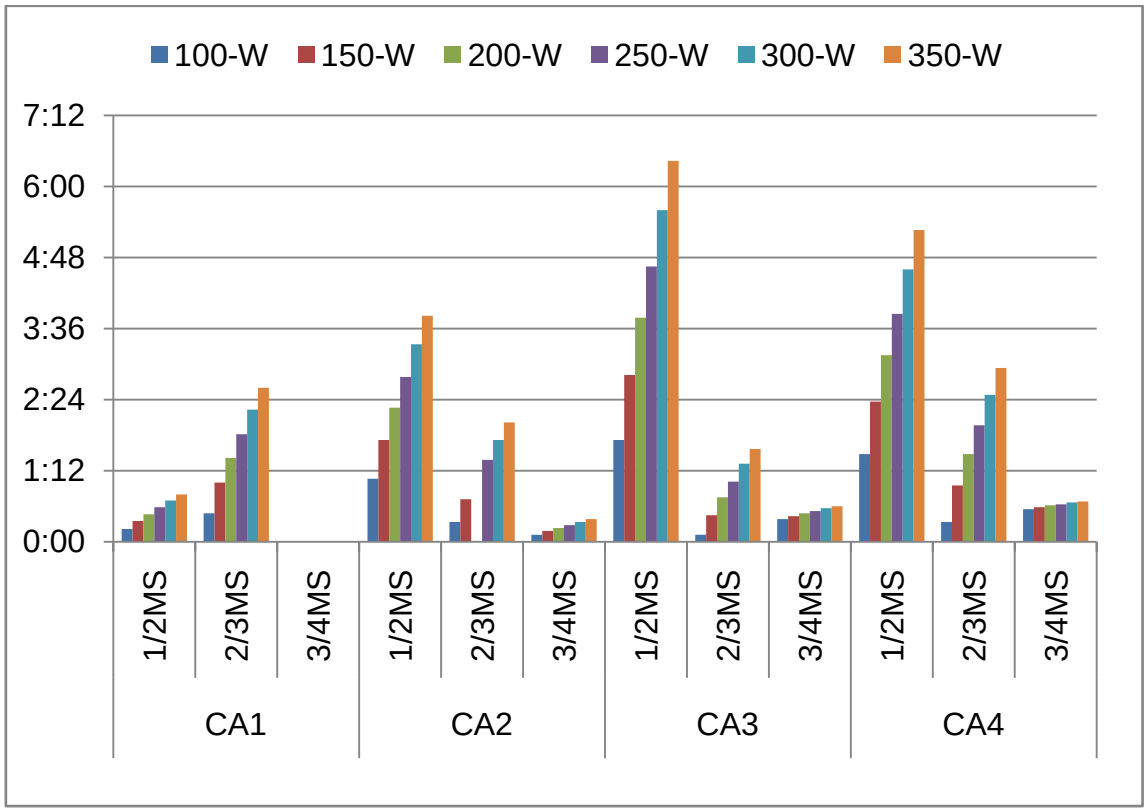
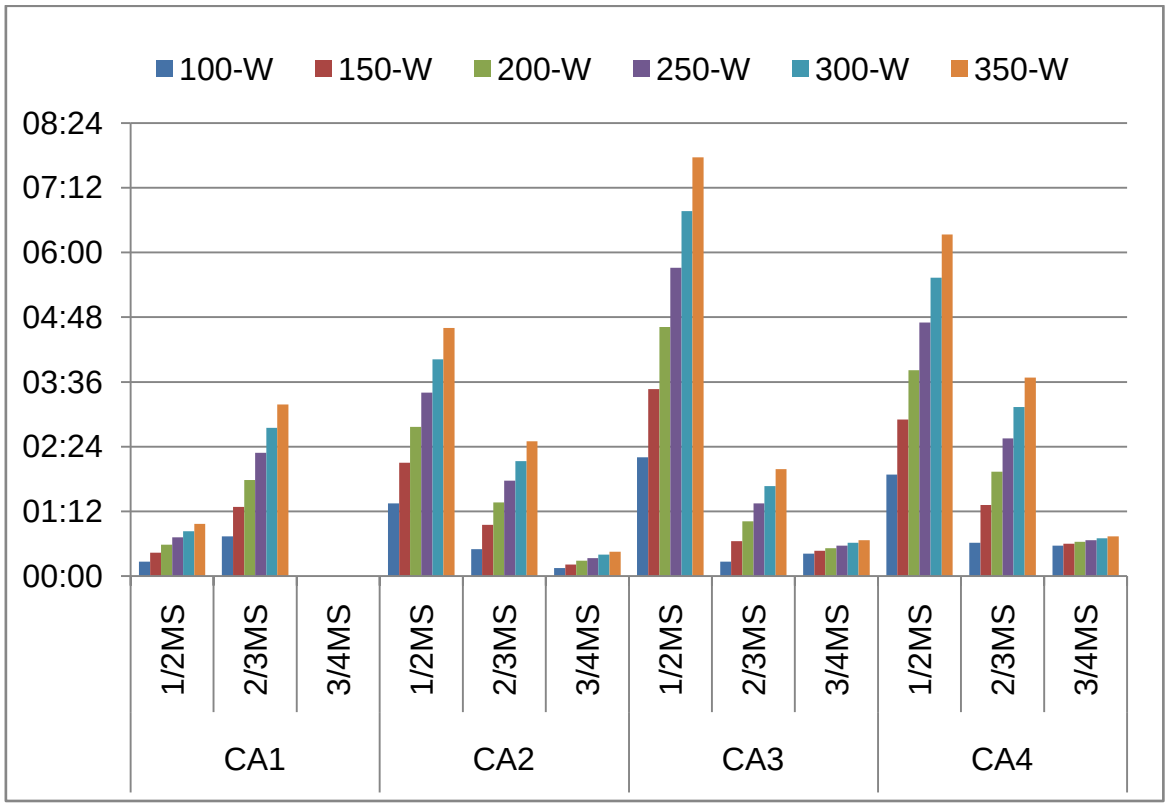


Table 45. ERTGs of 250-W, 300-W and 350-W sample texts across MSLs.

CA	TCs	250-W		300-W		350-W	
	STs	**1**	**2**	**1**	**2**	**1**	**2**
	CCs	**1085**	**1322**	**1295**	**1556**	**1481**	**1779**
1	**1/2MS**	00:35	00:43	00:42	00:50	00:48	00:58
	2/3MS	01:49	02:17	02:14	02:45	02:36	03:11
	3/4MS	-3s	-4s	-5S	-6s	-6s	-8s
2	**1/2MS**	02:47	03:24	03:20	04:01	03:49	04:36
	2/3MS	01:23	01:46	01:43	02:08	02:01	02:30
	3/4MS	00:17	00:20	00:20	00:24	00:23	00:27
3	**1/2MS**	04:39	05:43	05:36	06:46	06:26	07:46
	2/3MS	01:01	01:21	01:19	01:40	01:34	01:59
	3/4MS	00:31	00:34	00:34	00:37	00:36	00:40
4	**1/2MS**	03:51	04:42	04:36	05:32	05:16	06:20
	2/3MS	01:58	02:33	02:29	03:08	02:56	03:41
	3/4MS	00:38	00:40	00:40	00:42	00:41	00:44

Figure 36.ERTGs across MSLs for STs2.



Tables 44/45 and Figures 35/36 illustrate that the ERTG increases across MSLs with the increase of the C-count. A <1m ERTG is noticed between 1MS and 2MS for CA1, a 1-5m ERTG for CA2, a 2-8m ERTG for CA3, and a 1-6m ERTG for CA4. A <1-3m ERTG is observed between 2MS and 3MS for both CA1 and CA2, a <1-2m ERTG for CA3, and a 1-4m ERTG for CA4. A very low negative ERTG (0 to -8s) is noticed between 3MS and 4MS for CA1, while a <1m ERTG is observed for CA2, CA3, and CA4. Results of the analysis confirm that the higher the MSL, the longer is the ERT.

IV.2.2.2. ERTGs across Categories

Tables 46 and 47 includes ERTGs across CAs in minutes (m) and seconds (s) ERTG by subtracting the ERT of a CA from the ERT of its preceding CA. For instance, CA1/2 ERTG is computed by subtracting CA1 ERT from CA2 ERT. The ERTGs for each sample text category are illustrated in figures 37 and 38.

Table 46. ERTGs of 100-W, 150-W and 200-W sample texts across CAs.

Level	TCs / STs / CC	100-W 1 429	100-W 2 538	150-W 1 676	150-W 2 821	200-W 1 890	200-W 2 1076
1MS	CA1/2	01:05	01:22	01:42	02:04	02:15	02:42
	CA2/3	01:03	01:20	01:41	02:03	02:13	02:41
	CA3/4	00:40	00:47	00:57	01:6	01:11	01:24
	CA1/4	02:48	03:28	04:19	05:13	05:39	06:47
2MS	CA1/2	00:14	00:17	00:21	00:25	00:26	00:31
	CA2/3	00:24	00:29	00:34	00:40	00:43	00:50
	CA3/4	00:53	01:06	01:23	01:41	01:49	02:12
	CA1/4	01:32	01:53	02:18	02:45	02:58	03:33
3MS	CA1/2	00:25	00:30	00:37	00:44	00:48	00:57
	CA2/3	00:37	00:43	00:50	00:58	01:02	01:12
	CA3/4	00:40	00:46	00:53	01:01	01:05	01:16
	CA1/4	01:42	01:59	02:21	02:44	02:55	03:24
4MS	CA1/2	00:18	00:21	00:25	00:29	00:31	00:37
	CA2/3	00:22	00:28	00:35	00:43	00:47	00:57
	CA3/4	00:30	00:36	00:45	00:54	00:58	01:09
	CA1/4	01:10	01:25	01:45	02:06	02:16	02:43

Figure 37. ERTGs of first sample texts across CAs.

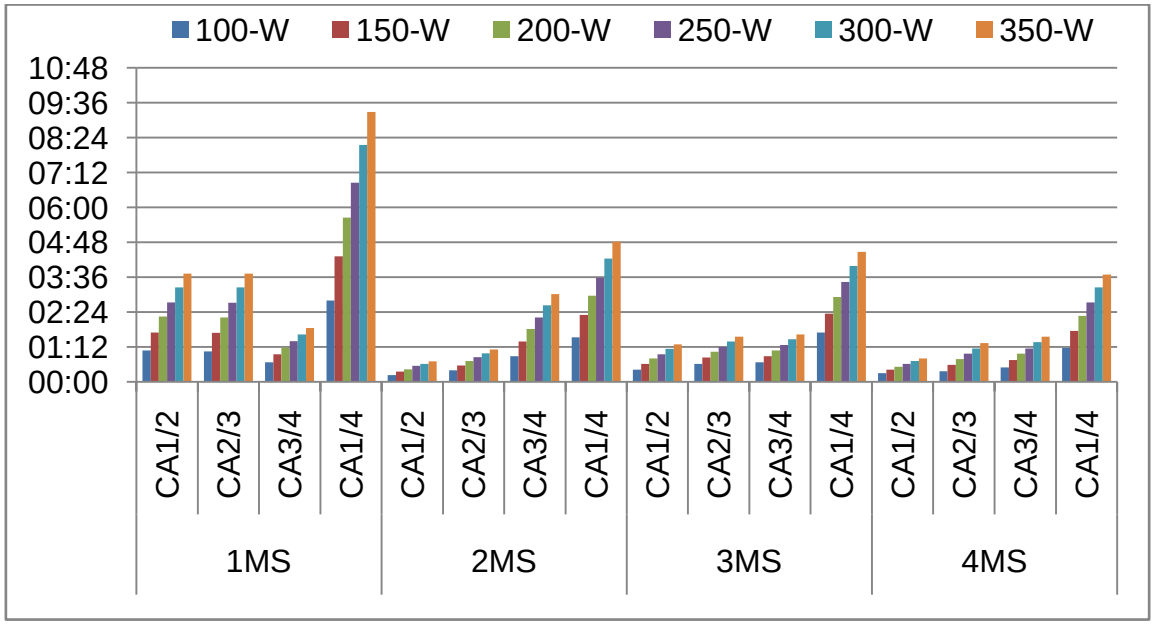
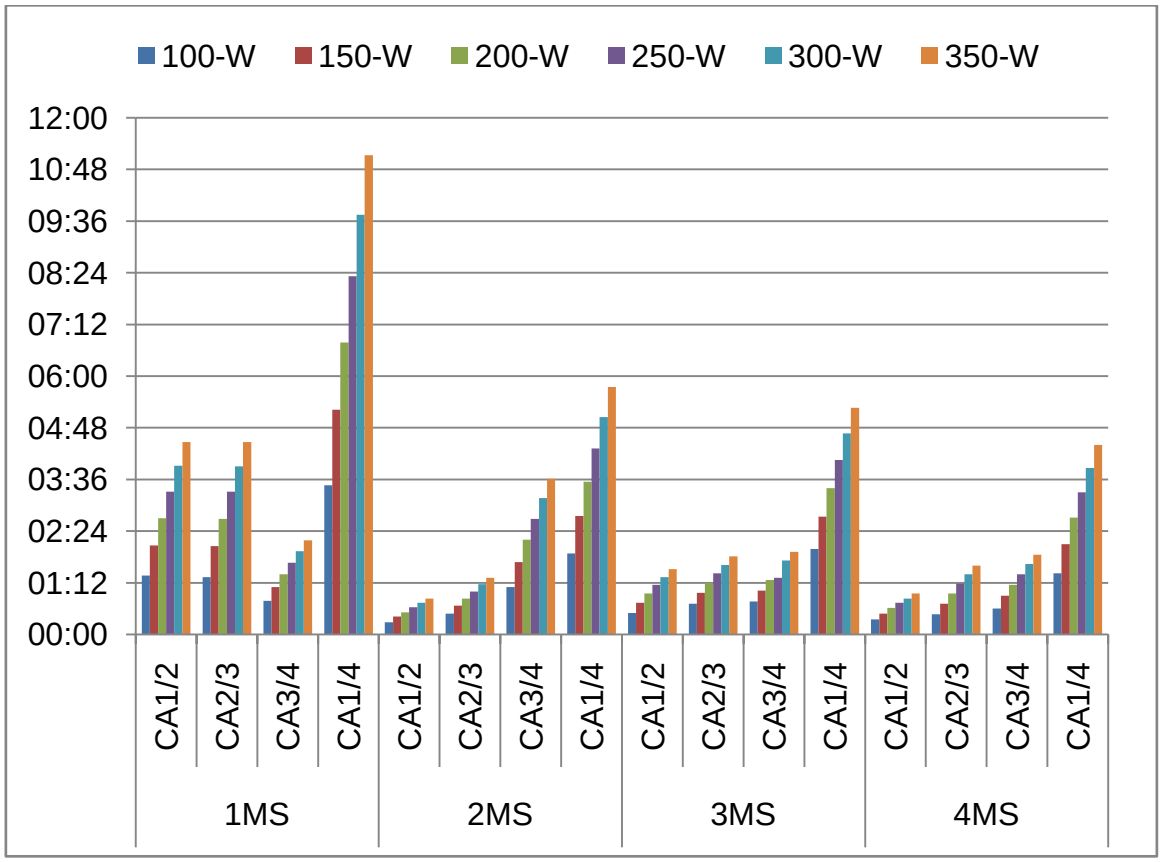


Table 47. ERTGs of 250-W, 300-W and 350-W sample texts across CAs.

L	TCs	250-W		300-W		350-W	
	STs	1	2	1	2	1	2
	CC	1085	1322	1295	1556	1481	1779
1MS	CA1/2	02:44	03:19	03:15	03:55	03:43	04:28
	CA2/3	02:43	03:19	03:15	03:54	03:43	04:28
	CA3/4	01:24	01:40	01:38	01:56	01:51	02:11
	CA1/4	06:51	08:19	08:09	09:45	09:17	11:08
2MS	CA1/2	00:33	00:38	00:37	00:44	00:42	00:50
	CA2/3	00:51	01:00	00:59	01:10	01:07	01:19
	CA3/4	02:13	02:41	02:38	03:10	03:01	03:37
	CA1/4	03:35	04:19	04:14	05:03	04:49	05:45
3MS	CA1/2	00:57	01:09	01:08	01:20	01:17	01:31
	CA2/3	01:12	01:25	01:23	01:37	01:33	01:49
	CA3/4	01:16	01:19	01:28	01:43	01:38	01:55
	CA1/4	03:26	04:03	03:59	04:40	04:28	05:16
4MS	CA1/2	00:37	00:44	00:43	00:50	00:48	00:57
	CA2/3	00:58	01:11	01:09	01:24	01:20	01:36
	CA3/4	01:09	01:24	01:22	01:38	01:33	01:51
	CA1/4	02:44	03:18	03:15	03:52	03:41	04:24

Figure 38. ERTGs of second sample texts across CAs.

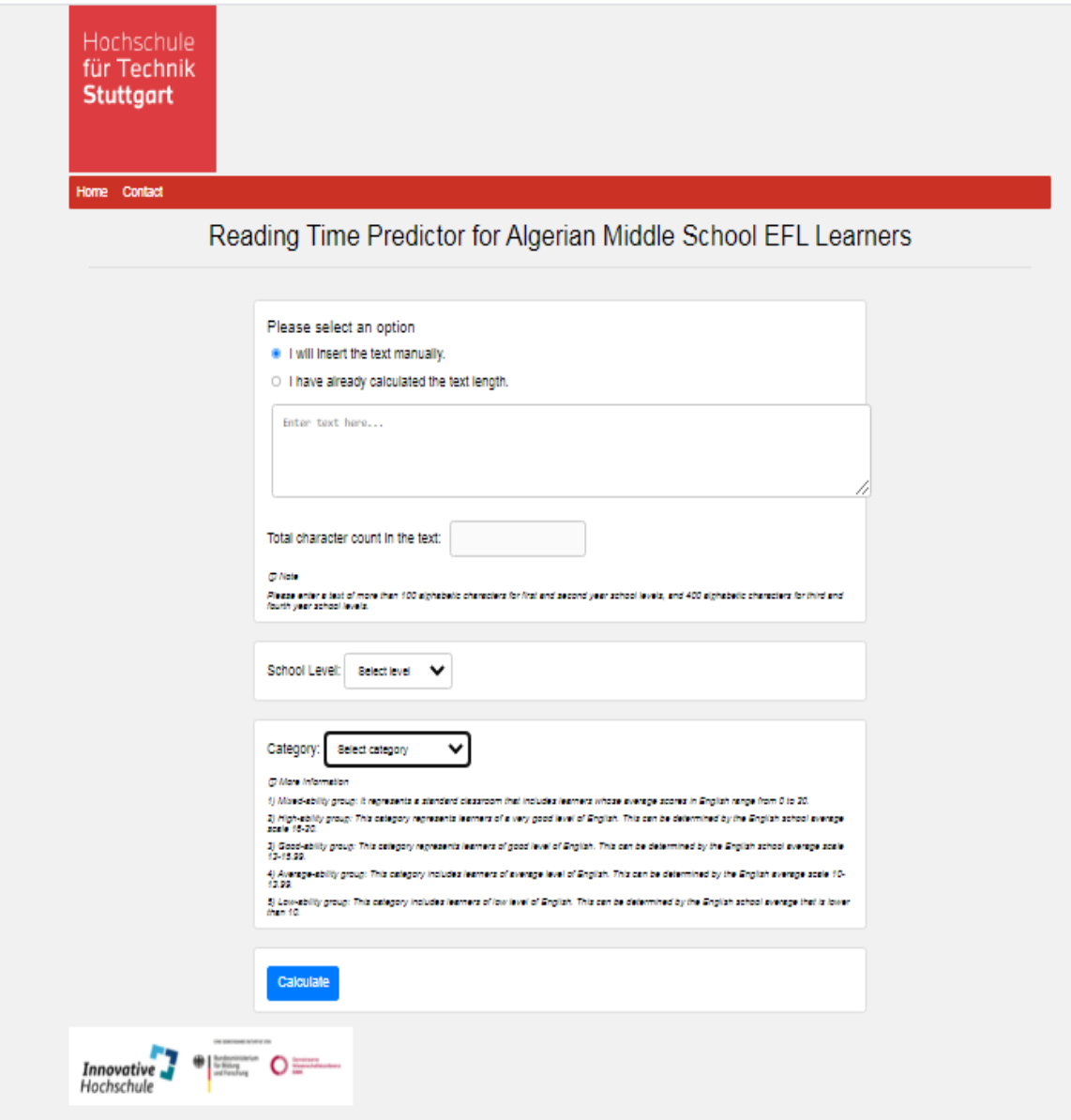


Data in Tables 46/47 and Figures 37/38 demonstrate that ERTG across CAs increases with the increase of the C-count. A 1-4m ERTG is noticed between CA1 and CA2 for 1MS, a <1-1m ERTG for 2MS and 4MS, and a <1-2m ERTG for 3MS. A 1-4m ERTG is observed between CA2 and CA3 for 1MS, a <1-1m ERTG for 2MS, a <1-2m ERTG for 3MS, and a <1-2m ERTG for 4MS. A 1-2m ERTG is noticed between CA3 and CA4 for 1MS and 3MS, a 1-4m for 2MS, and <1-2m ERTG for 4MS. A 3-11m ERTG is noticed between CA1 and CA4 for 1MS, a 2-6m for 2MS, 2-5m ERTG for 3MS, and 1-4m ERTG for 4MS. Results of the analysis confirm that the lower the target reader's level in English, the longer is the ERT.

IV.3. Online Application of BNP Readability Formulas

The website **'https://transfer.hft-stuttgart.de/pages/ulrike.pado/behira/'** was created to facilitate the use of BNP Readability Formulas by Algerian classroom teachers and textbook writers. The website is hosted on the M4_Lab transfer portal of the University of Applied Sciences of Stuttgart in Germany (Hochschule für Technik Stuttgart). It is free of use and easily accessible. The following is the interface of the website.

Figure 39. BNP Readability Formulas website interface 1.

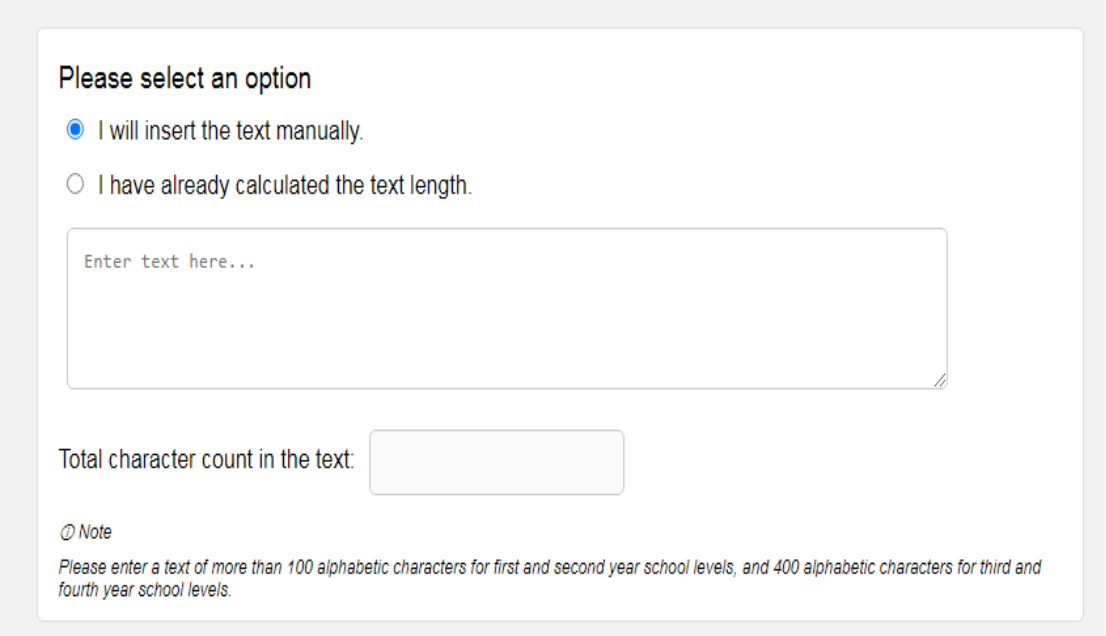


To get the approximate ERT of the evaluated text for Algerian middle school EFL learners using BNP Readability Formulas, the following steps are to be followed by the website users:

A. Select one of the two options.

A.1 Option 1: Insert the text to be evaluated manually.

Figure 40. BNP Readability Formulas website interface 2.



A.2. Option 2: Insert the character count without spaces of the text to be evaluated

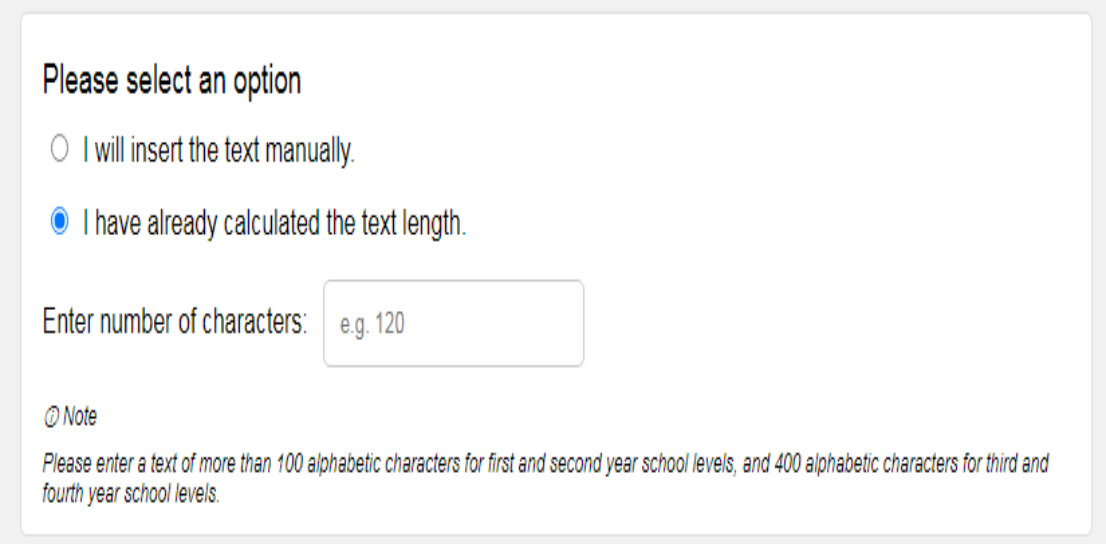
Note: You can have the character count of a text using Microsoft Word Office following these steps:

- Open a new document in Microsoft Office Word.
- Type or paste the text.
- Click on ‘Revision’.
- Click on the icon 

.
- Use the character count without spaces from text statistics.

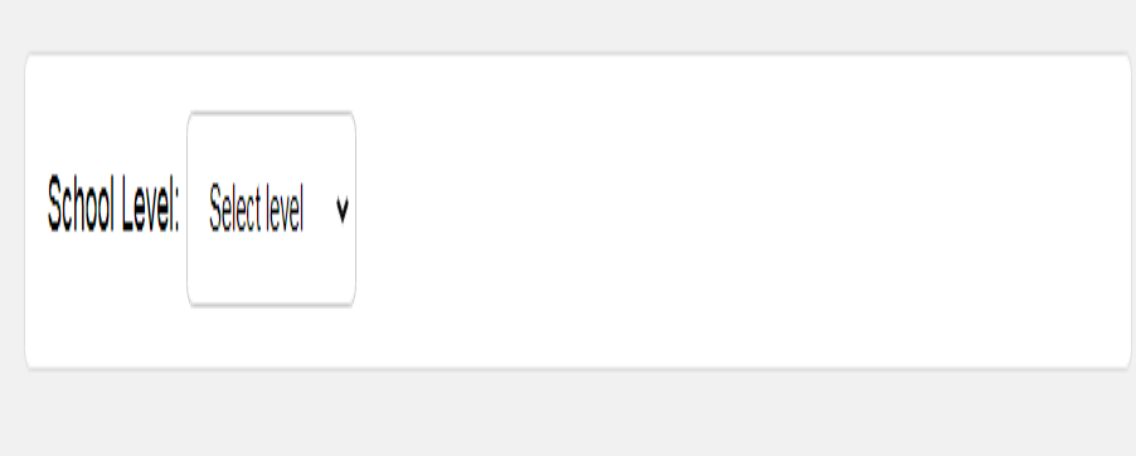
Note: Please enter a text of more than **100** alphabetic characters for first and second year school levels, and **400** alphabetic characters for third and fourth year school levels.

Figure 41. BNP Readability Formulas website interface 3.



B. Select the level of the target readers: 1MS, 2MS, 3MS or 4MS.

Figure 42. BNP Readability Formulas website interface 4.



C. Select the category of the target readers among the following categories:

(a) Mixed-ability group: It represents a standard classroom that includes learners whom averages in English range from 0 to 20. Thus, CA4 C-models are adopted for this category since learners of this group are the lowest readers.

(b) High-ability group: It represents learners of very good level in English. This can be determined by the English school average scale 16-20. CA1 C-models are used for this category.

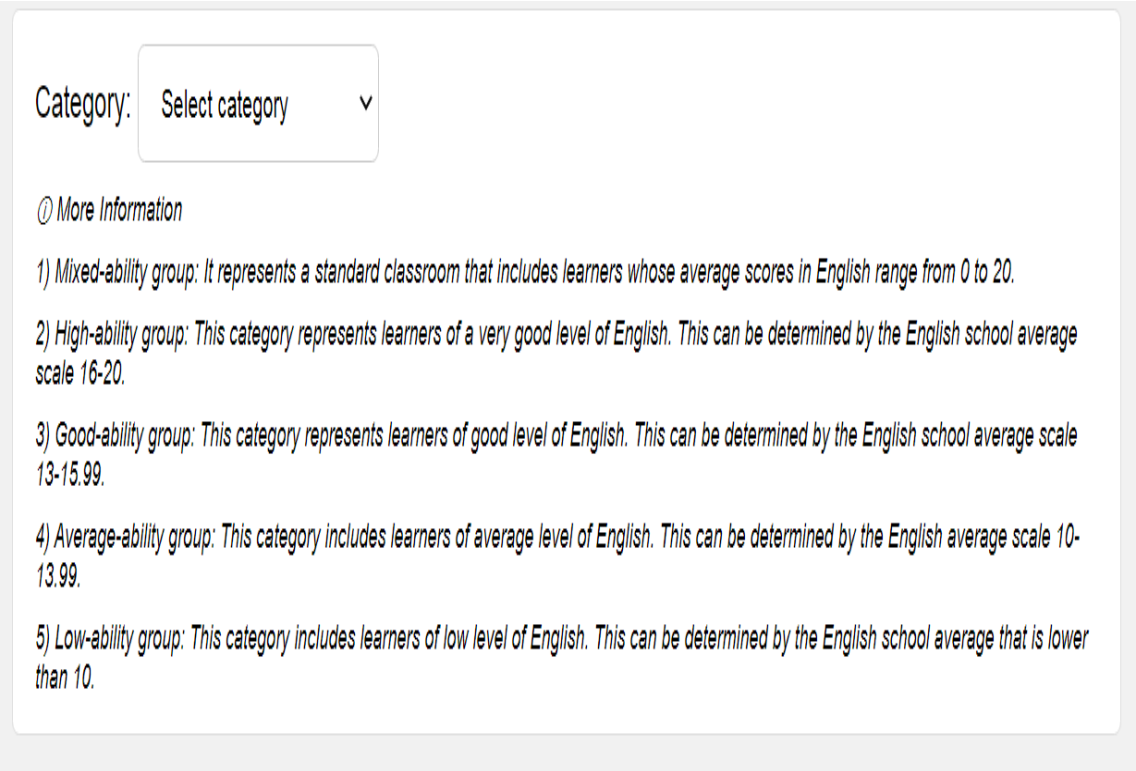
(c) Good-ability group: This category represents learners of good level in English. This can be determined by the English school average scale 13-15.99. CA2 C-models are used for this category.

(d) Average-ability group: This category includes learners of average level in English. This can be determined by the English average scale 10-13.99. CA3 C-models are used for this category.

(e) Low-ability group: This category includes learners of low level in English. This can be determined by the English school average that is lower than 10. C-models of CA4 are used for this category.

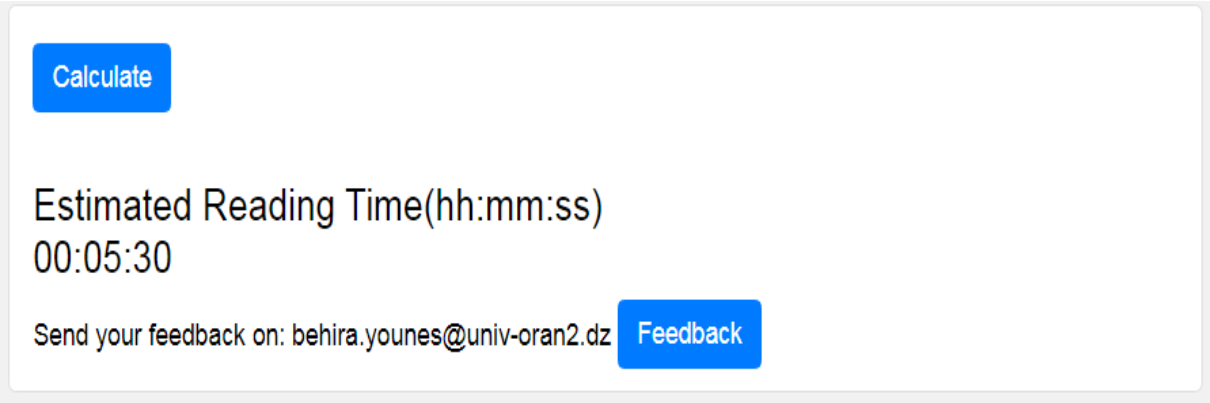
In case no low-ability learners are among the target readers, the user chooses the category of ‘average-ability group’ instead of ‘mixed-ability group’ category. ERT of the evaluated text will be provided in minutes as the number of seconds will be rounded down if it is less that 30s or rounded up if more than 30s.

Figure 43. BNP Readability Formulas website interface 5.



D. Click on 'Calculate' to get the estimated reading time for the evaluated text. The estimated reading time will be provided in minutes and seconds. The number of seconds will be rounded down if it is less that 30s or rounded up if more than 30s.

Figure 44. BNP Readability Formulas website interface 6.



IV.4. Teachers' Experimentations of BNP Readability Formulas

IV.4.1. Methodology

A teacher's experimentation form was designed to examine the efficiency of BNP Readability Formulas in predicting approximate reading times to Algerian middle school learners of English. The form includes items on the participants' working place and the taught levels for the current school year. Each participant is provided a form to fill in by selecting sample texts for the target readers who should be carefully selected to represent four categories of learners for whom specific formulas are trained. Results of the teachers' experimentations are presented in the following tables and figures.

IV.4.2. Study Participants and Data Collection

64 learners from different urban and suburban middle schools in Tiaret participated in the study.

IV.4.2.1. Participants' School Level and Ability

Table 48. Participants' school level and category.

School Level	High-ability reader (Average 16-20)		Good-ability reader (Average 13-15.99)		Average-ability reader (Average 10-13.99)		Poor-ability reader (Average lower than 10)		Total	
	N	%	N	%	N	%	N	%	N	%
1MS	2	12.5%	2	12.5%	10	62.5%	2	12.5%	16	100%
2MS	2	12.5%	2	12.5%	2	12.5%	10	62.5%	16	100%
3MS	2	12.5%	10	62.5%	2	12.5%	2	12.5%	16	100%
4MS	10	62.5%	2	12.5%	2	12.5%	2	12.5%	16	100%
Total	16	25%	16	25%	16	25%	16	25%	64	100%

Table 48 demonstrates that 64 learners of different levels and abilities participated in the experiments.

IV.4.2.2 Character Counts of Experiments' Texts

Table 49. Character counts of experiments' texts.

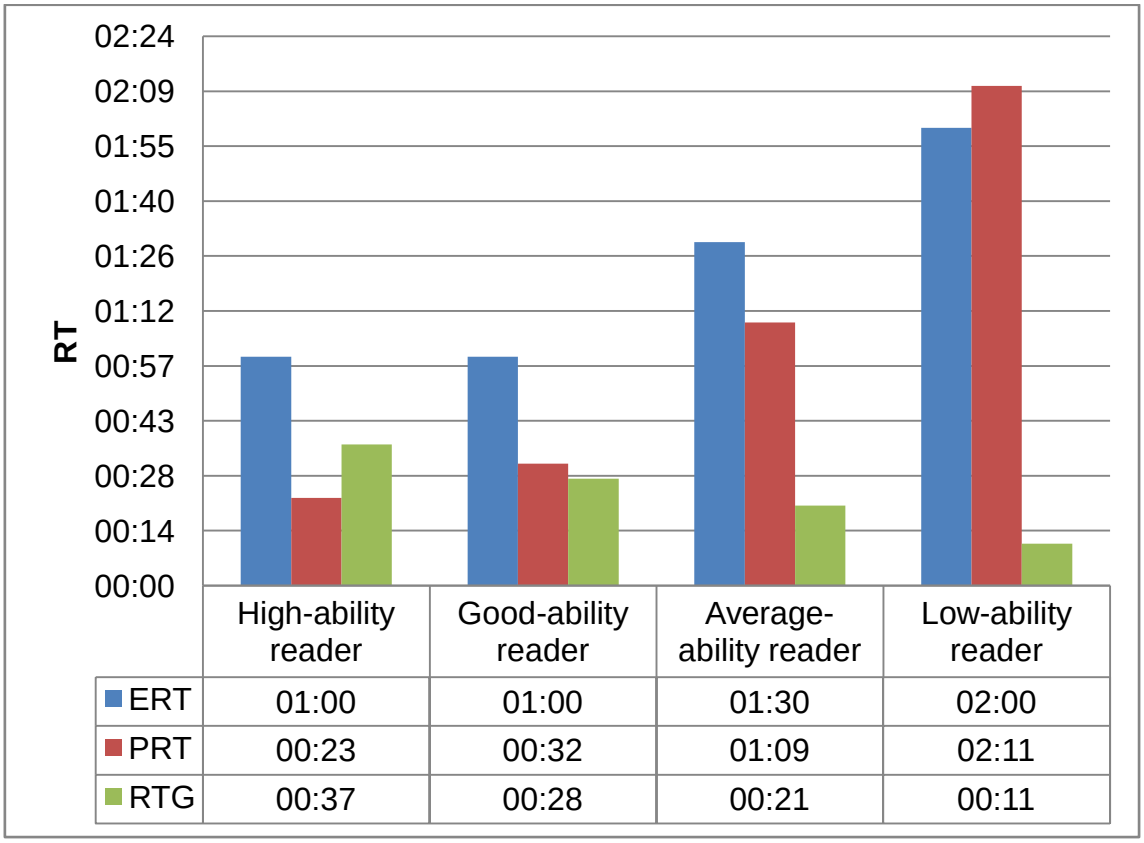
School Level	Character Counts of Experiments' Texts		
	Experiment1's Text	**Experiment 2's Text**	**Experiment 3's Text**
1MS	180	170	431
2MS	472	435	607
3MS	485	910	451
4MS	809	891	887

Table 49 shows that the texts selected by the teachers are of different length. It also illustrates that the teachers selected texts that can be used for intensive reading sessions which confirms the importance that teachers give to such type of reading. It should be noted that no preconditioned for text length was required for the experiments and teachers were free to select any text.

IV.4.3. First Year MS Experiments

IV.4.3.1. Experiment 1

Figure 45. ERT, PRT and RTG of 1MS Experiment 1's participants.



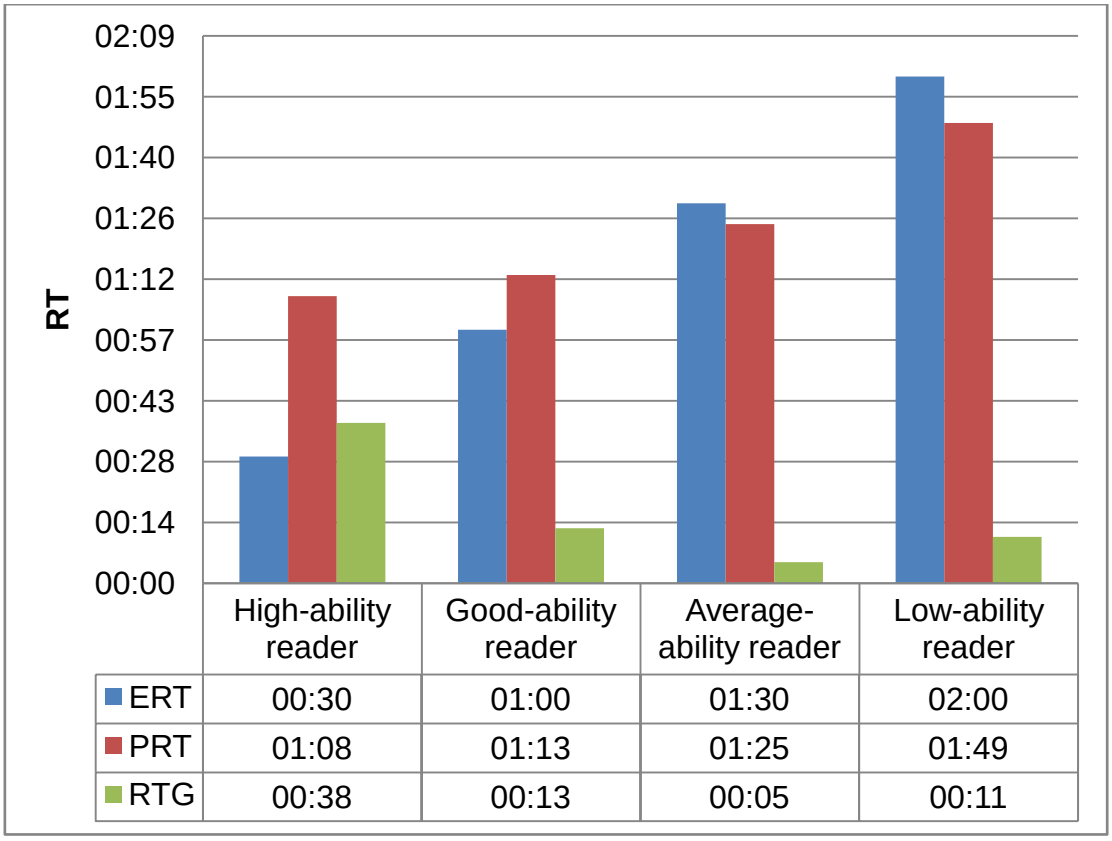
	High-ability reader	Good-ability reader	Average-ability reader	Low-ability reader
ERT	01:00	01:00	01:30	02:00
PRT	00:23	00:32	01:09	02:11
RTG	00:37	00:28	00:21	00:11

Figure 45 shows a RTG of <-1m for the three first categories of readers and <+1m for the low-ability reader category. It should be noted that such RTG is not significant as the ERTs of BNP formulas are rounded up for each 30 seconds. The figure also demonstrates a compatible increase of both the ERTs and PRTs through the categories of readers which confirms the finding in the previous chapters on the congruency of the school achievement and the reading ability of the learner. It also confirms the negative correlation between the learners' reading ability and the reading time; i.e., the higher the reading ability of the leaner, the lower the reading time is. Results in Figure 45 confirm

that BNP Readability Formulas for the 4 categories of 1MS participants predicted compatible reading times.

IV.4.3.2. Experiment 2

Figure 46. ERT, PRT and RTG of 1MS Experiment 2's participants.

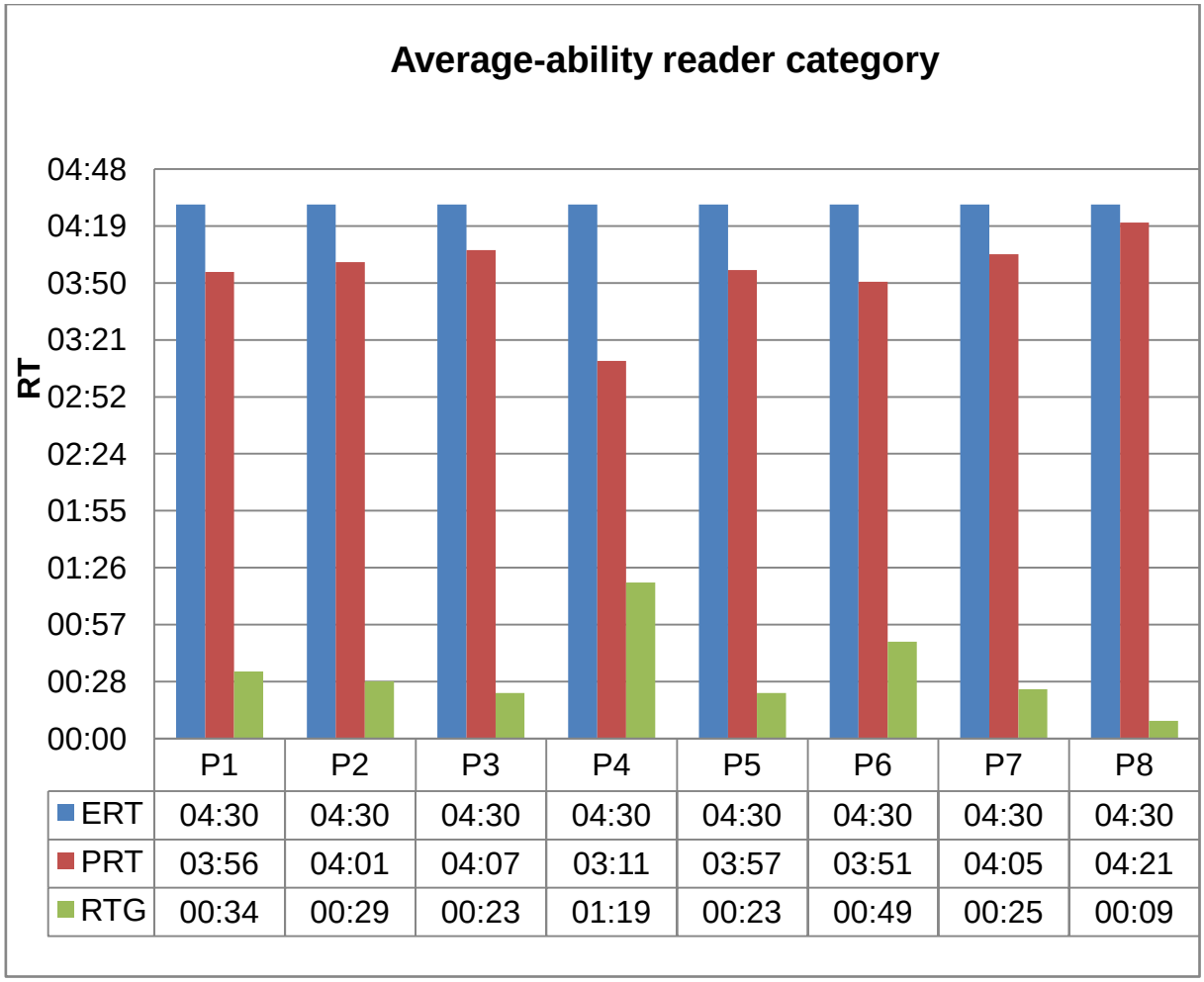


	High-ability reader	Good-ability reader	Average-ability reader	Low-ability reader
ERT	00:30	01:00	01:30	02:00
PRT	01:08	01:13	01:25	01:49
RTG	00:38	00:13	00:05	00:11

Figure 46 illustrates a RTG of <+1m for the first and second categories of readers and <-1m for the third and fourth categories. The figure also demonstrates a congruent increase in ERTs and PRTs through the categories of readers as noticed in experiment1 confirming the negative correlation between the reading ability and reading time. Results shown in Experiment 2 corroborate the feasibility of BNP Readability Formulas for the 4 categories in predicting compatible reading times for the 1MS sample participants.

IV.4.3.3. Experiment 3

Figure 47. ERT, PRT and RTG of 1MS Experiment 3's participants.



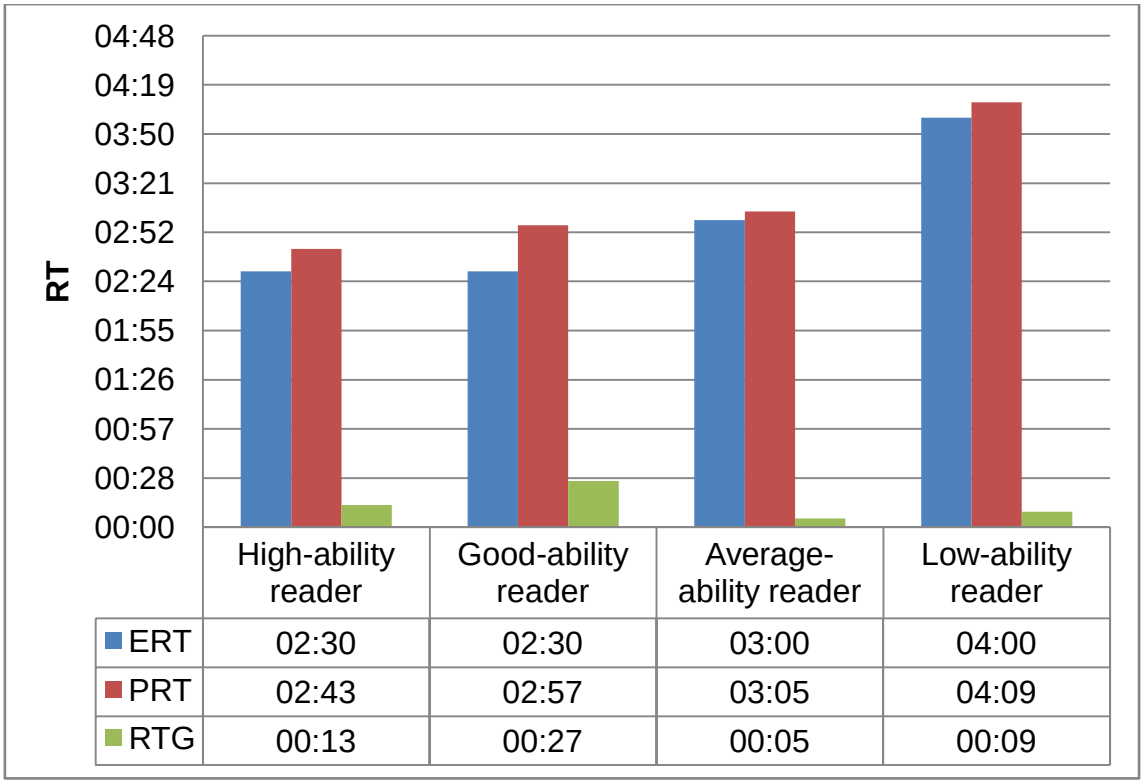
	P1	P2	P3	P4	P5	P6	P7	P8
ERT	04:30	04:30	04:30	04:30	04:30	04:30	04:30	04:30
PRT	03:56	04:01	04:07	03:11	03:57	03:51	04:05	04:21
RTG	00:34	00:29	00:23	01:19	00:23	00:49	00:25	00:09

Experiment 3 includes 8 participants form the average-ability reader category. Except for participant 4, Figure 47 shows a RTG of <1m for all participants. The results of Experiment 3 confirm the feasibility of BNP Readability Formula for this category of readers.

IV.4.4. Second Year MS Experiments

IV.4.4.1. Experiment 1

Figure 48. ERT, PRT and RTG of 2MS Experiment 1's participants.

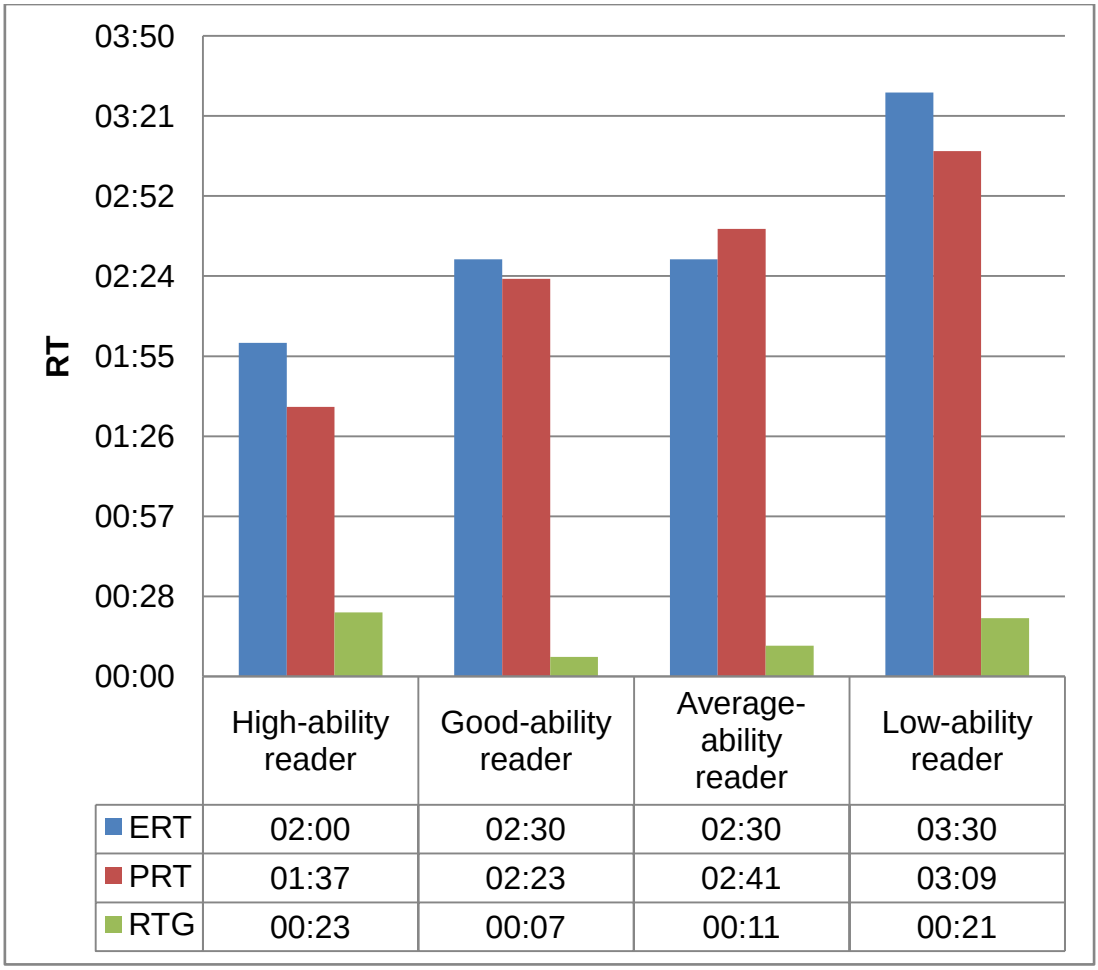


	High-ability reader	Good-ability reader	Average-ability reader	Low-ability reader
ERT	02:30	02:30	03:00	04:00
PRT	02:43	02:57	03:05	04:09
RTG	00:13	00:27	00:05	00:09

Figure 48 shows a <1m RTG for all categories of readers. The highest RTG is noticed for the second category reader with 27 seconds. The PRT increases through the four categories of readers as noticed in the experiments of 1st year level confirming the negative correlation between the reading time and the reading ability. Experiment 1 also confirms that BNP Readability Formulas for the 4 categories predicted compatible reading times for the 2MS year sample participants.

IV.4.4.2. Experiment 2

Figure 49. ERT, PRT and RTG of 2MS Experiment 2's participants.

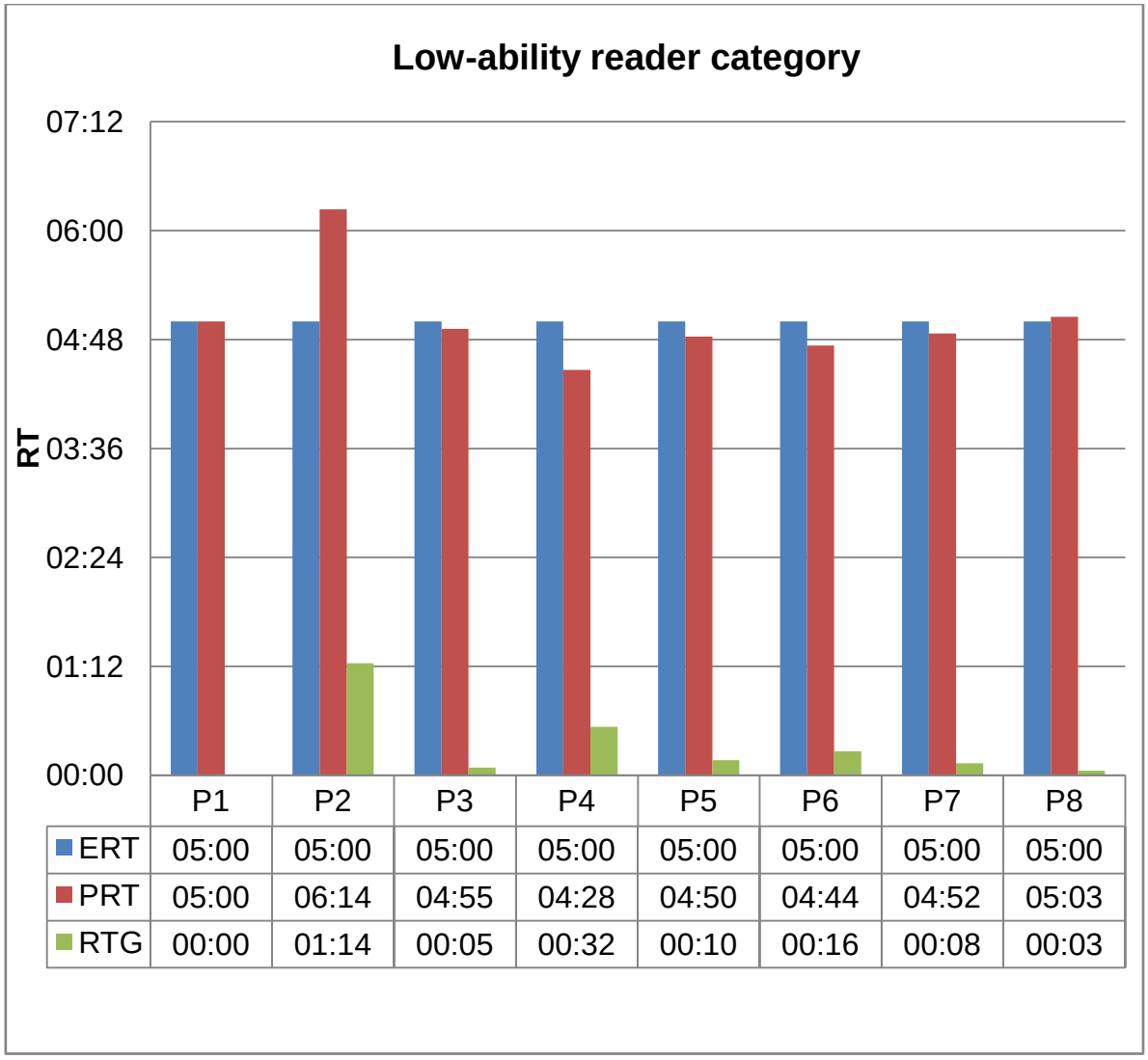


	High-ability reader	Good-ability reader	Average-ability reader	Low-ability reader
ERT	02:00	02:30	02:30	03:30
PRT	01:37	02:23	02:41	03:09
RTG	00:23	00:07	00:11	00:21

Figure 49 shows a <1m RTG for all categories of readers. A negative correlation between the reading time and the reading ability is noticed through the four categories of readers. ERTs provided by BNP Readability Formulas for the 2MScategories match the PRTs in Experiment 2.

IV.4.4.3. Experiment 3

Figure 50. ERT, PRT and RTG of 2MS Experiment 3's participants.



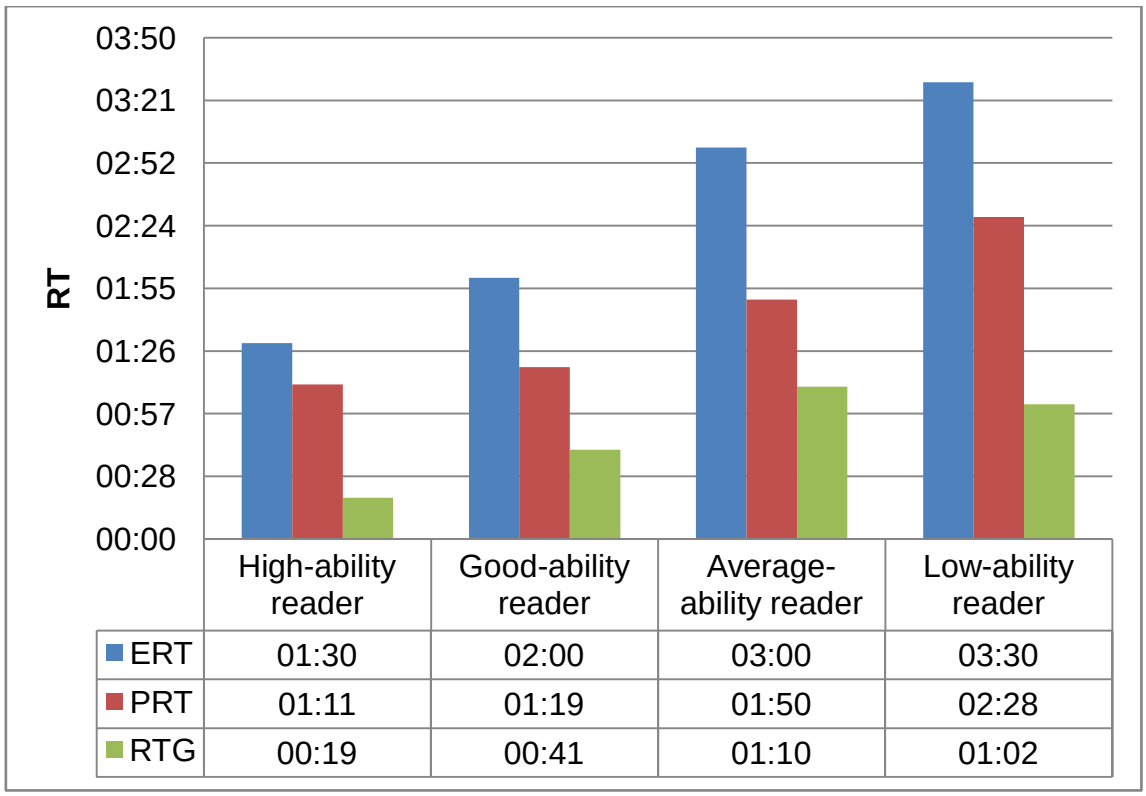
	P1	P2	P3	P4	P5	P6	P7	P8
ERT	05:00	05:00	05:00	05:00	05:00	05:00	05:00	05:00
PRT	05:00	06:14	04:55	04:28	04:50	04:44	04:52	05:03
RTG	00:00	01:14	00:05	00:32	00:10	00:16	00:08	00:03

Data in Figure 50 demonstrate that Experiment 3 includes 8 participants form the low-ability reader category. The RTG<-30s for six participants and <-1m for one participant. The results of Experiment 3 confirm that BNP Readability Formula for this category of readers is very practical in predicting the approximate reading time.

IV.4.5. Third Year MS Experiments

IV.4.5.1. Experiment 1

Figure 51. ERT, PRT and RTG of 3MS Experiment 1's participants.

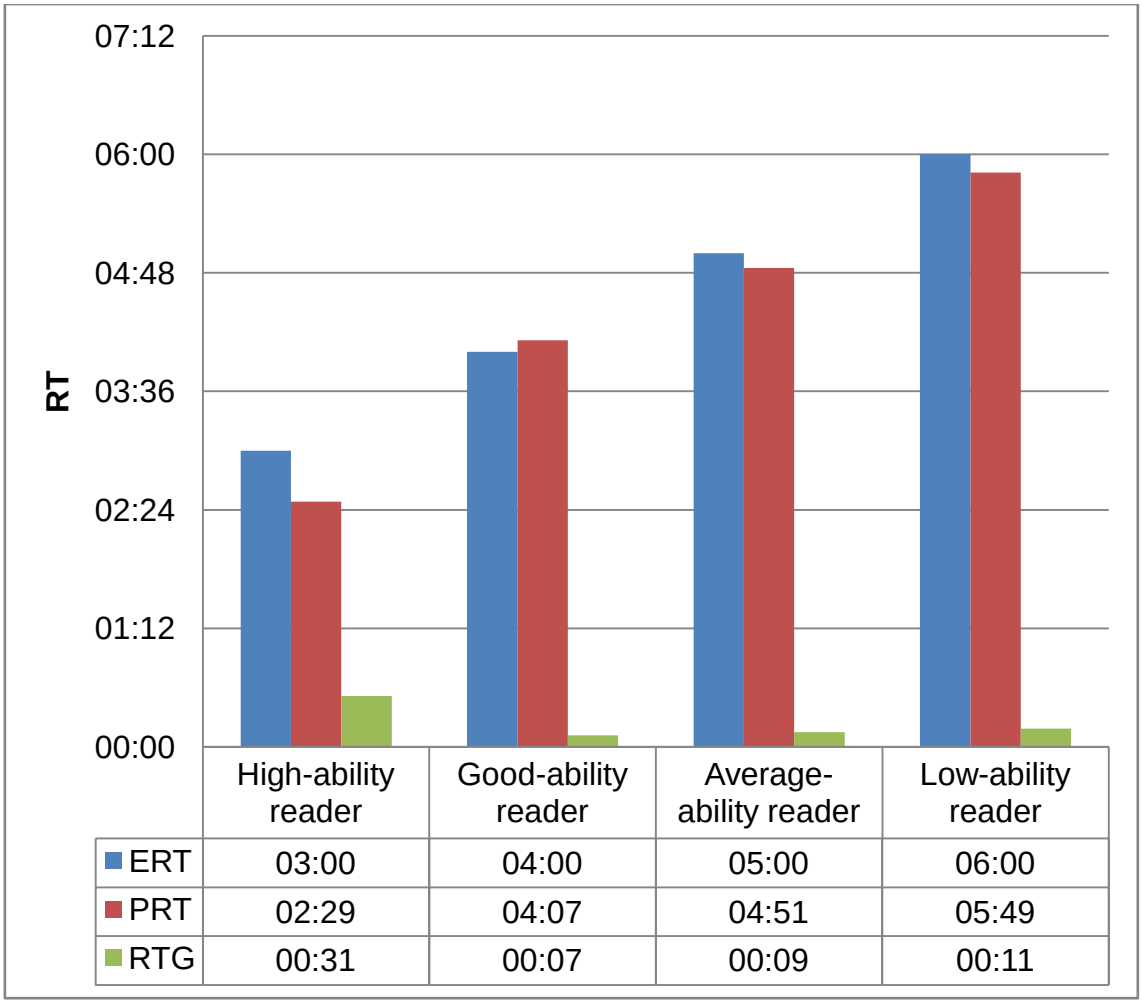


	High-ability reader	Good-ability reader	Average-ability reader	Low-ability reader
ERT	01:30	02:00	03:00	03:30
PRT	01:11	01:19	01:50	02:28
RTG	00:19	00:41	01:10	01:02

Figure 51 shows a <+1m RTG of for high-ability and good-ability readers and a +1m RTG for average-ability and low-ability readers. The reading times estimated by BNP Readability Formulas are slightly higher than PRTs. The PRTs increases through the four categories of readers. Data in Figure 51 figure out that the ERTs of BNP Readability Formulas for the 3MS year categories of readers are quasi compatible with the PRTs.

IV.4.5.2. Experiment 2

Figure 52. ERT, PRT and RTG of 3MS Experiment 2's participants.



	High-ability reader	Good-ability reader	Average-ability reader	Low-ability reader
ERT	03:00	04:00	05:00	06:00
PRT	02:29	04:07	04:51	05:49
RTG	00:31	00:07	00:09	00:11

Figure 52 shows a RTG of <1m for the four categories of readers and. A negative correlation is observed between the readers' ability level and their reading times. It is also observed in the figure that BNP Readability Formulas' ERTs are congruent with the PRTs.

IV.4.5.3. Experiment 3

Figure 53. ERT, PRT and RTG of 3MS Experiment 3's participants.

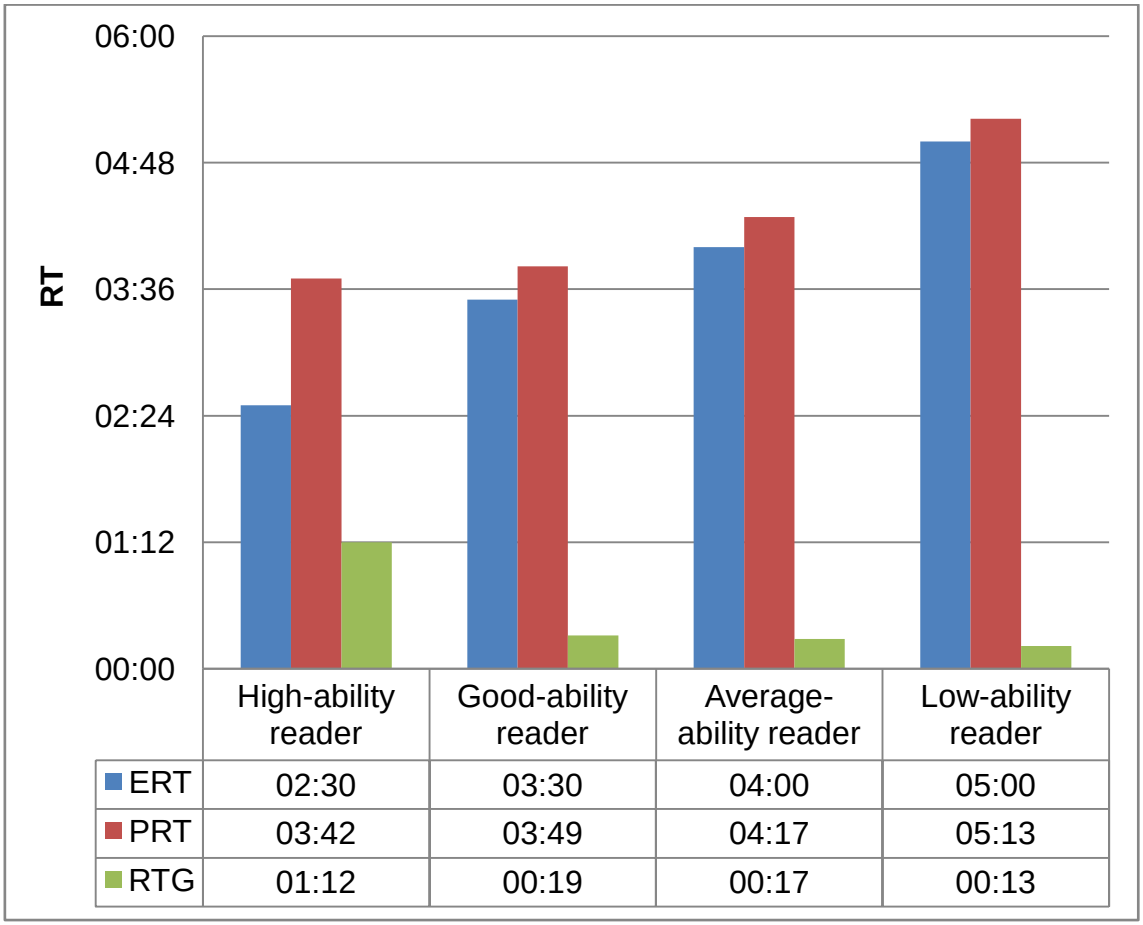
	P1	P2	P3	P4	P5	P6	P7	P8
ERT	02:00	02:00	02:00	02:00	02:00	02:00	02:00	02:00
PRT	01:28	01:58	01:55	01:18	01:57	02:21	01:23	01:08
RTG	00:32	00:02	00:05	00:42	00:03	00:21	00:37	00:52

Eight 3MS good-ability readers participated in Experiment 3 as shown in Figure 53. A <-30s RTG is noticed for half of the participants and a <-1m RTG for the second half. The results in the figure confirm the usefulness of the 3MS good-ability readers' BNP Readability Formula in providing compatible ERTs.

IV.4.6. Fourth Year MS Experiments

IV.4.6.1. Experiment 1

Figure 54. ERT, PRT and RTG of 4MS Experiment 1's participants.



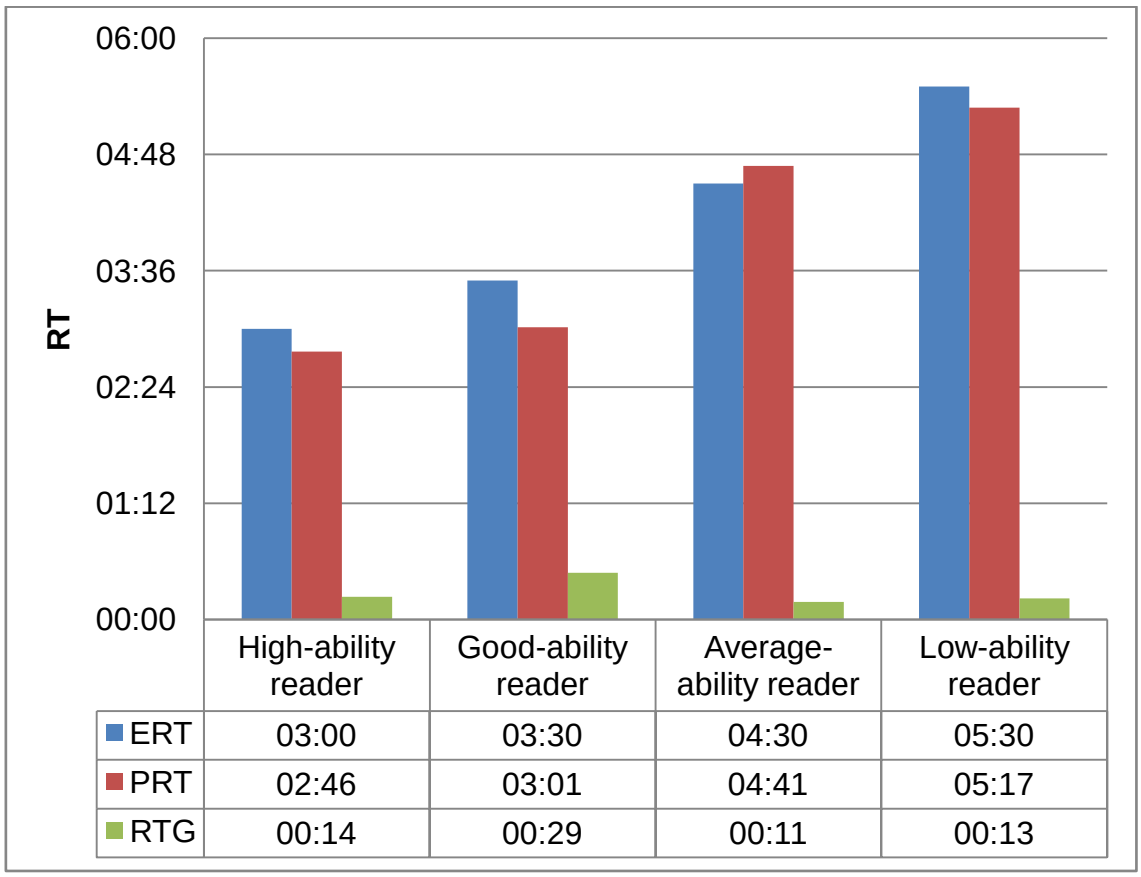
	High-ability reader	Good-ability reader	Average-ability reader	Low-ability reader
ERT	02:30	03:30	04:00	05:00
PRT	03:42	03:49	04:17	05:13
RTG	01:12	00:19	00:17	00:13

A <+1m RTG is noticed for the categories of good-ability reader, average ability reader and low ability reader while a gap of +1m12s is observed for the high-ability reader category. Figure 54 also demonstrates that BNP Readability Formulas estimate reading times lower than the participants' reading times with a very low difference. The PRTs increases through the four categories of readers confirming the negative correlation between the learners' ability level

and their reading times. Data in Figure 54 shows that the ERTs provided by BNP Readability Formulas match the PRTs for all categories of learners.

IV.4.6.2. Experiment 2

Figure 55. ERT, PRT and RTG of 4MS Experiment 2's participants.

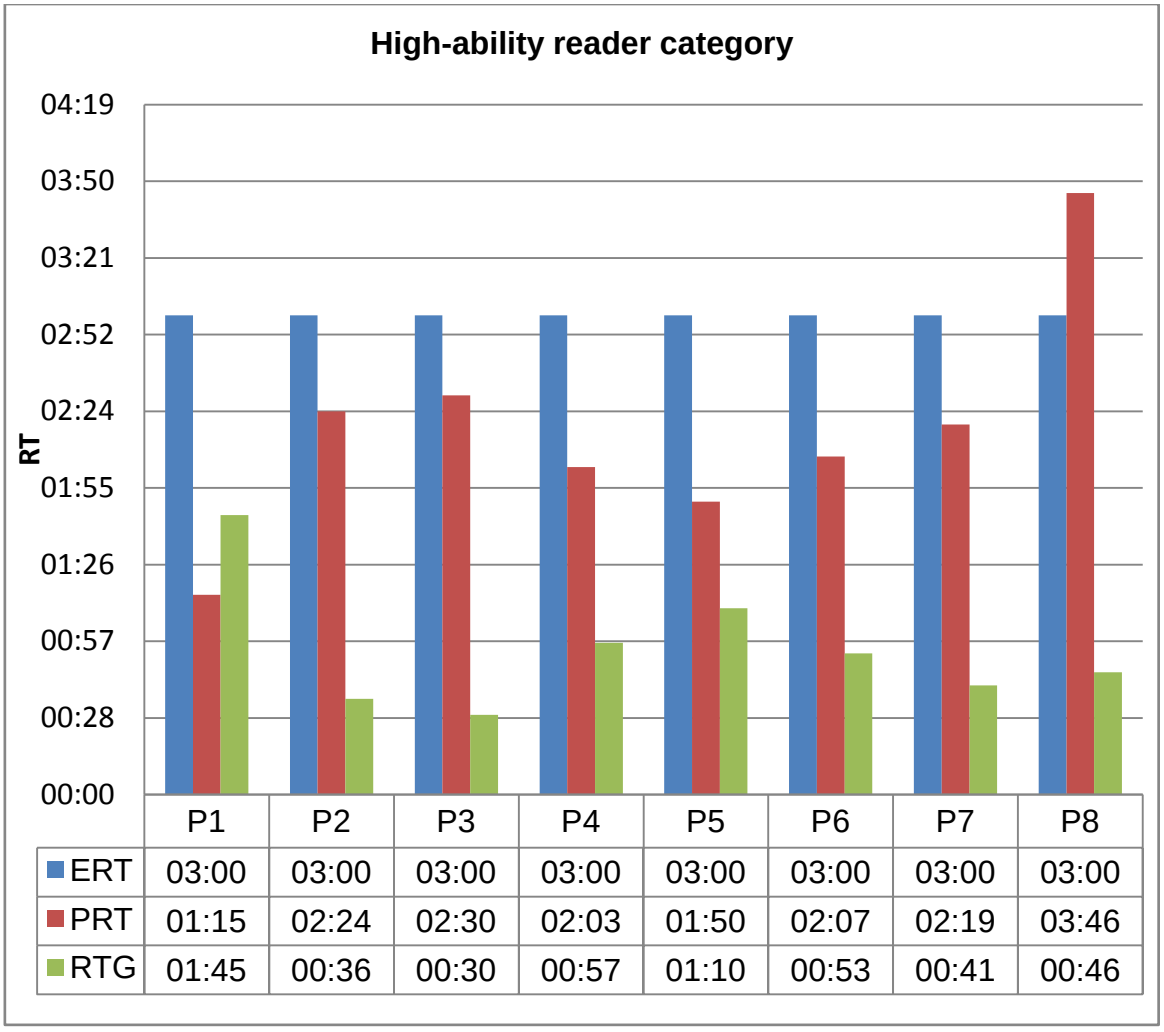


	High-ability reader	Good-ability reader	Average-ability reader	Low-ability reader
ERT	03:00	03:30	04:30	05:30
PRT	02:46	03:01	04:41	05:17
RTG	00:14	00:29	00:11	00:13

A RTG of <30sis observed for all categories of readers involved in Experiment 2. The negative correlation between the readers' ability level and their reading times is clearly noticed in Figure 55. Data provided by this Experiment confirms that congruency of BNP Readability Formulas' ERTs to the PRTs.

IV.4.6.3. Experiment 3

Figure 56. ERT, PRT and RTG of 4MS Experiment 3's participants



	P1	P2	P3	P4	P5	P6	P7	P8
ERT	03:00	03:00	03:00	03:00	03:00	03:00	03:00	03:00
PRT	01:15	02:24	02:30	02:03	01:50	02:07	02:19	03:46
RTG	01:45	00:36	00:30	00:57	01:10	00:53	00:41	00:46

Figure 56 shows that eight4MShigh-ability readers took part in Experiment 3. A <-1m RTG is noticed for 4 participants and a <-2m RTG for the other 4. The results of Experiment 3 confirm the effectiveness of the BNP Readability Formula for the 4MShigh-ability readers' in providing congruent ERTs.

IV.5. Conclusion

The analysis and testing of the LRMs training data reveal that the C-models are the best to adopt. First, ERTW is not affected by a change in the PSW-percentage in a text despite the effect this variable has on the text difficulty. Moreover, a significant increase in ERTSY and ERTC for texts with higher PSW-percentage is observed compared to texts with the same W-count with low PSW-percentage: the higher the PSW-percentage in a text, the higher the ERTSY and ERTC are. Furthermore, very good positive correlations are noticed for SY-models and C-models with low RMSEs. Finally, ERTSY is quite similar to ERTC for all MSLs and CAs. Thus, it is easier and more accurate to compute the C-count of the evaluated text on electronic devices, which will be used in the application of the formulas, than the SY-count.

The teachers' experimentations of BNP Readability Formulas confirm what has been discussed in previous chapters about the negative correlation between the learners' ability level and the reading time they need to read a given text. The lower the learners' ability level, the longer their reading times are. The experimentations also confirm the feasibility of BNP formulas in estimating approximate reading times for texts of different lengths that highly match the middle school target readers of different levels and categories. All teachers expressed their positive impressions of the website being a helpful scientific tool that can provide them with a framework for predicting the readability of the texts through estimating reading times. Additionally, most of the teachers are fully aware that other text characteristics should be taken into consideration as well as the learning objectives to be achieved in selecting appropriate reading texts. This point is clearly put in the general introduction of this research work.

General Conclusion

General Conclusion

Predicting the text readability of a reading text for the target readers has been the preoccupation of many readability researchers in the United States, resulting in the introduction of many readability formulas in different sectors, including education. Despite their efficiency in their application context, these tools cannot be adopted in the Algerian EFL context due to the many differences between the US and Algerian schooling systems and the target readers of both contexts. Therefore, this study aimed at investigating the best variables that can be adopted in designing a specific readability tool that combines both a linguistic characteristic of the evaluated text and a target reader's characteristic.

The examination of the reading texts of middle school textbooks confirms that neither length nor linguistic counts nor readability criteria were adopted by textbook writers in the selection of the reading texts. It also reveals that the word frequency variable was not given much importance despite its effect on the readability level of a reading text, especially that the target readers are beginner-level EFL learners (Dale and Chall 1948, Burmouth 1966, Dale and Chall 1995). Moreover, the polysyllabic word count is very low in the MSTs reading texts affecting their readability level. Furthermore, the linear developments of the variables of W, SY and C count are very consistent in all MSTs reading texts. In addition, the analysis shows that the lower the variables AWL, ASL and ASW are, the lower the estimated readability of the texts are too, which sustains the adoption of such variables in many readability formulas. Besides, a positive correlation is noted between these variables and the polysyllabic word count variable (SSW, DSW and PSW count) in predicting the readability of the reading texts. Therefore, the variables of the W, SY and C

count were thoroughly analysed to identify the best linguistic variable to adopt in devising BNP readability formulas for Algerian middle school EFL learners.

Algerian middle school EFL teachers are required to set, in their lesson plans, the estimated time for each classroom activity. However, it has been noticed that most teachers find difficulties in estimating the reading time that their learners need to read a text due to the differences in learners' reading abilities. The reading speed, therefore, was thought to be a good reader's characteristic that can be adopted in devising a set of formulas that estimate the reading time of a text and which will help teachers plan their lessons and select the appropriate reading texts for their learners. The second variable, i.e., the linguistic characteristic of the assessed text, was identified by training LRMs in WEKA software using the variables which have been described by readability experts as good readability indicators, mainly the word count, syllable count and character count.

WEKA training and prediction results demonstrated that the overall LRMs predictions are too low compared to low-ability readers and too high compared to high-ability readers, which induced the development of individual LRMs for each MSL category. In addition, very high positive correlations and low RMSEs are noticed for the character-based LRMs. Furthermore, a consistency is observed through the estimated reading times of the character and syllable-based LRMs despite the polysyllabic word-count differences in the sample texts compared to the estimated reading times predicted by the word-based LRMs. Moreover, the character-based LRMs estimate quite similar reading times to the ones estimated by the syllable-based LRMs. Besides, variance in estimated reading times across the MSLs and their categories confirm that the higher the MSL, the longer the estimated reading time is; and the lower the target reader's level of English, the longer the estimated reading time is. Hence, the character count, as a linguistic characteristic of the evaluated text, and the average reading time per character, as a target reader's characteristic, are proved to be

the best variables to adopt in BNP formulas to get the approximate estimated reading times of texts for the Algerian middle school EFL learners.

The testing of BNP Readability Formulas by different middle school teachers on learners of different schools and ability levels confirms the feasibility of the formulas in estimating reading times that match the middle school EFL target readers' school and ability level. BNP Readability Formulas are free of use and can easily be accessed on the website '**https://transfer.hft-stuttgart.de/pages/ulrike.pado/behira/'.** The website is hosted on the M4_Lab transfer portal of the University of Applied Sciences of Stuttgart in Germany (Hochschule für Technik Stuttgart).

Both textbook writers and classroom teachers can use BNP Readability Formulas in selecting and/or adapting appropriate texts that match the Algerian middle school EFL requirements, mainly time management. BNP Readability Formulas can also help textbook writers select reading texts to maintain gradation and consistency through MSLs and their textbooks. Additionally, teachers can use BNP Readability Formulas to select texts for both intensive and extensive reading sessions compared to other formulas that were proved to be efficient only for long texts that are not appropriate for intensive reading classes. It should be noted, however, that users of BNP Readability Formulas should take into consideration other non-measurable characteristics, such as sentence structure, abstractness and coherence, when selecting and/or adapting a reading text.

BIBLIOGRAPHY

Bibliography

I. Books

Bernhardt, E. 1991. *Reading Development in a Second Language: Theoretical, Empirical, and Classroom Perspectives*. New Jersey: Ablex.

Bormuth, J. R. 1971. *Development of standards of readability: Toward a rational criterion of passage performance*. Chicago: The University of Chicago.

_____. 1969. *Development of readability of analysis*. Chicago: The University of Chicago.

Caylor, J. S., et al. (1973), Methodologies for Determining Reading Requirements of Military Occupational Specialties, Human Resources Research Organization, Virginia, USA.

Chall, J. 1958. *Readability: An appraisal of research and applications*. Columbus, Ohio: Ohio State University Press.

Chall, J. & Conrad. S. S. 1991. *Should textbooks challenge students? The case for easier or harder textbooks.* New York: Teachers College Press.

Chall, J. & Dale, E. 1995. *Readability revisited: The New Dale-Chall Readability Formula*. Cambridge, Massachusetts: Brookline Books.

Cunningsworth, A. 1984. *Evaluating and selecting EFL teaching materials*. London: Heinemann Educational Books.

Dubin, F. &Olshtain, E. 1986. *Course Design: Developing programs and materials for language learning*. Cambridge: Cambridge University Press.

Dudley-Evans, T. & St John, M.J. 1998. *Developments in English for specific purposes: A multi-disciplinary approach*. Cambridge: Cambridge University Press.

Farr, R. 1969. *Reading: What can be measured*? Newark, DE: International Reading Association.

Flesch, R. F. 1943. *Marks of readable style*. New York: Columbia University.

_____. 1946. *The art of plain talk*. New York: Harper & Brothers Publishers.

_____. 1949. *The art of readable writing*. New York: Harper & Brothers Publishers.

_____. 1951. *How to test readability*. New York: Harper & Brothers.

_____. 1951. *The art of clear thinking*. New York: Harper & Brothers Publishers.

_____. 1954. *How to Make Sense*. New York: Harper & Brothers Publishers.

_____. 1955. *Why Johnny Can't Read—And What You Can Do About It.* New York: Harper & Row.

_____. 1962. *How to be brief: An index to simple writing*. New York: Harper & Row Publishers.

_____. 1964. *The ABC of style: A guide to plain English.* New York: Harper & Row.

_____. 1972. *Say what you mean*. New York: Harper & Row Publishers Inc.

_____. 1977. *A deskbook of American spelling & style*. New York: Barnes and Noble.

_____. 1979. How to Write Plain English: A Book for Lawyers and Consumers. New York: Harper and Row.

Gérard, F. M. and Roegiers, X. 2009. Des manuels scolaires pour apprendre: concevoir, évaluer, utiliser.Bruxelles: De Boeck Université.

Gilliland, J. 1972. *Readability.* London: Hodder and Stoughton.

Grant, N. 1987. *Making the most of your textbook*. New York: Longman.

Graves, K. 2000. *Designing Language Courses*. Boston, MA: Heinle & Heinle.

Gray, W. S. & Bernice E. L. 1935. *What makes a book readable.* Chicago: University of Chicago Press.

Gunning, R. 1952. The Technique of Clear Writing. New York: McGraw-Hill.

Harmer, J. 2007. How to teach English. Essex: Pearson Longman.

Harrison, C. 1980. *Readability in the Classroom*. Cambridge: Cambridge University Press.

Harwood, N. (ed.) 2010. *English Language Teaching Materials: Theory and Practice* .Cambridge: Cambridge University Press.

Hedge, T. 2000*. Teaching and Learning in the Language Classroom.* Oxford: Oxford University Press.

Hutchinson, T. &Waters, A. 1987. *English for Specific Purposes: A learning-centered approach*. Cambridge: Cambridge University Press.

Klare, G. R. 1963. *The measurement of readability*. Ames, Iowa: Iowa State University Press.

_____. 1980. *How to write readable English.* London: Hutchinson.

Madsen, H. S. & Bowen, J. D. 1978. *Adaptation in Language Teaching*. Rowley: Newbury House Publishers.

McCarthy, M. 1990. *Vocabulary*. Oxford: Oxford University Press.

McDonough, J., Shaw, C. &Masuhara, H. 2013. *Materials and Methods in ELT: A Teacher's Guide.* Oxford: Wiley-Blackwell.

McGrath, I. 2002. *Materials evaluation and design for language teaching*. Edinburgh: Edinburgh University Press.

Nation, I. S. P. 2009. *Teaching ESL/EFL Reading and Writing*. New York: Routledge.

Nunan, D. 1988. *Syllabus design*. Cambridge: Oxford University Press.

_____. 1988. *The learner-centred curriculum*. Cambridge: Cambridge University Press.

Richards, J. C., Platt, J. and Platt, H. 1992.Longman dictionary of language teaching and applied linguistics. London: Longman.

Ruiz, G. M. F., Palmer, S. J. C. & Fortanet, G. I. (eds.) 2010*. English for Professional and Academic Purposes*. New York: Rodopi.

School Renaissance Institute. 2000. The ATOS Readability Formula for Books and how it Compares to other Formulas*.* Madison, WI: School Renaissance Institute, Inc.

Sherman, L. A. 1893. Analytics of Literature: A Manual for the Objective Study of English Prose and Poetry. Boston: Ginn & Company.

Spache, G. 1974. *Good Reading for Poor Readers*. Champaign: Garrard Press.

Thorndike, L. E. 1921. The Teacher's Word Book. New York City: Teachers College, Columbia University.

Thorndike, E. L. and I. Lorge. 1944. The Teacher's Word Book of 30,000 Words. New York: Bureau of Publications, Teachers College, Columbia University.

Tomlinson, B. (ed.) 1998. *Materials Development in Language Teaching*. Cambridge: Cambridge University Press.

_____. (ed.) 2003. *Developing Materials for Language Teaching.* London: Continuum Press.

_____. (ed.) 2011. *Materials Development in Language Teaching*. Cambridge: Cambridge University Press.

Ur, P. 1996. *A Course in language teaching: Practice and theory*. Cambridge: Cambridge University Press.

Westwood, P. 2008. *What teachers need to know about reading and writing difficulties.* Victoria: Australian Council for Educational Research.

II. Articles

Anderson, N. 2003. "Reading" in Nunan (ed.) 2003.

Aslanian, Y. 1985. "Investigating the reading problems of English as a second language students: an alternative". *English Language Testing Journal 39/1: 20-27.*

Bensoussan, M. & Laufer, B. 1984. "Lexical guessing in context in EFL reading comprehension". *Journal of Research in Reading 7:* 5-32.

Bernhardt, E. B. 1984. "Toward an Information-Processing Perspective in Foreign Language Reading." *Modern Language Journal 68: 322–331*.

_____. 1986. "Proficient Texts or Proficient Readers?" *Association of Departments of Foreign Languages Bulletin 18/1: 25-28.*

Bernhardt, E. B. & Kamil, M. L. 1995. “Interpreting relationship between L1 and L2 reading: Consolidating the linguistic threshold and the linguistic interdependence hypothesis.” *Applied Linguistics 16: 15-34.*

Bogert, J. 1985. “In defense of the Fog Index”. *The Bulletin of the Association for Business Communication 48/ 2: 9-12.*

Bojar, K. 1984. “Let's not try to 'Determine' readability”. *Teaching English in the Two Year College 10/2: 149-53.*

Bormuth, J. R. 1966. “Readability: A new approach.” *Reading Research Quarterly 1: 79-132*.

Brown, J. D. 1997. “An EFL readability index.” *University of Hawaii Working Papers in ESL 15/2: 85-119.*

_____. 1998. “An EFL readability index”. *JALT Journal 20/2: 7-36.*

Brown, J. I. 1952. “The Flesch Formula through the looking glass.” *College English 13: 393-394.*

Caylor, J. S., et al. 1973. Methodologies for Determining Reading Requirements of Military Occupational Specialties. Technical report No. 73-5. Alexandria, VA: Human Resources Research Organization.

Chall, J. & Dale, E. 1948. “A formula for predicting readability.” *Educational Research Bulletin 27: 11-20*.

Coleman, M. & Liau, T. L. 1975. “A computer readability formula designed for machine scoring.” *Journal of Applied Psychology* 60: 283-284.

Dale, E., and Chall, J. S. 1948. “A Formula for Predicting Readability: Instructions.” *Educational Research Bulletin, 27*(2), 37-54.

_____. 1949.“The Concept of Readability.” *Elementary English, 26(1), 19-26.*

Davison, A. & Kantor, R.N. 1982. “On the failure of readability formulas to define readable text: A case study from adaptations.” *Reading Research Quarterly, 17/2: 187-209.*

Dolch, E. W. 1949. “The use of vocalulary lists in predicting readability and developing reading materials.” *Elementary English 26/3: 142-149.*

Dreyer, L. G. 1984. “Readability and responsibility.” *Journal of Reading 27/4: 334-338*.

Drury, A. 1985. “Evaluating readability.” *IEEE Transactions on Professional Communication PC 28/4: 11-14.*

DuBay, W. H. 2004. “The Principles of Readability.” Costa Mesa, California: Impact Information.

Duffy, T. M. & Paula. K. 1982. “Testing a readable writing approach to text revision.” *Journal of Educational Psychology 74/5: 733-748.*

Ellis, R. 1997. “The empirical evaluation of language teaching materials.” *ELT journal51/1: 36-42.*

Flesch, R. F. 1943. “Estimating the comprehension difficulty of magazine articles.” *Journal of General Psychology 28: 63-80.*

_____. 1948. “A new readability yardstick.” *Journal of Applied Psychology 32/3: 221-233.*

_____. 1948. “A readability formula in practice.” *Elementary Education 25/6: 344-351.*

_____. 1949. “A dissenting opinion on readability.” *Elementary English 26: 332-334.*

Fry, E. 1964. “Judging readability of books.” *Teacher Education 5: 34-39.*

_____. 1968. “A readability formula that saves time.” *Journal of Reading 11: 513-516.*

_____. 1977. “Fry's readability graph.” *Journal of Reading, 20: 242-252.*

_____.1987. “The varied uses of readability measurement today.” *Journal of Reading 30/4: 338-343.*

_____. 1989. “Reading formulas: Maligned but valid.” *Journal of Reading 32: 292-297*.

*Spache, G.1953. "*A New Readability Formula for Primary-Grade Reading Materials.*" The Elementary School Journal 53/7: 410-413.*

Graves, K. 2003. “Coursebooks” in Nunan (ed.) 2003.

Greenfield, J. 2004. “Readability formulas for EFL.” *JALT Journal 26: 5-24.*

Harris, A. J. & Milton. D. J. 1979. “A framework for readability research.” *Journal of Reading 22: 390-398.*

Heilman, M, et.al. 2007. “Combining lexical and grammatical features to improve readability measures for first and second language texts.” In *Proceedings of North American Chapter of the Association for Computational Linguistics: Human Language Technologies*, 460-467.

Hitoshi, N, et.al. 2013. “A Pilot Study on Readability Prediction with Reading Time.”*Proceedings of the 2nd Workshop on Predicting and Improving Text Readability for Target Reader Populations*, pages 78–84, Sofia, Bulgaria, August 4-9.

Hunt, A. & Belgar, D. 2005. “A framework for developing EFL reading vocabulary.” *Reading in a Foreign Language 17/1: 23-59.*

Hutchinson, T. & Torres, E. 1994. “The textbook as agent of change.” *ELT Journal 48/4: 315-328.*

Irwin, J. & Davis, C. 1980. “Assessing readability: The checklist approach.” *Journal of Reading 24:124-130*.

Islam, C. 2003. “Materials for Beginners” in Tomlinson (ed.) 2003.

Kevyn, C. T. 2014. Computational assessment of text readability: A survey of current and future research. ITL-International Journal of Applied Linguistics, 165(2):97–135.

Kincaid, J.P., et al. 1975. “Derivation of new readability formulas (automated readability index, fog count, and flesch reading ease formula) for Navy enlisted personnel.” Research Branch Report. 8–75. Chief of Naval Technical Training: Naval Air Station Memphis.

Klare, G. R. 1976. “A second look at the validity of the readability formulas.” *Journal of Reading Behaviour 8: 129-152.*

Laner, F. J. 1976. “Readability techniques for authors and editors.” *Journal of Technical Writing and Communication 6/3: 203-213.*

Littlejohn, A. 1998. “The analysis of language teaching materials: Inside the Trojan Horse” in Tomlinson (ed.) 1998.

Lively, B. A. and S. L. Pressey. 1923. “A method for measuring the 'vocabulary burden' of textbooks. Educational administration and supervision” 9: 389-398.

Lorge, I. 1944. “Predicting readability.” *Teachers College Record 45: 404-419.*

_____. 1949. “Readability formulae - An evaluation.” *Elementary English 26/2: 86-95.*

MacGinitie, W. and Tretiak. R. 1971. “Sentence depth measures as predictors of reading difficulty.” *Reading Research Quarterly 6*: 364-376.

Mason, R. 1984. “A readability primer.” *Teaching English in the Two Year College 10/2: 157-160.*

McClure, G. M. 1987. “Readability formulas: Useful or useless?” *IEEE Transactions on Professional Communication PC 30/1: 12-15.*

McConnell, C. 1982. “Readability formulas as applied to college economics textbooks”. *Journal of Reading 26/1: 14-17*.

_____. 1983. “Readability: Blind faith in numbers?” *Journal of Economic Education 14/1: 65-71.*

McLaughlin, G. 1969. “SMOG Grading: A New Readability Formula.” *Journal of Reading*, 12(8). 639-646.

Meade, C. D. and Smith, C. F. 1991. “Readability formulas: cautions and criteria”. *Patient Education & Counseling 17: 153-158.*

Noution, P. 2007. “Best Practice in Vocabulary Teaching and Learning” in Richards & Renandya (eds.) 2007.

O’Neill, R. 1982. “Why use textbooks?” *ELT Journal 36 /2: 104-111.*

Powers, et al.1958. “A Recalculation of Four Adult Readability Formulas.” *Journal of Educational Psychology*. 49/2: 99-105.

Selzer, J. 1981. “Readability is a four-letter word.” *Journal of Business Communication 18/4:* 23-34*.*

Smith, J. E. and Nora, P. S. 1971. “Readability: A measure of the performance of the communication function of financial reporting.” *The Accounting Review 46:* 552-561.

Solomon, N. W. 2007. “Strain Index: A new readability formula.” *Journalism Online Newsletter*. Retrieved on 13/06/2019 from www.ogg.osu.edu/media/documents/health_lit/STRAIN%20INDEX.pdf

Sowmya, V. and Detmar, M. 2012. “On improving the accuracy of readability classification using in- sights from second language acquisition.” In *Proceedings of the Seventh Workshop on Building Educational Applications Using NLP*, 163-173.

Spache, G. 1953. “A New Readability Formula for Primary-grade Reading Materials.” *Elementary School Journal* 53, 410-413.

Stevens, K. C. 1980. “Readability formulae and McCall-Crabbs standard test lessons in reading.” *The Reading Teacher 33: 413-415.*

Taylor, W. 1953. “Cloze procedure: A new tool for measuring readability.” *Journalism Quarterly 30: 415-433.*

VandeKopple, W. J. 1984. “Some pattern of information and the readability of texts.” *Teaching English in the Two Year College 10/2: 107-111.*

Vogel, M., and Washburne, C. 1928. “An Objective Method of Determining Grade Placement of Children’s Reading Material.” *The Elementary School Journal, 28*(5), 373-381.

Weller, O., et al. 2020. “You Don’t Have Time to Read This: An Exploration of Document Reading Time”, *Proceedings of the 58th Annual Meeting of the Association for Computational Linguistics*, 1789-1794.

Williams, H. S. 1984. “Alternatives to traditional readability formulas: Consider structure and texture.” *Teaching English in the Two Year College 10/2: 141-145.*

APPENDICES

APPENDIX I

First Year Middle School Institutional Textbook Reading Texts

TEXT 1: Page 41

Hello, my name is Razane. I am 11 years old. I am from Algeria and I live in Batna.
I am a pupil at Ben Boulaid Middle school. How about you?

TEXT 2: Page 41

Hi, I am Susan. I am 13.
I am from Great Britain and I live in London.

TEXT3: Page 59

My Blog

Hi everyone,
My name is Jack. I am 13 years old and I am new in this school. I am from Canada. My mother is from Scotland. I am in class 2B. I like basketball and listening to music.
I have got a pet hamster called Scruff.
Nice to meet you all.
Jack Smith

TEXT 4: Page 60

Hi! Razane,
My name is Adaku. I am 12 years old. I am from Nigeria. I speak English.
I like swimming. I like wearing blue jeans and sport shoes. My favourite food is rice and beans. I have got a pet dog called Max.
How about you?
Love,
Adaku

TEXT 5: Page 66

The **Williams family** has got a small brown dog.
The **Johnsons** family is a large English family. They have five children: two sons and three daughters. They have got a black and white dog.
The **Taylors** do not have a dog. They have a white and black cat.
The **Wilsons** have got two daughters and one son. They have a brown and a black pet dog.

TEXT 6: Page 80

Hello!

My name is Younes. I am 11 years old. I am a pupil at Ben M'hidi Middle School.

I get up at 6:30 a.m. I wash my face, have breakfast and get dresses. At 7:30 a.m, I go to school. I arrive early to clean the whiteboard and arrange the chairs and the tables of my classroom. My first lesson begins at 8:00 a.m. we have break time from 9:30 a.m until 1:00 a.m. during break time, I play games with my friends. I return back to class for another lesson until 12:00. in the afternoon, lessons begin at 1.:0 p.m and end at 4:30 p.m. At 5:00 p.m, I watch TV and drink milk. At 6:00 p.m, I do my homework. At 9:00 p.m, I go to bed.

At the weekend, I visit my grandmother who lives in the countryside. I water her trees and feed her pets. She has a cat and a dog.

TEXT 7: Page 85

Hello! I am Margaret. I am 11 years old. I am a pupil at Welcome Primary School.

I get up at 7:30 a.m, wash myself, get dressed and have breakfast.

School begins at 9:.00 but I get there early and chat with my friends in the playground until the bell rings at 8:50. At 9:00, we all go into the hall for assembly. We then have lessons, Maths and English, until 10.30 when we have a break. The next lesson begins at 10:50 and lunch time is from 12:15 to 1:15 p.m. Afternoon school is from 1:15 to 3:15. We have a short break in the afternoon. Two days a week, I stay after school for clubs. When I get home, I have tea then I do my homework on the school's website. At 6:00 p.m I watch TV before I go to bed at 9:00. On Saturday morning, I attend ballet classes and in the afternoon, my family goes for a walk in the countryside.

TEXT 8: Page 90

Dear friend Younes,

I hope you are fine. I am happy to know about daily activities.

My mother wants to know about your mother's daily activities.

Please let us know what she does everyday.

My regards to your parents,

Margaret

Text 9: Page 116

My Ideal School

My ideal school is a school where honesty, responsibility and respect are values. I am responsible and respectful.

My ideal school is my home. It gives me instruction, education and care. It is a place where I can make friends all over the world.

I share my ideas with them to build a more peaceful world.

My ideal school is a free open space where reading is a pleasure.

My ideal school is a space where I can elect my representatives.

It is a school of initiative, success and excellence.

My ideal school is my family. It is a place where I express my opinion and listen with respect to my teachers and classmates.
My ideal school is a garden where I plant trees and flowers.
My duty is to love it, keep it clean, and decorate it with pictures of my beautiful country and its national heroes.
My ideal school is a school of values and happiness where the Algerian flag is always up.

(The Course Book Authors)

TEXT 10: Page 136

I sing a song about my homeland,
A song I call << I love my true>>,
The sea, the mountain and the sand
Algeria, is the rose with the morning dew
I work hard for you, I never, never stop,
Algeria, my country, the best and the top.
Stand up classmates, greet her and say:
Algeria, my country you're the sun of my day

(The Coursebook Authors)

Text 11: Page 139

Hello!
My name is Algeria. My North is beautiful with its forests. In winter, my North is amazing with its snowy mountains: Tikjda, Chelia and Chrea.
I am an open book where you can learn a lot from me: Roman ruins in Djemila, Timgad and Tippaza. In my West near Tiaret, you can see the Amazigh Jeddar tombs. They teach about my ancient history. Not far from M'sila, there is Al Qal'a of Beni Hammad. My fantastic South is an open museum famous for the TassiliN'Ajjer paintings and the wonderful Assekrem sunset. Do you like splendid Islamic architecture? Visit Ketchawa mosque in Algiers and Beni Isguen in Ghardaia. Don't forget your camera! You love the sun, the sea and mountains? Visit Jijel is the right placeto visit. You want to admire the beauty of a city with suspended bridges? Costantine in my East welcomes you with its special Malouf music. Couscous is my national dish. I invite you to taste it wherever you are: in my East, my West, my North or my South.
Enjoy yourself!

(The Coursebook Authors)

APPENDIX II

Second Year Middle School Institutional Textbook Reading Texts

TEXT 1: Page 37

Me and My Magic Cube

Tue. 10th Jan.

Hello, everybody. This is the first time I create a blog and post something on it. So, I am going to talk about myself because many people from different parts of the world do not know me.

My name is Mohamed Islam Bouhafs. I am 12. I live in Batna. My father is a journalist and my mother is a teacher. I have got one brother and two sisters. I am tall and slim. I have got dark hair and black eyes. My friends say that I look handsome. I don't know.

I can solve the Magic Cube in thirty seconds. Every day, I train myself on the cube for one hour because I am getting ready for the International Magic Cube Championship.

I live with my grandparents. Every weekend, I visit my aunt and uncle to play with my cousins. I love them very much because they are kind and nice to me.

Mohamed Islam Bouhafs

www.blog.medbouhafs

TEXT 2: Page 44

My Best Friend

My best friend is called Ernesto, and he is my classmate. We go to school together.

Ernesto comes from an educated family. His father is a school principal and his mother is a teacher. He is punctual, well-educated, and has good manners. He is friendly, clever and really hardworking. He always does his homework. He is also well- dressed and well-behaved. All the teachers have a high opinion of him.

Ernesto has a well-built body; he is tall and slim and has small blue eyes and curly brown hair.

He takes part in all sports, scout and mountaineering activities and he also likes to play the guitar. He has a good heart. He is truthful, honest and obedient.

Ernesto makes his parents very proud of him. He secures good marks and is usually top of his class in examinations. He inspires me to work harder. He keeps me away from bad company. I am happy to have such a friend.

Andrés Diaz

April 26th 2012

TEXT 3: **Page 68**

I have two teenage children who love shopping for clothes. They go to the mall with their friends every Saturday.

On school days, my son, Stan, likes to wear blue jeans and T-shirts. He only wears a suit on formal occasions like wedding or funerals. He feels comfortable wearing a jacket but not a tie. My daughter, Lily, likes to wear pants. She wears a dress or a skirt and blouse for parties or dinners. She doesn't feel comfortable in high heeled shoes and loves wearing casual and sporty clothes.

In winter, my children wear coats, hats and gloves on cold days. When they go skiing, they put on toques and mittens. My son doesn't like rainy days because he has to wear a raincoat and carry on an umbrella. My daughter loves to wear a scarf.

In the summer, Lily and Stan usually wear shorts, caps and sandals to the beach. Sometimes on weekends, we go walking in the mountains so they wear hiking boots and thick woollen socks to protect their feet and toes.

Today is Saturday; my children come home with a bag of clothes each: two sweaters and a pair of leather shoes for Stan. For Lily: a black belt to wear with her blue dress, a pair of grey pants, a matching jacket and a green blouse.

My children have no problem spending money. They think money grows on trees!

Adapted from:

http://esldivlabs.vcc.ca/

TEXT 4: Page 74

HOW PARENTS CAN HELP TEENAGERS MANAGE THEIR MONEY

Sharing responsibilities with your kids

It is important that teenagers recognize the value of money and understand that t is not an unlimited resource. Giving them the freedom to manage their own budget will teach them valuable lessons about only spending what they can afford. You can send them out to do some grocery shopping with a list and strict budget.

Pocket money and budgeting

For many people, pocket money is the first taste of financial responsibility. Providing your teenager with a regular, set amount of money and responsibility of paying for something (like refilling their mobile phones) gives them their first opportunity to practice how to say within a budget.

Developing a savings habit

Learning about the importance of saving an important part of adult life. This means encouraging your teenagers to put aside small amount of money every week to buy clothes. If your teenager is trying to save up for a large purchase, or simply wants some extra spending money, one option is to find a part-time job.

Adapted fromwww.monyadviceservice.org.uk

TEXT 5: Page 94

Healthy Dietary Recommendations

Some of the tastiest and most delicious foods also happen to be some of the most fattening and unhealthy. Here are some foods you should avoid eating excessively or all the time if you don't want to become overweight and obese, or have diabetes and other dangerous chronic illnesses.

1.Chocolate, sweets (or candies), cakes and pastries are fattening and sugary. Eat them with moderation, not every day.

2.Sugary drinks, like sodas, are full of sugar and calories, and have no nutritional value. Even lite sodas are not good for health. Drink water and herbal teas (infusions) instead.

3.Fast food like pizza, shawarma sandwiches, hamburgers and panini are full of cheese and meat, which in turn contain lots of fat and salt. Any fast food meal is usually served with chips, mayonnaise and ketchup, which are fattening because chips are oily (greasy) and salty, mayonnaise is full of fat and ketchup contains a lot of sugar. Avoid eating out at fast food restaurants. Eat at home instead. Eat more salads, fruit and vegetables. Have balanced and healthy meals on a regular, daily basis.

4. Salted peanuts, crisps andcrackers contain too much salt, which is very bad for your health. Avoid eating too much salty food. Do not add salt to your food: it's already salted!

Parts of this text are adapted from :http://www.mydiet.com

TEXT 6: Page 98

Hello, Nadia!

You asked me last time to send you a copy of my diet plan but I can't find it anywhere. Anyway, I can remember almost everything Dr Sandgate wrote. She recommends that a typical daily menu should be balanced, and include a salad at lunch (tomatoes, lettuce, olive oil and lemon) and a vegetable soup at dinner. One grilled turkey escalope for lunch on Monday, Wednesday and Friday and one grilled chicken leg for lunch on Tuesday and Thursday. Grilled fish for dinner at weekends. At lunch, I can take two boiled eggs instead of meat. Two vegetables as side dishes every day at lunch and dinner (peas, carrot, green beans, cabbage or spinach). For dessert, I have to eat one fruit after each meal (apple, orange or strawberry). I have the right to eat one slice of whole meal bread at each meal. I can drink only water or herbal teas.

Every day, I have to breakfast on tea, cereals with skim milk and fresh-squeezed lemon or orange juice.

Oops! I forgot about the hardest part of this diet: exercise! I have to go to the gym every afternoon after school and do stretching for one hour, plus riding the stationary (exercise) bike for half an hour. At weekends, I have to go jogging in the park near my home for one hour every morning. You and I can say bye to ketchup, mayo, chocolate and cheesy snacks!

Keep in touch,

All the best,

Amy

TEXT 7: Page 132

An Unforgettable Journey to the South of Algeria

Itinerary (Part 1): London-Tassilin'Ajjer

Day1

We'll depart via London and Algiers to Biskra on scheduled flights. We'll arrive in Biskra late in the afternoon. The airport bus will transfer the group to the town youth hostle, where we'll have dinner and stay for the night.

Day 2

We'll exploreBiskra in the morning. The town is situated 400km southeast of Algiers. The Ziban capital has a long history marked by Berbers, Romans, Arabs, Turks and French. The old souk is well known for its spice shops. Tourists can still see traditional mudbricks houses with small doors and windows, scattered in the middle of palm groves in Old Biskra. In the afternoon, our guide Ahmed will take us to Togla, an oasis located 36km to the west of Biskra and famous for the quality of its dates called "degletnur". After dinner, two vans will drive us to Ghardaia, where we'll spend the night in a local school dormitory. *(to be continued*)

Peter Smith,
editor-in-chief The Online School Magazine
www.londondchoolmag.edu.uk

TEXT 8: Page 133

An Unforgettable Journey to the South of Algeria
Itinerary (Part 2):
London-Tassilin'Ajjer

Day 3

We'll explore Ghardaia in the morning in the company of Mohamed, our local guide. The M'zab capital was founded in 1048. It is situated 5470km southwest of Biskra. It is built on a hill. The old medina is beautiful with its souk marketplace), its arcades, its whitewashed and red sandstone houses, and its typical old mosque minaret. In the afternoon, we'll visit Ben Isguen, one of the five oases of the M'zabValley. We'll have "mechoui" (whole barbecued lamb) in a palm grove. Don't forget that M'zab is a UNESCO World Heritage site.

Day 4

A coach will take us to El -Oued early in the morning. Souf Valley is situated about 450km northeast of Ghardaia. "The city with a thousand domes" is surrounded by palm groves and sand dunes. Old houses and buildings in Souf have domes instead of flat ceilings or roofs. This keeps the temperatures cool in summer. In the old souk, many traditional craft shops sell traditional rugs with different shapes, sizes, colours and prices. Omar, our Soufi guide, will show us around all these interesting places. The weather will be nice and sunny on days 3 and 4. (*to be continued*)

TEXT 9: Page 134

An Unforgettable Journey to the South of Algeria

London-Tassilin'Ajjer(*continued)*

Posted on Jan. 10

By the end of the fourth day, our group flew south to Tamanrasset, the capital of the Hoggar (1.700km far from El- Oued), where we spent the night at a youth hostel. In the morning, our Tuareg guide Hamza took us on a tour in the old town with its souk, its old re mud-brick houses and its silversmiths making and selling Tuareg jewellery like the famous pendant "Agades cross". After lunch, we visited the Hoggar Museum, which displays Tuareg clothing, swords and daggers.

On the sixth day, Hamza organized for us a caravan to Assekrem and Mount Tahat, the highest mountain in Algeria (2.918m). Riding camels was an awesome experience! After a long journey to the north (about 86km), we arrived at Mount Tahat. It was sunset. We took some beautiful photos and camped there for the night. The next morning, we rode southeast for about 20km to Assekrem. The view was splendid! We spent the rest of the day and night there. The nights are quite cool in the desert but it's warm in daytime. In the morning, we drove back to Tamanrasset in 4WD vehicles. *(to be continued)*

TEXT 10: Page 136

My Diary

Tues.30 Dec.

A morning flight took us from Tam to Djanet (700km to the northeast). We visited Djanet, "the pearl of the Tassili", with its 16th century "Ksar" and beautiful palm groves. The weather was cloudy that day and a bit windy.

Wed. 31 Dec.

Sunny day! We drove northwest to the Tassili National Park, a UNESCO World Heritage Site that hosts endangered fauna and flora like the Saharan cheetah and cypress tree. We camped in the lovely oasis of Essendilen (50km northwest) with its palm grove and splendid gorge. We returned to Djanet at night to celebrate New Year's Eve.

Thu. 1 Jan.-Fri.2 Jan.-Sat.3 Jan.

After a good night's sleep, we trekked to the amazing gorge of Oued Tafilalet (12Km east of Djanet). Donkeys carried our food and water, bags and tents. On Friday, we walked to Tamrit plateau and Valley (only a few kilometres to the northwest), where we admired beautiful rock paintings of antelopes and the endangered cypress trees ("tarout" in Tamachek, the Tuareg Berber language). On Saturday, we continued our trek to Sefar (14 Km to the northwest) an open-air museum or prehistoric rock paintings and engravings depicting animals and hunters. This was our last night in the Sahara! What a wonderful trip!

TEXT 11: Page 143
Text 1

What is a "World Heritage Site"?

Heritage is our legacy from the past, what we live with today, and what we pass on to future generations. Our cultural and natural heritage are both irreplaceable sources of life and inspiration.

What makes the concept of World Heritage exceptional is its universal application. World Heritage sites belong to all the peoples of the world, irrespective of the territory on which they are located.

The United Nations Educational, Scientific and Cultural Organization (UNESCO) seeks to encourage the identification, protection and preservation of cultural and natural heritage around the world.

http://www.unesco.org

TEXT 12: Page 143
Text 2

CHINESE "TULOU"

Traditional Communal House

The Tulou are earthen square or circular houses constructed between the 15th and 20th centuries over 120 Km south-west of Fujian province, China.

The Tulou are several storeys high, housing up to 800 people each. They were built for defence purposes around a central open courtyard with only one entrance and windows to the outside, above the first floor.

The houses functioned as village units and were known as "a little kingdom for the family". They have tall fortified mud walls capped by tied roofs. The buildings were divided vertically between families with each disposing or two or three rooms on each floor.

Adapted from:http://www.unesco.org

TEXT 13: Page: 144
Text 3

TIN HINAN
A Tuareg Queen

She was born in the Tafilalt (Morocco) in 4th century CE (…) What reason could have made her decide to leave her native Berber and in the North (…) and settle west of Tamanrasset, in Abalessa in the Hoggar? (…)

In 1925 two archaeologists entered the chamber of the dead princess (…) She wore seven silver and seven gold bracelets on her left wrist (…) Near her, dates and fruits were placed in baskets (…) Her skeleton was taken to the (Bardo) museum of Algiers.

Adapted from: Assia Djebbar. So Vast the Prison. Seven Stories Press,1999.

TEXT 14:Page 144
Text 4

TASSILI ROCK ART
Painting and Engravings

The Tassilin'Ajjer site (72.000 sq. Km) has one of the most important prehistoric cave art in the world. More than 15.000 drawings and engravings describe the climatic changes, the animal migrations and the evolution of human life in the Sahara since 10.000 BC, when the Sahara was green and wet. Wind and water sculpted amazing "forests of rock" and impressive gorges. From 10.000 BC to the first centuries of our era, successive peoples left many engravings and paintings of herders, hunters, wild animals and cattle, and even horses.

Adapted from:
http://www.unesco.org

APPENDIX III

Third Year Middle School Institutional Textbook Reading Texts

TEXT 1: Page 30

A Little Prince

(…) This little prince was awarded the first prize of the Arab Reading Challenge competition by a great prince, the Emir of Dubai (…)

Our little prince's name is Mohamed Farah Djeloud, who managed to stand out from the 3.5 million candidates after being listed among the 240 finalists in Dubai. With much encouragement from his modest family, the seven-year-old Algerian champion read some 50 books and even wrote a small one!

He was offered a $150.000 cheque to finance his higher education in the presence of the Algerian Minister of Education at Dubai Opera (…)

Ferhani Ameziane "le Petit Prince", El Watan 5 Nov, 2016.

(Adapted translation from French)

TEXT 2: Page 31

Mohamed Farah's Speech at the Arab Reading Challenge Award Ceremony in Dubai

"I read so that I can learn. I'm a pupil who is very keen on reading because reading is necessary for my mind, just like the food I eat, or the water I drink, or the air I breathe. Reading is the mind's food. It is a religious obligation, not just an extra, superficial activity as the winter Abbas Mahmud al-Aqqad once said.

Reading is a criterion for evaluation nations. The Greek philosopher Aristotle was once asked: "How can you evaluate a man?" He replied, "I ask him about what he reads and how many he can read."

What makes me interested in reding is a sacred dream, one that can't be fulfilled without reading. My dream is to become a great scholar, like Sheikh Abulhamid Ibn Badis" (…)

(Source for video: Dubai Media Office 24 Oct,2016 http://twitter.com/DXBMediaOffice)

TEXT 3: Page 32

SOCIETY

Reading can lead to an intellectual revolution in the Arab World, judge says.

Published: 18:19 October 24, 2016

Jumana Khamis, Staff Reporter

Duabi:(…) the second grader, who travelled over 30 hours to attend the closing ceremony, told *Gulf News* he is very happy to have won the competition and is very grateful to his parents who encouraged him to read.

(…) Reading 50 books for the competition. Jalood said his favourite book is an Arabic book called *The Cave Man and the Stone Age.*
(…) "It's a dream, it's a drea," said Jalood's father when asked about his son's accomplishment. "Mohamed has been always so smart and quick to understand and analyse books. He is quite active and has an imagination that he develops through reading. He's also very much into Karate,'' said the proud Dad.
(…) Palastenian teacher Hanan Al Hroub (…) attended the award ceremony as a judge (…) "Reading books expands children's thinking, their ability and knowledge. When you read, you have knowledge, you are strong, and you can do more." She said.

(Adapted from: http://gulfnews.com)

TEXT 4: Page 34

Save the Imzad

The Last Four Imzad Players"*The Imzad is for the Tuareg what the soul is for the body." Said Hadj Moussa Akhamok in 2003 when he offered me an imzad.*Imzad is a one-string fiddle or violin played with a bow. Because of modern life the imzad, and all the culture that goes with it, is dying. Only a few old ladies who can play this ancestral instrument are still alive. They are dreaming of transmitting their knowledge to the whole world. (…)
Tuareg culture can continue to exist thanks to these women's perseverance (…) The *"Save the Imzad"* association aims at contributing to preservation of the Imzad as an expression of culture and identity.
(Farid Sellal, ''Les4 dernières joueuses d'imzad''
Adapted translation from French www.imzadanzad.com)

TEXT 5: Page 35

Dar Imzad
A Home for Ancestral Culture
(founded in Jan.2004)

There are three scools that provide training in imzad in Algeria: Tamanrasset, idles and Tin-Tarabine (more than 100 Km north and east of Tamanrasset, respectively).
Dar Imzad in Tamanrasset hosts a school where young Tuareg girls can learn how to play the imzad. The last old imzad lady players are their teachers.
It also hosts workshops where these Tuareg girls can make their own imzad thanks to other old Tuareg ladies, who teach them how to do it.
The young students are also trained by other teachers in Tifinagh (Tuareg Alphabet), traditional culture and imzad songs and poetry. They can also learn how to use the computer.
Dar Imzad provides a recording studio where Tuareg music, both traditional and modern, is recorded.
(Translated from French Materials adapted & collected from:
www.imzadanzad.com)

TEXT 6: Page 43

Rudyard Kipling (English writer & poet. Nobel Prize. 1865-1936)

If

If you can wait and not be tired by waiting.
Or, being lied about, don't deal in lies.
Or being hated, don't give way to hating (…)
If you can dream- and not make dreams your master.
If you can think- and not makethoughts your aim (…)
If you can talk with crowds and keep your virtue.
Or walk with kings- nor lose the common touch (…)
If all men count with you, but none too much (…)
Yours is the Earth and everything that's is in it.
And- which is more you'll be a Man, my son!

(Adapted version from: http://public-domain-poetry.com)

TEXT 7: Page 45

Al- Hadja Fatma on her way to school

Blida- At 73 al-Hadja Fatma can be proud of being a perseverant woman. She went to school and defeated ignorance. She told APS (Algeria Press Service) of her 20-year -old love story with the Arabic Language when she went to the pilgrimage to Mecca: " I felt really sad when an Indonesian woman offered me a copy of the Quran. She didn't know of my inability to read".

Today, al-Hadja is getting ready for her final year primary school exam. She also plans to take the baccalaureate exam: "I wish time could stop! I would get more degrees." She is now extremely proud to say: "I can read and write!" She is asking illiterate old people to go to IQRA schools to learn how to read and write.

(Adapted translation from French Algeria Press Service.15 Apr,2016 http://www.aps.dz)

TEXT 8: Page 66

Djemila: The Roman "Cuicul"

I visited Algeria for the first time **thirteen years ago**, in the spring of 2004 to be more precise. Djemila (60km northeast of Setif) was the first of the great Roman cities on my itinerary. It was declared a UNESCO World Heritage Site **thirty-six years ago.** Roman Empire Nerva, who ruled from 96 to 98 AD, founded the city **about two thousand years ago.** The major buildings that survive today include the temple of Emperor Septimus Serverus, the Grand Baths, the theatre and the Triumphal Arch. 20.000 people lived in the city in the 3rd century AD. During its history, the city was badly damaged by earthquakes until finally it was abandoned **fifteen centuries ago.**

(http://www.algeriaemb.org.au/FORGOTTENTREASURESOFALGERIA.htm)

TEXT 9: Page 73

After a ten-hour journey in Wagonette drawn by three mules, I was glad to see the town of Setif standing on bare hills in the middle of a plain. No

habitations were near, save a few Arab tents and gourbis. On entering **the town**, my eyes were refreshed by the pretty gardens and boulevards of Setif, which is still, as it used to be in the time of the Romans, a military station of great importance. There are about 3.000 French soldiers in the garrison of the town, **today** (…) The open-air museum, in which we are really interesting relics, is on the common promenade, and the children amuse themselves knocking off the noses and the fingers of the statues.

Under the Romans, Setif was called Sitifis Colonia, and was the capital of Sitifia Mauritania. In the Middle Age, Arab traveller EL-Bekri described the cotton plantations and corn-fields that used to flourish in this plain. But under the Turkish Government it decayed and its agriculture vanished (…) An important Arab market is still held there everySunday, at which 8.000 natives attend.

(Adapted from: C.S. Vereker, Scenes in the Sunny South, Longmans, Green& Co., London, 1871)

TEXT 10: Page 74

I never saw any place the position of which struck **me as so** magnificent as that of Constantine. It is built on a high plateau round which rushes a rapid river, called the Rhumel. It is called by the Arabs 'Belad-el-Haoua' (the City of the Air).

Constantine is divided into two distinct towns, of which I need not say that the Arab is the only one which is interesting. The streets are excessively narrow; the different trades live each in **their** separate quarters. There is one for shoemakers, another for workers in leather, another for jewellers, and so on for bakers, butchers, and all other trades (…)

We walked through a narrow passage just behind our hotel (Hotel d'Orient), and came into a court, round which were a number of little rooms in which were squatted the weavers of burnouses and haiks are annually woven in Constantine alone. The dearest and most beautiful are the gandouras, which are a mixture of silk and wool **they** are only worn by the higher classes (…)

Leaving the burnous court, we walked on to the shoe bazzar, where every description of bright-coloured leather shoe and slipper (rihyia or babouche) was being embroidered. It is impossible to describe in words the beauty of these Eastern bazzars.

(Adapted from: Lady Herberi, A Search after sunshine. Spottiswoode& Co., London, 1871)

TEXT 11: Page 82

An Algerian Artist

Alphonse-Étiennen Dinet was born in Paris on March 28,1861 and died on December 24, 1929 in the same city. From 1871, he studied at the Lycée Henry IV. Upon graduation in 1881 he enrolled in the École nationale supérieure des Beaux-Arts. Dinet made his first trip to BouSaàda in southern Algeria in 1884. The following year he made a second trip on a government scholarship, the time to Laghouat. At that time he painted his first two Algerian pictures: " Les Terrasses de Laghouat" and "Oued M'Sila après l'orge". He won

the silver medal for painting at the Exposition Universelle in 1889. In 1903 he bought a house in BouSaàda and spent three quarters of each year there. He announced his conversion to Islam in a private letter of 1908, upon which he changed his name to Nasr'Eddine Dinet. In 1929 he and his wife undertook the Hajj to Mecca. The respect he earned from the natives of Algeria was reflected by the 5.000 who attended his funeral on 12 January 1930 in BouSaàda.

(Adapted from: http://www.goodreads.com)

TEXT 12: Page 99

The ancient Greeks thought **our** eyes emitted rays, like a laser, **which** enabled **us** to see. The first person to realise that light enters the eye, rather than leaving **it** , was the 10th -century Muslim mathematician, astronomer and physicist ibn al- Haitham (965-1040).

He invented the first pinhole camera after noticing the way light came through a hole in window shutters. The smaller the hole, the better the picture, **he** worked out, and set up the first camera Obscura (from the Arab word "*qamara"* for a dark or private room). His findings provided a basis for modern optics (i.e. the study of light and sight).

(Adapted from:Paul Valley, "How Islamic Inventors Changed the World" The independent,11 march 2006**)**

TEXT 13: Page 99

Many modern surgical instruments are of exactly the same design as **those** devised in the 10th century by a Muslim surgeon and physician called al-Zahrawi (936-1013). **His** scalpels (small knives), bone saws (used for cutting), forceps (with two long parts used for picking up and holding things), scissors and many of the 200 instruments he devised are recognizable to a modern surgeon.

It was he **who** discovered that catgut used for internal stitches dissolves away naturally (a discovery he made when his monkey ate **his** lute stringed) and that **it** can be also used to make medicine capsules.

(Adapted from:Paul Valley, "How Islamic Inventors Changed the World" The independent,11 march 2006**)**

TEXT 14: Page 110

What an observer sees and hears during the day:

The crescent moon travels from left to right on the frieze, and when in between two doors the upper door opens to reveal a figure of a man. Soon after, the two flacons will tilt forward and spread their wings, and a ball will drop out of their beaks and into the vase. The observer will hear a cymbal like sound, and both falcons will back to their original position and close their wings. When the 6th door opens, the musicians will begin to play their instruments: the drummers beat their drums, followed by the trumpeters.

What an observer sees and hears during the night:

At the beginning of night, light will begin to show through the first glass roundel and the crescent moon will again be moving from the left to the right of the observer. When it is midnight, the crescent moon will be between the sixth and

seventh door, and the sixth door figure will fall and open the door. This will trigger the mechanism for the musicians to play. The only play twice during the night, at midnight, and at daybreak, which coincides with the opening of the twelfth door.

TEXT 15: Page 139

WHY LEARN ABOUT LITTER?

There are health risks associated with litter, such as the carriage of disease to young children. Litter ruins the look of our environment, kills wildlife and causes fires. Discarded food, such as apple cores and banana skins, attracts rats and mice. Knowing this will change the behavior of people in Scotland for generations to come, ensuring that we keep Scotland beautiful.

LITTER IN SCHOOL

A playground that is covered in litter makes parents and visitors think that pupils don't care about the buildings, the grounds or each other. If children work and play in a littered school, it doesn't encourage **them** to put their own rubbish in the bin. Many schools have given rewards to pupils **who** have helped with tidying **their** classrooms or schoolyard at the end of the day.

LITTER IN THE COMMUNITY

Pupils often involve themselves in working with neighborhood residents to clean up these areas just beyond the schools site. **They** should regard litter clearing as a positive environmental action- not as a punishment. **They** should also understand that litter prevention improves the environmental quality of the school and **its** neighborhood. In many Scottish towns and villages, pupils have conducted a litter pick in neighbouring streets and asked the council to add more bins. Organizing a regular litter pick in the community gives young people an understanding that the litter problem and putting litter in the bin doesn't just happen in school but should happen everywhere.

(Adapted from: http://keepscotlandbeautiful.org)

TEXT 16: Page 140

In Search of the Elusive Saharan Cheetah

Sarah Durant, Zoological Society of London. January 28,2015

I am travelling through the magnificent red mountains and sandy plains in the Hoggar National Park in south central Algeria, with my PhD students, Farid Belbachir and AmelBelbachir-Bazi. We' re setting up the first surveys of cheetahs here.

The Saharan cheetah is classed as a separate subspecies – *Acinonyx jubatushecki*. it is a carnivorous mammal with an average lifespan of 0-12 years. **It** has a more "doglike" face with a pointed muzzle and sharp facial features compared with its sub- Saharan relatives – **who** appear distinctly round-faced and thick necked in comparison.

Surveying these immense landscapes is not an easy job. **We** used 40 camera traps, each 10 km apart, to cover a total area of 2.600km2. after 2-3 months, we were successful in capturing 32 precious photographs suggesting

that the Saharan cheetah were also likely to be nocturnal, unlike their largely diurnal sub-Saharan cousins.

There has been a dramatic decline in Saharan wildlife over the course of the 20th century. **Today,** only 250 Saharan cheetah are thought to remain, and the subspecies is listed as Critically Endangered by IUCN. The future of Saharan cheetah hangs in the balance. Surely**we** will lose something of the magic of the spectacular landscapes of the Sahara if **we** allow the cheetah to disappear.

(**Adapted from: http://nationalgeographic.com**)

TEXT 17: Page 146

Algeria: Environmental Issues

Algeria is more advanced innature conservation than its neighbours Morocco or Tunisia, with a comprehensive environmental law that includes nature conservation, a system of protected reserves and parks, and universities and institutions with specialized training in conservation. Overall, about 24 percent of the country is within the protected area system. National parks, including the giant Tassili n'Ajjer National Park in the south-eastern of the country, comprise a large proportion of this total.

The effects of Algeria's human population on the fragile environment have been serve. The greatest ecological threats are deforestation and burning of scrub vegetation, conversion of steppe habitat to cultivated land, and soil erosion due to overgrazing by sheep. In addition, desertification caused by the steady progress of the Sahara poses a constant ecological and environmental menace.

Pollution of Mediterranean coastal waters is a real problem. Therefore, Algeria has obliged itself to cooperate with other nations in protecting the Mediterranean Sea from pollution and degradation of sensitive habitats.

(Adapted from: http://countriesquest.com)

APPENDIX IV

Fourth Year Middle School Institutional Textbook Reading Texts

TEXT 1: Page 40

Mohammed Dib

(*born July 21, 1920, Tlemcen, Algeria-died May 2, 2003, La Celle- Saint -Cloud, France)*

Mohammed Dib is an Algerian novelist, poet, and playwright, known for his early fiction trilogy on Algeria, La Grande Maison (1952; 'The Big House'), L'Incendie (1954; "The Fire"), and Le Métier à tisser (1957; "The Loom"), in **which** he described the Algerian people's awakening to the struggle for independence that began in 1954. The trilogy recounts the years 1938-42.

Dib's later novels portray the French colonial repression of the Algerian people, the search for the authentic expression of an Algerian personality, the war for independence and **its** effects, the new Algeria after independence and the plight of the Algerian emigrant worker in France. These novels, such as Cours sur La Rive Sauvage (1964; "Run on the Wild Shore"). And Habel (1977) express optimism in the brotherhood of mankind. **He** wrote for those who are dispossessed through economic exploitation.Dib viewed himself as essentially a poet**. He** was also the author of a film scenario and two plays.

(ThinlayKalsangBhutia*, Encyclopedia Britanica, Feb, 25, 2016*)

TEXT 2: Page 41

The Great Mosque of Tlemcen

The Almoravids (Almurabitun) established **their** rule on a region extending from low Senegal in Western Africa to the Mediterranean in the North, crossing later to Andalusia. The Almoravid expansion towards the east, into Algeria, took place in the 1800's reaching as far as Algiers.

Their leader Yusuf Ibn Tashfin founded the city of Tagrart, **which** became known as Tlemcen, in 1082. The building of this **new city** began with the construction of the main mosque, **which** Ibn Tashfin commissioned to hold daily and Friday prayers. Much of the existing structure belongs to the works undertaken by Yusuf's successor, **his** son Ali (1106-1142). An inscription placed the date to year 530 Hijri/ 1136CE. Historic sources indicate that both Yusuf bin Tashfin and his son Ali brought artisans and architects from Cordoba, Andalusia to build the mosque.

The Great Mosque of Tlemcenis an architectural masterpiece. In historical terms, **it** is one of the oldest and best preserved Almoravid buildings in Algeria.

(by Foundation for Science Technology and Civilisationwww.muslimheritage.com)

TEXT 3: Page 44

BIO CARD: Kateb Yacine

August 2, 1929: KatebYacine was born in Smendou, near Constantine
October 28, 1989: Kateb Yacine died in Grenoble, France
May 8, 1945: When the demonstrations of Setif, Kheratta and Guelma broke out, the young Kateb Yacine was a boarder at the Setif high school.
May 11, 1945: He was arrested and held for two months. After that, he was not allowed back into school. During his detention, his mother became insane.
1946: He published a volume of poems, Soliloques ("Soliloquies"). As the young revolutionary Kateb Yacine was taken with the nationalist ideas of the PPA (Algerian People's Party), he toured Algeria and France giving political talks.
From 1947 until his death: Kateb Yacine's life was one long errancy through the world and every kind of writing: journalism, poetry, plays, novels, etc.
1956: He published Nedjma, a novel but also a poem. Nedjma is a woman whose name translates as "star" used to symbolize Algeria, the motherland. Nedjma has marked all Maghrebian literature.
1959: Kateb Yacine created an Algerian theatre with Le Cercle des Represailles.
1970: His play, L'Homme aux Sandales de Caoutchouc ("The Man with the Rubber Sandals"), expressed solidarity with Vietnam in its struggle against American imperialism. After this play, Kateb Yacine stopped writing in French and started writing in the Algerian vernacular Arabic to be closer to his people: Mohamed, Prends ta Valise ("Mohamed, Grab your Suitcase") is a good example of the plays he wrote during this period. It is about the problems of Algerian immigrant workers in France.
1977: La Palestine Trahie ("Betrayed Palestine") is a play about the problem of Palestine.

TEXT 4: Page 46

FACT FILE: Roman Timgad

Geographical Location: northern slopes of the Aures mountains, 35Km southeast of Batna.
Date of Foundation: Roman Emperor Trajan.
Roman Name: Thamugadi.
Reason for its foundation: to serve as an encampment for the 3rd Augustan Legion and a military colony.
By the middle of the 2nd century: new public buildings are built: temples, markets, baths and immense private residences.
AD 430: After the Vandal invasion, Timgad was destroyed at the end of the 5th century by the Aures mountain-dwellers.
After the 8th century: Thamugadi ceased to be inhabited.
1982: Timgad was added to the UNESCO list of World Heritage Sites.
Architecture: Timgad was built in Roman style, with gates and arches. The Eastern and Western gates were the main ones with the Trajan Arch as the main entrance to the city. The streets were paved with limestone slabs and the houses decorated with mosaics. All buildings were constructed entirely of stone.

The theatre is an architectural marvel that has been well-preserved to the present day.

TEXT 5: Page 80

A Gaza Refugee Child's Dream

Yara Jouda lives in Alnusierat refugee camp in the Gaza Strip. Her original hometown was Ashdod-now occupied after the war of 1948. She is a student at Mamdouh Saidam High School. She says, "writing is my favourite hobby. It's a way to tell our true story to the world." Yara also loves reading novels, listening to music, dancing and riding a bike. This is what she wrote for "The Palestine Chronicle", an online Palestinian newspaper, on 20 December 2015.

I am a girl from Gaza barely 15 years old. Maybe I'm not old enough, but I'm mature enough to write in the name of dead Palestinian children who didn't have enough time to enjoy life. These kids dreamt of being doctors to treat people who suffer during military offensives. They wanted to fight against thosewho stole our land, destroyed our houses and killed our families and friends, not to mention that they made us refugees.

I have a little bit of a different dream. I have always dreamt of traveling around the world, not to enjoy or have fun, but to deliver the message of these kids. I believe that every person in the world should protect these children. I hope those who are reading this message Muslims, Christians, Jewish and everyone else-have enough humanity to do something about it, to take some responsibility.

When I was 7 years old, I remember clearly that I always wanted to fight our enemy. I really hope that you won't judge me or my dream because that's the dream of every child in Gaza.

I hope that my message reaches your hearts and makes you understand our situation in Gaza.

(adapted from: www.palestinechronicle.com)

TEXT 6: Page 82

Inside the Battle of Algiers: Memoir of a Woman Freedom Fighter

Zohra Drif, the legendary freedom fighter, was born on a farm in Tiaret. She was a little over 19 when the Algerian Revolution broke out. Two years later, she was studying law at Algiers University when she joined a group of (FLN) revolutionaries and placed a bomb in the French Milk Bar café. The following year, Mrs Drif was arrested and condemned to 20 years of hard labour for "terrorism". She spent five years in prison before she was finally released upon independence. Here is an extract from her book:

For nearly five years, I was the only Arab girl at the French primary school, with my big long braids and long skirts reaching to my ankles, among the little European girls with their short hair and their little dresses above the knee. The difference between me and these girls even extended to the foods we ate at ten o'clock in the playground: they pulled out a brioche, a croissant,

sometimes a chocolate croissant or a baguette with jam. As for me, I had my Algerian treats-maqrouta, mbardja, msemna or matlou with our family's honey.
I completed my primary-school years as an excellent student, finishing tied for first place in my class with my classmate Roselyne Garcia. I considered Roselyne a dear friend until we reached the sixth-grade entrance exam, a major test that marked the passage from childhood to adolescence. We were in school the day the results were announced. I, Zohra Drif, daughter of the Arab qadi, managed to rank among the first students in the region, whereas my best friend Roselyne, the daughter of Tissemsilt's baker and an excellent student, had failed. I was as shocked as the rest of the school at Roselyne's results.
When we parted to go home, I told her, still crying, "You know, Roselyne, everybody knows you're an excellent student. It was an accident. Next year, you'll get it." Roselyne replied, "But Zohra, it's not that. You don't understand a thing. How do I explain to my mother that you passed out and I didn't? She will never understand that Zohra the Arab succeeded and I failed." I was unsure whether I had misunderstood or understood all too well. Soon my tears dried up. I looked her in eye and spat back, "Well, you'll just have to explain to your mother that it was the Arabs like Zohra who invented mathematics."
In a few short seconds, I lost my best friend and my innocence. I suddenly realised that all my excellent marks, all my efforts to learn French language and culture and all my sincere feelings of friendship for Roselyne would never make me the equal of Roselyne, the European. With one simple sentence, she put me in my place as the "Arab".

(Adapted from: inside the battle of Algiers: memoir of a woman freedom fighter by Zohra Drif, just world books,USA, 2017)

TEXT 7: Page 115

"My son starts school today. It is all going to be strange and new to him for a while and I wish you would treat him gently. So, dear Teacher, you should teach him things he will have to know – but gently, if you can. You should make him understand that for every enemy, there is a friend. You should explain to him that all men are just, that all men are not true. But you shouldn't let him forget that foe every scoundrel there is a hero, that for everyone crooked politician, there is a dedicated leader. You should also help him to understand that, in school, it is far more honorable to fail than to cheat."

(adapted from: www.guidinglightacademy.com)

TEXT 8: Page 118

Differences between countries become less evident each year. Nowadays, all over the world people share the same fashions, advertising, brands, eating habits and TV channels. Do the advantages outweigh the disadvantages of this? It is undoubtedly the case that the world today has become a global village. One of the effects of this is that increasingly people all over the world are exposed to similar services and products and adopt similar habits. My view is that this is largely a beneficial process and in this essay I will explain why.

The first point to make is that there are some downsides to this process of cultural globalization, but these are relatively minor. The most significant of these disadvantages is that it can weaken national culture and traditions. For example, if people watch films and television programmes produced in the United States, sometimes they will adopt the lifestyle of the American characters they see on television. Typically, however, this only affects minor details such as clothing and does not seriously threaten national identity.

When we turn to the other side of the argument, there are two major points to make in favour of this process. The first of these is that the more we share habits, products and services, the better we understand each other and this reduces prejudice against other nations. The other point relates to modernity. It is a sign of progress in a society that people no longer are restricted to brands and products from their own society but are able to access more international goods.

In conclusion, I understand the point of view of people who worry about cultural globalization because it is a threat to national traditions. However, this is outweighed by its positive impact on international understanding and the fact that it represents progress within a society.

(Essay by Dominic Cole (www.dcielts.com))

TEXT 9: Page 120

An Algerian Charity Group that Raises Hope

Few years ago, the Algerian society witnessed the emergence of several charity groups, namely “Ness El Khir”. It first started in 2009 with a small group of young people (mostly friends and neighbours) from Algiers, who decided to assist poor people without having to be part of an official organisation. We had the pleasure to meet one of the most active members of “Ness El Khir”, Souf Mounir Youcef, who told us about the remarkable and successful experience the group has been through.

1.Youcef, having had more than three years of experience with this amazing group, could you tell us a little about the steps you go through before proceeding into a given activity?

“Before proceeding into any activity, we first organise a meeting to make a plan for the operation we intend to carry out as well as to determine the required budget. Then, we start collecting money starting from our families to everyone we know. For the time being, we are planning to take breakfasts to hospitals on a regular basis.”

2. Are there other activities that you perform within hospitals?

“Sure! We occasionally arrange what we call a Colourful Day, a day in which we pay a visit to hospitalised children. This consists in organizing a small party in which we disguise into clowns and decorate the children’s rooms with balloons and paintings. At the end of the day, we give them some presents such as toys and short stories.”

3. Is there anything else that you do for children?

“Yes. At the beginning of every school year, we prepare My *school Bag* event. We just try to find the maximum of poor families, counting the number of

children they have, and then buy all the books they need and the necessary things they will be using at school."

4. Going out and looking for poor families in a city as big as Algiers must be very difficult!

"Not at all! When we are united, we never feel the heaviness of work. For example, with the beginning of every winter, we collect blankets, coats and some warm clothes, then denote them to the homeless people we find in the streets. We call this activity A *Warm Winter For All."*

5. What about religious events?

" In Ramadan, for example, we prepare supper and take it to the rest homes, where we break the fast with old parents abandoned by their children. In El Eid, when Ramadan is over, we organise a *Cake Workshop*; we often take the necessary ingredients to the orphanage, and teach orphans how to make cakes."

6. Ness El Khir are also concerned about environmental issues. Could you tell us more?

APPENDICE V

Teachers' Experimentation Form

Dear teacher,

This paper is part of a research work that aims at developing readability formulas for Algerian middle school EFL learners. Your feedback is of a paramount importance to confirm the usefulness of the research outcomes. Please follow the guidelines below to fill in the accompanied experimentation form.

Thanks a lot for your cooperation.

❖ Guidelines:

1. Enter the following web address into your browser:

https://transfer.hft-stuttgart.de/pages/ulrike.pado/behira/

2. Select one of the two options:

A. Option 1: Insert the text to be evaluated manually either by typing or copying and pasting it.

B. Option 2: Insert the character count of the text to be evaluated.

Note: You can have the character count of a text using Microsoft Word Office following these steps:

- Open a new document in Microsoft Office Word.
- Type or paste the text.
- Click on 'Revision'.
- Click on the icon 

.

- Use the character count without spaces from text statistics.

Note: Please enter a text of more than **100** alphabetic characters for first and second year school levels, and **400** alphabetic characters for third and fourth year school levels.

3. Select the school level of the target readers: 1MS, 2MS, 3MS, or 4MS.

4. Select the category of the target readers among the following categories:

(f) Mixed-ability group: It represents a standard classroom that includes learners whom averages in English range from 0 to 20.

(g) High-ability group: It represents learners of very good level in English. This can be determined by the English school average scale 16-20.

(h) Good-ability group: This category represents learners of good level in English. This can be determined by the English school average scale 13-15.99.

(i) Average-ability group: This category includes learners of average level in English. This can be determined by the English average scale 10-13.99.

(j) Low-ability group: This category includes learners of low level in English. This can be determined by the English school average that is lower than 10.

Note:

- For your experimentation you will not select the category of mixed-ability group.

5. Click on 'Calculate' to get the estimated reading time for the evaluated text. The estimated reading time will be provided in minutes and seconds. The number of seconds will be rounded down if it is less that 30s or rounded up if more than 30s.

6. Use the teachers' feedback form to do your experimentation:

- Write the title of the selected text for experimentation and its source if possible.
- Write its count of characters (without spaces).
- Select the target school level.

- Select the target category of the learner.
- Write the estimated reading time level calculated by the website for the selected school level and category of the learner.

7. Choose 8 pupils (2 from each category) from each middle school level you teach.

8. Provide each pupil with the selected text to be read.

9. Write down the reading time of each participant on the teacher's feedback form.

Experimentation Form

I- Professional Information:

❖ Please write or put a cross mark (**X**) when necessary.

1) School name**:**.....

2) School location:.....

3) Levels you teach for 2021/2022 school year:

(a) 1st year ☐ **(b)** 2nd year ☐ **(c)** 3rd year ☐ **(d)** 4th year ☐

II- Experimentation:

❖ Please write or put a cross mark (**X**) when necessary.

1) Text title.	....
2) Text source.	....
3) Count of characters (without spaces).	.....
4) School level.	**(a)** 1st Year ☐ **(b)** 2nd Year ☐ **(c)** 3rd Year ☐ **(d)** 4th Year ☐
5) Category.	**(a)** High-ability reader (Average 16-20) ☐ **(b)** Good-ability reader (Average 13-15.99) ☐ **(c)** Average-ability reader (Average 10-13.99) ☐ **(d)** Low-ability reader (Average lower than 10) ☐
6) Estimated reading time of the text calculated by the website (minutes and seconds).	.....
7) Participant's reading time of the text (minutes and seconds).	.....

❖ For further information, please contact **Mr. Younes BEHIRA** via email: behira.younes@univ-oran2.dz

Appendix VI

Texts Selected by Teachers for Experimentation of BNP Readability Formulas

I. 1MS Experiments' Texts

Experiment 1

Target Level: 1MS
School location: Tiaret.
Text source: Internet.
Text title: Daily Activities
Character Count: 180

Text:
Hi, Omar
I am Peter. I am at home. I am happy to introduce my family. John is my father. He is an engineer in a company. Sara is my mother. She is a nurse in a hospital. She is 30.
Tim is a pupil. He is my brother.
This is a photo of my family.

Experiment 2

Target Level: 1MS
School location: Tiaret.
Text title: Me and My Country
Text source: Internet.
Character Count: 170

Text:

Hi, I am Amine from Algeria. My national currency is the Algerian Dinar. My national dish us Couscous. One of my national celebration days is the 5th of July 1962. Eid El Fitr is one of my religious celebration days.

Experiment 3

Target Level: 1MS
School location: Tiaret
Text title: A Day in Life of English Pupil
Text source: Internet.
Character Count: 431

Text:

Hello! I am Margaret. I am years old. I am a pupil at Welcome Primary School. I get up at 7:30 a.m. I wash myself. I get dressed, have breakfast and I go to school. Schools begin at 9:00. At 9:00, we have lessons, Maths and English, until 10:30 when we have a break. The next lesson begins at 10:50 and lunch time is from 12:15 to 1:15 p.m.

In the afternoon, school is from 1:15p.m to 3:15 p.m. When I go home, I have tea then I do my homework. At 6p.m, I watch TV before I go to bed at 9 p.m. On Saturdays, I go for a walk with my family in the countryside and I attend ballet classes.

II. 2MS Experiments' Texts

Experiment 1

Target Level: 2MS
School location: Tiaret
Text title: At the Supermarket
Text source: Internet.
Character Count: 472

Khadija: Good morning, sir.
Shopkeeper: Good morning, madam. Can I help you?
Khadija: Yes, please I would like a kilo of peppers, 2 kilos of onions and 1/2 kilo of lettuce. Please.
Shopkeeper: Ok. We have also fresh oranges and plums today. Do you want any?
Khadija: I really need some.
Shopkeeper: fine how much do you want
Khadija: 1 kilo of plums and 2 kilos of oranges please Is there any butter
Shopkeeper: Yes, look at the dairy products section.
Khadija: Yes, I'll have a packet.
Shopkeeper: Is that all madam?

Khadija: Yes, thanks. How much are they?
Shopkeeper: All in all, they are 400 dinars.

Experiment 2

Target Level: 2MS
School location: Tiaret.
Text title: Mourad's Daily Activities
Text source: Internet.
Character Count: 435

Text:

Mourad is 13 years old boy. He weighs 78 kilos. He is so fat, he loves eating junk food, salted crisps, chocolate, fast food and sweets.

On weekdays, he eats hamburgers, pizzas and cakes. On weekends, he has pancakes with honey and cookies. His mother advised him to stop eating junk food and have healthy food like vegetables, fruit, chicken, fish and homemade bread. But Mourad ignores her advice. He orders unhealthy food every day. That's why he became sick and lazy.

Mourad wants to change his eating habits and starts a healthy balanced diet.

Experiment 3

Target Level: 2MS
School location: Tiaret.
Text source: Internet.
Text title: Me and My Magic Cube
Character Count: 607

Text:

Hello, everybody. This is the first time I create a blog and post something on it. So, I am going to talk about myself because many people from different parts of the world do not know me. My name is Mohamed Islam Bouhafs, I am 12. I live in Batna. My father is a journalist and my mother is a teacher. I have got one brother and two sisters.

I am tall and slim. I have got dark hair and black eyes. My friends say that I look handsome. I don't know. I can solve the Magic Cube in thirty seconds. Every day, I train myself on the cube for one hour because I am getting ready for the International Magic Cube Championship. I live with my

grandparents. Every weekend, I visit my aunt and uncle to play with my cousins. I love them very much because they are Kind and nice to me.

III. 3MS Experiments' Texts

Experiment 1

Target Level: 3MS
School location: Tiaret
Text title: Life in the Past
Text source: Internet.
Character Count: 485

Text:

In the past, the way people lived was very different from the way in which we live nowadays. In old times people used to live in simple houses in villages with no electricity, most of the work was by hands. Now there are more technological items, robots and facilities.

Fifty years ago, people used to dress up in simple clothes. Now they wear modern clothes of fashion and new style. People, in the past, consumed fresh, natural and healthy food but today they eat Burgers, Pizza and Pies. Children used to play with rag dolls, marbles hopscotch today they play video games, chess, monopoly and jack stones. (BBC documentary, adapted)

Experiment 2

Target Level: 3MS
School location: Tiaret
Text title: Tarvel Agency
Text source: Internet.
Character Count: 910

Text:

Travel Agency

Kate: Charles, Would you please readthis advertisement for the travel agency (Best Travel)*?*

Charles: OK. Have you already planned next year's spring, summer, autumn or winter holiday? No? Then perhaps we , at Best Travel ,can help. We really know how to look after our customers.
All our holidays are in the United Kingdom. So you're not going to wait in queues at airports, eating strange food, travelling in the middle of the night,… We have over 100 different holidays on offer, which means that there's something for everyone. For persons who enjoy peace and quiet and prefer to travel south, why don't you relax on one of Devon's golden beaches with attractive hotels and wonderful sea views? Or for the more independent traveller, we have lots of excellent camp sites which have all been very carefully chosen.
Everything is organised for you - you don't even need your own bike. You need to be pretty fit and to enjoy having fun . For you who prefer windsurfing, mountain climbing or just being lazy - we have the answers.
Just phone 0737 833559 for information, or come and see us in George Street..
Kate*:* Fantastic ! Let's contact them now

Experiment 3

Target Level: 3MS
School location: Tiaret
Text title: A little Prince
Text source: Internet.
Character Count: 451

Text:

(…)This little prince was awarded the first prize of the Arab Reading Challenge competition by a great prince the Emir of Dubai(…)

Our little prince's name is Mohamed Farah Djeloud who managed to stand out from the 3.5 million candidates after being listed among the 240 finalists in Dubai with much encouragement from his modest family the seven-year-old algerian champion read some 50 books and even wrote a small one!
He was offered a $150.000 cheque to finance his higher education in the presence of the Algerian Minister of Education at Dubai Opera(…)

IV. 4MS Level Experiments' Texts

Experiment 1

Target Level: 4MS
School location: Tiaret.
Text title: Abdelhamid Ibn Badis.
Text source: Internet.
Character Count: 809

Text:

Abdelhamid Ibn Badis was a teacher and a writer. He was born in Constantine on the 4th December 1889. When he was 13 years old, El Cheikh Mohamed El Madassi taught him Arabic language and helped him to learn the Koran.After that, his father sent him to El Zaytouna University in Tunisia. He stayed there two years, he studied hard until he had the licence.

When he came back to Algeria, he had good ideas. He used them to develop the society. He loved his country and he loved the mosque too; he made a program. He taught young persons in the evening, men the day and women every Friday. He wrote four newspapers: El Souna, El Sirat, El Chihab and El Moountakad. He also wrote poems. «Chabou El Djazairi moslim» which means «Alegrian people are moslim» is very famous.In 1936, he founded «Djamiate Oulama El mouslimine» and was its first president. El Cheikh El Bachir El Ibrahimi was his assistant.Abdelhamid Ibn Badis died on April 16th, 1940 He was a great and famous personality and he will be our example forever.

Experiment 2

Target Level: 4MS
School location: Tiaret
Text title: My School Days
Text Source: Internet.
Character Count: 891

Text:

I think that my primary school days were the most cheerful and careless days in my whole life. Then I went to school with big desire, though my first days were hard. I was the smallest pupil in my class and I had short ginger hair. My classmates made fun of me all the time calling me 'small carrot'. But being funny and helpful made them love me later. One day, our teacher asked us to

draw a picture for our family, I drew four carrots. When the teacher asked, I said: “this is my family, we are all red head.” All pupils were laughing, but I ended up by standing at the back of the class for being naughty.

All the children at school became good friends. We were playing and learning together every day. We started to write and read. We were active and wanted to know everything in the world.

In breaks, we were playing with toys: boys with cars and girls with dolls. In the corridor, we had to walk in a line by pairs whereas we always wanted to run and teachers stopped us.

Primary school gave us a base knowledge and cognition. It formed our mentality and psychology.

Now we can thank primary school for our joyful childhood.

Experiment 3

Target Level: 4MS
School location: Tiaret
Text title: Mohammed Dib
Text Source: Thinley Kalsang Bhutia , Encyclopedia Britannica
Character Count: 887

Text:

Mohammed Dib, (born July 21, 1920, Tlemcen, Algeria—died May 2, 2003, La Celle-Saint-Cloud, France), Algerian novelist, poet, and playwright, known for his early trilogy on Algeria, La Grande Maison (1952; “The Big House”), L’Incendie (1954; “The Fire”), and Le Métier à tisser (1957; “The Loom”), in which he described the Algerian people’s awakening to self-consciousness and to the impending struggle for independence that began in 1954. The trilogy recounts the years 1938–42. Dib’s later novels,portray the French colonial repression of the Algerian people,the search for the authentic expression of an Algerian personality, the war for independence and its effects, the new Algeria after independence and the plight of the Algerian emigrant worker in France. These novels such as ‘Cours sur la Rive Sauvage’ (1964; “Run on the Wild Shore”) and Habel (1977) express optimism in the brotherhood of mankind.He wrote for those who are dispossessed through economic exploitation.Dib viewed himself as essentially a poet. He wrote several collections of poetry.Dib was also the author of a film scenario and two plays.