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ENHANCING BIOLOGY STUDENTS' ACADEMIC ACHIEVEMENT IN READING COMPREHENSION THROUGH AN INNOVATIVE STRATEGY IN UNIVERSITY CONTEXT: “REVOLUTION” STRATEGY

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Abstract

This paper has arisen from diligent studies on the reading comprehension ability of biology students in the university EFL context. The purpose of the paper is to enhance biology students’ academic achievement in reading comprehension through an innovative strategy inspired from the word “REVOLUTION”. The strategy is introduced in the present paper and it is developed and implemented for the first time in reading comprehension instruction. To collect the relevant data, a questionnaire, interviews, reading comprehension texts and tests were used. Participants were 67 EFL learners studying plant biology at two universities in Iran. They were assigned into two groups of experimental and control. In the experimental group, the REVOLUTION strategy was used as a treatment in teaching reading comprehension, while in the control group, the teacher read out the text and asked students to listen, the teacher

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was supposed to answer the students' important questions. The main findings of the study showed that when the teacher applied the REVOLUTION strategy, the students had a much better performance on the reading comprehension tests. The conclusion to be drawn from this study is that the implementation of this strategy can be useful in improving the reading comprehension of university students, it enhances learners' academic achievement in reading comprehension and also helps them to understand academic texts easily and effectively.

Keywords: Biology students, EFL context, reading comprehension, REVOLUTION strategy

Abstrak

Kertas kerja ini diterbitkan daripada kajian yang bersungguh-sungguh tentang keupayaan pemahaman bacaan pelajar biologi dalam konteks EFL universiti. Tujuan kertas kerja ini adalah untuk meningkatkan pencapaian akademik pelajar biologi dalam pemahaman bacaan melalui strategi inovatif yang diilhamkan daripada perkataan "REVOLUSI". Strategi ini diperkenalkan dalam kertas kerja ini dan ia dibangunkan dan dilaksanakan buat kali pertama dalam pengajaran pemahaman bacaan. Untuk mengumpul data yang berkaitan, soal selidik, temu bual, teks pemahaman bacaan dan ujian telah digunakan. Peserta adalah 67 pelajar EFL yang mempelajari biologi tumbuhan di dua universiti di Iran. Mereka ditugaskan kepada dua kumpulan eksperimen dan kawalan. Dalam kumpulan eksperimen, strategi REVOLUSI digunakan sebagai rawatan dalam pengajaran pemahaman bacaan, manakala dalam kumpulan kawalan, guru membaca teks dan meminta pelajar mendengar dan guru menjawab soalan penting pelajar. Dapatan utama kajian menunjukkan bahawa apabila guru mengaplikasikan strategi REVOLUSI, pelajar mempunyai prestasi yang lebih baik dalam ujian kefahaman bacaan. Kesimpulan yang boleh dibuat daripada kajian ini ialah pelaksanaan strategi ini boleh digunakan dalam meningkatkan kefahaman bacaan pelajar universiti, meningkatkan pencapaian akademik pelajar dalam pemahaman bacaan dan juga membantu mereka memahami teks akademik dengan mudah dan berkesan.

Kata kunci: Pelajar Biologi, konteks EFL, pemahaman bacaan, strategi REVOLUSI

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1.0 INTRODUCTION

1.1 The Importance of Reading Comprehension Ability for Biology Students

Most of the scientific journals are published in the English language. Therefore, mastery of English is very necessary in today's era of globalization (Gustanti & Ayu, 2021). Currently, about 98% of academic publications in science especially in the areas of nature and biology science are written and read in English, including researchers from both English countries and English as a Foreign Language countries (Rao, 2019). Hence, the success of undergraduate and postgraduate students highly depends on their reading comprehension and writing skills.

Onyegegbu (2002) stated that biology is a branch of science with the purpose of familiarizing students with basic knowledge, academic concepts, and scientific skills. Therefore, it is crucial for biology students to have the abilities such as problem-solving, intercultural communicative competence and critical thinking to be potential scholars in the academic world. To achieve these objectives in biology, students should be able to read and write scientifically. Here, more importance and emphasis is being placed on the reading comprehension skill than writing skill, because in order to be a competent writer, a student must first be an excellent reader. It is noteworthy that English proficiency, especially in reading comprehension ability highly influences the academic achievement and success of university students.

In the same line, Khataee (2018a) and Hood (2002) explained that reading comprehension is an important skill for those with international communication activities and global communication purposes. According to Khataee (2018b), Wang (2008) and Nurie (2017), it is essential for EFL students who need to learn the English language to develop their reading ability for a better comprehension of written texts. This has also been supported by Ahmadi and Pourhosein (2012) that stated reading comprehension is one of the significant elements in language learning because it provides the foundation for a substantial amount of learning in EFL learners. Thus, university students need to improve their reading comprehension skills for a better understanding of academic texts (Yuen & Mussa, 2015). According to Rahmani and Sadeghi (2011), EFL students need to learn to analyze the text for comprehension before they begin to read on their own or comprehension instruction. Ahmadi and Pourhosein (2012) also explain that reading comprehension is a cooperative mental practice between a reader’s knowledge of the world and knowledge about a given subject. In other words, reading comprehension is a communication procedure in which readers interact with a text as their background knowledge is activated (Sase, 2014).

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Nowadays, university students from countries where English is a foreign language, face so many problems in academic processes such as reading and writing articles in English (Singh, 2019). It is important to apply effective strategies to develop the English proficiency and reading comprehension ability of university students.

The present study focused on the idea that developing strong reading comprehension ability is very important for biology students in the EFL context to succeed in their academic achievement. Reading is an important skill for EFL students because it provides a great opportunity for EFL learners to improve their language proficiency by receiving appropriate input (Khataee, 2019). Therefore, this study introduced an effective and innovative strategy for improving biology students' reading comprehension abilities. Moreover, the results of this study could be taken into account as help for teachers and professors at schools and foreign language departments of universities in order not only to help learners to promote their academic performance but also to help them to improve real reading comprehension skills.

RQ1: What is the effect of the REVOLUTION strategy on the academic achievement of biology students in reading comprehension?

RQ2: What are the biology students' main comprehension problems and perceptions?

1.2 REVOLUTION

In this paper, the researcher introduced a new strategy named "REVOLUTION". The reason for this naming is first, the ten stairs of the strategy and second, the meaning of the word revolution itself which is "a big change or improvement in the way that people do a particular activity". This strategy makes a revolution in teaching reading comprehension and is one of the most relevant, effective and innovative strategies for improving paramedical students' reading comprehension ability including ten stairs. This innovative method helps adult learners to present their best performance in reading comprehension. The researcher believed that the stages of the reading comprehension process are like the stairs of a ladder. If a learner can get to the top of the ladder, it means that the learner has comprehended the text completely.

According to this study, the teacher has to make a revolution in the learners' minds to lead them to successful reading comprehension. The researcher is inspired by the word revolution to make mental activities in the learners' minds.

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In this research “REVOLUTION” is the best meaningful word to name this strategy and every letter of it introduces each stair of the reading comprehension ladder (see figure one).

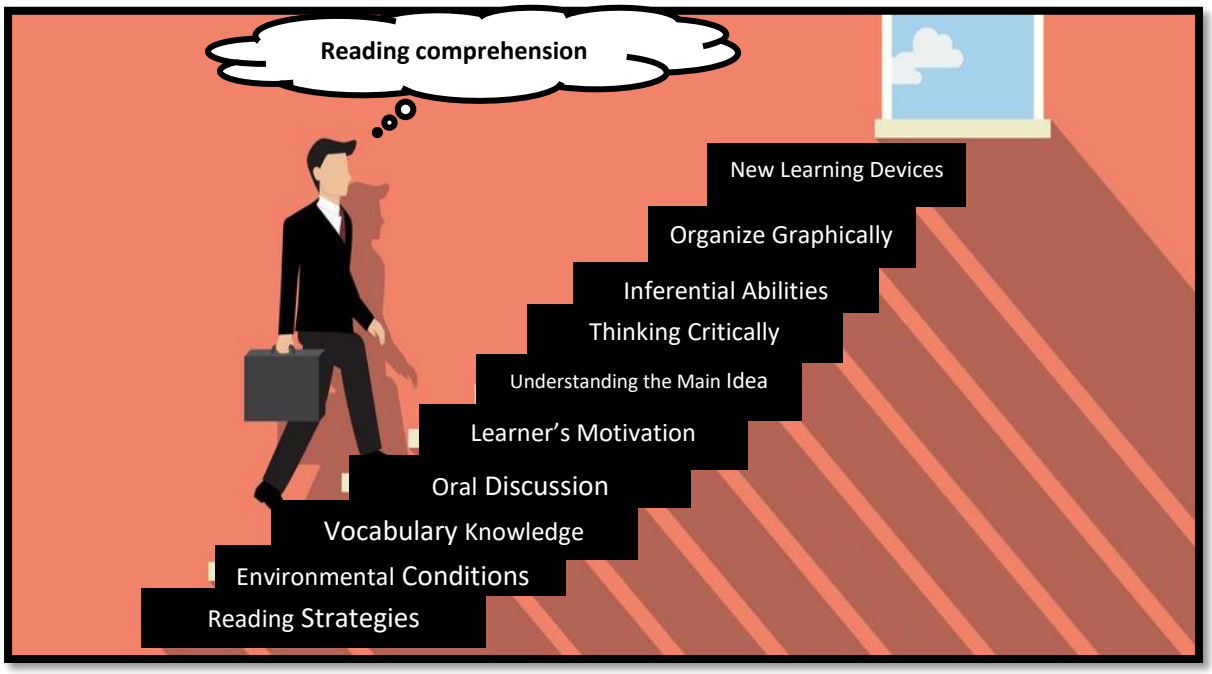

Figure 1. Stairs of the REVOLUTION strategy

Stairs of *REVOLUTION*

1. REVOLUTION: The first letter of the word REVOLUTION is “R”, it stands for Reading strategies.

2. The second letter is “E”, it stands for “Environmental Conditions”.

3. The third letter is “V”, it stands for “Vocabulary Knowledge”.

4. The fourth letter is “O”, it stands for “Oral Discussion”.

5. The fifth letter is “L”, it stands for “Learners’ Motivation”.

6. The sixth letter is “U”, it stands for “Understanding the Main Idea”.

7. The seventh letter is “T”, it stands for “Thinking Critically”.

8. The eighth letter is “I”, it stands for “Inferential abilities”.

9. The ninth letter is “O”, it stands for “Organize Graphically”.

10. The tenth letter is “N”, it stands for “New Learning Devices” (audiovisual aids).

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2. 0 LITERATURE REVIEW

2.1 Reading Strategies

Teaching reading strategies formally, explicitly and directly increase learners' reading comprehension and learners who are aware of using reading strategies are more likely to understand the reading materials. It is widely supported by some researchers that conveyed "the student has to be engaged in utilizing strategies to construct meaning from text, using text information to build conceptual understanding, effectively communicating ideas orally and writing". (Gambrell et al. 2011).

According to Khataee (2019), readers should learn different comprehension strategies to gain the ability to construct meaning from the written text rather than simply finding the meaning put there by the writer. Anderson (2005) also emphasized that the way the strategy instruction is used can better increase learners' reading comprehension. Therefore, when learners are empowered with knowledge of particular reading strategies they will get better reading comprehension.

2.2 Environmental Conditions

Another factor that affects EFL learners' reading comprehension is environmental conditions. The creation of a proper and relaxed learning environment is considered an advantage for the development of language skills (Mart, 2012; Altun & Hussein, 2022). Saad & Yunus (2015) asserted that teachers should provide a controlled and quiet place because in a frenetic or unorganized environment, learners will find it difficult to understand what they read. In addition, Hanifa (2018) indicated that students may find it difficult to concentrate on the written text in an unsafe class or home environment. EFL learners' reading comprehension skills improve in safe environments.

In a very recent study, Altun (2023) stated that relaxation and safety are two important factors that influence RFL learners' learning processes. Moreover, it is illustrated that the noise of loud conversations of school staff also the noise of televisions or radios can also serve as distractions for readers (Ali, 2013; Dockrell & Shield, 2006).

2.3 Vocabulary Knowledge

Several studies (Baleghizadeh, 2012; Katemba & Sihombing, 2023; Zhong, 2012) have shown that to predict levels of academic reading comprehension, the scores of vocabulary size can be used. In a study carried out by Katemba & Sihombing (2023), it was found that in a reading class factors such as difficult words, comprehension of sentences, how to read the word or

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sentence correctly, directly affecting the reading comprehension performance of language learners.

Kaivanpanah & Zandi (2009) investigated the role of the depth of vocabulary knowledge in reading comprehension. To collect the relevant data, a Test of English as a Foreign Language (TOEFL) and a measure of depth of vocabulary knowledge were administered to 17 males and 40 females who were studying English as a foreign language. The obtained results revealed that depth of vocabulary knowledge was significantly related to reading.

Zhong (2012) also found that a strong vocabulary knowledge in the test passages followed by questions is a crucial factor in affecting language learners on a test of reading comprehension. Lack of adequate word meaning knowledge and small vocabulary size usually impedes learners from comprehending the meaning of the passage.

In another study done by Chang et al. (2008), a strong correlation between vocabulary knowledge and reading comprehension and also between reading rate and primary knowledge was found. Vocabulary knowledge plays an important role in reading comprehension and it has an effect similar to background knowledge in reading comprehension. The vocabulary knowledge facilitates decoding, which itself is a significant part of reading comprehension.

Moreover, Rashidi & Farahani (2006) conducted a study on the relationship between depth of vocabulary knowledge and Iranian EFL learners' lexical inferencing strategy use and success. They concluded that there was a significant relationship between the depth of vocabulary knowledge and the type of lexical inferencing strategy used. The learners who used different types of lexical inferencing strategies had a stronger depth of vocabulary knowledge and applying these strategies made them more successful in inferring the meaning of unknown words.

2.4 Oral Discussion

Generally, in a class discussion, learners express their perspectives and opinions on different issues arising from the text, consider alternative perspectives proposed by others, and try to reconcile conflicts among opposing points of view. Yusuf et al. (2015) believed that reading is a skill to understand the content of the text and expand the reader's knowledge, therefore, when learners participate with each other in a class discussion in deep and meaningful ways, the result is that they become able to produce what is beyond their abilities and dispositions of the individual students who compose the class. The reason is that every individual student brings to the discussion special social and cultural values and background knowledge. Murphy

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et al. (2009) believe that putting students into different groups and encouraging them to talk is not enough to enhance comprehension and learning, but it is an essential step in the reading comprehension process.

2.5 Learner's Motivation

Motivation affects learners' reading comprehension activities and helps EFL learners read more efficiently. This idea is supported by Seymour & Walsh (2006) and has a significant role in the process of language learning, many do not know its great importance in reading comprehension.

It was also mentioned by Lestari (2014) that the readers' interest and motivation are two crucial factors when developing reading comprehension skills. Language learners can hardly focus on the reading when the reader finds the material uninteresting or dry. Therefore, when readers find the written material interesting, they will comprehend and remember it better. Educators can keep readers motivated by providing interesting pieces throughout the student's class time (Poolman et al. 2016; Herlina, 2016; Cain & Oakhill, 2014).

2.6 Understanding the Main Idea

Being able to extract the main idea of the text allows learners to recall important information, especially the keywords. To figure out the purpose of the writer, the gist of the text, and the significant details it is necessary for the learner to understand the main points of the writer (Khusniyah & Lustyantie, 2017). Identifying a relationship between these and the learner's background knowledge is the key point to improve reading comprehension (Zohar & Barzilai, 2014; Keshta, 2016; Basar & Gurbuz, 2017).

2.7 Thinking Critically

Teachers should have a systematic plan to lead students to be able to read, analyze, draw inferences, extract meanings, synthesize and link information in a variety of contexts (Muijselaar et al., 2017; Ahmad & Ahmad, 2018). Hence, language learners need to be able to read, analyze, think critically and make informed decisions in today's world so that they can live and work in intercultural contexts and they will be able to solve various kinds of challenges and problems.

2.8 Inferential Abilities

According to Muijselaar et al. (2017), the process of inferencing involves the mental recognition of the text, or integration of ideas from different parts of a text to extract and construct an appropriate message from the propositional content of the text. For this purpose,

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the reader will sometimes use prior knowledge. The term inference can also be used to designate the end product of the process, where it signifies a reader's reaction to a text or question item. In the latter case, inference will refer to an answer.

2.9 Organize Graphically

Harvey and Goudvis (2007) asserted that highlighting fonts, keywords, illustrations, pictures and graphics among others helps the reader to capture relevant information from the text to understand general aspects and synthesize information from a paragraph. This strategy also allowed students to highlight useful key ideas so that they did not need to the entire text again and again.

2.10 New Learning Devices

Many universities and higher education institutions, excited over the benefits of new technologies/tools, are adopting new educational technology policies and procedures (Kuşdemir et al. 2018; Seher, 2017). In a research conducted by Kalinic et al. (2011) numerous universities, including the University of Glasgow, the University of Sussex and the University of Regensburg, have been working towards using technologies such as mobile learning or m-learning in their teaching and learning systems. For example, in another study carried out by Castillo-Manzano et al. (2017), the integration of mobile devices (tablets and/or laptops) into economic classes was investigated in Spain. They have concluded that "there are personal, socio-economic and technical differences that explain students' preferences for the use of one device or another" within their program (Castillo-Manzano et al., 2017).

3. 0 MATERIALS AND METHODS

The research had a main goal, which was to examine the effectiveness of an innovative strategy inspired from the word "REVOLUTION" for improving the reading comprehension of biology students in the EFL context.

3.1 Study Design

The present study applied a mixed method design to investigate the effectiveness of REVOLUTION as a pre-reading strategy in enhancing biology EFL learners' reading comprehension performance. Members of experimental group were taught based on the REVOLUTION strategy as a pre-reading strategy while EFL learners in the control group received no treatment. The important point about this strategy is that biology students can achieve a high level of comprehension by using different elements of the strategy.

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3.2 Participants

From 134 biology students in the EFL context, 67 students were taken randomly from intact classes. They were male and female EFL students studying plant biology at two universities. To ensure that all the students were at the same level of proficiency and homogeneity, Oxford Quick Placement Test (OQPT) was administered. Two students with extremely high levels of proficiency and three with extremely low levels were excluded from the study. There were two groups of participants, one group served as the experimental group and another as the control group. There were 34 participants in the experimental group and 33 participants in the control group. Their age ranged from 19 to 28, and they were speakers of Persian language. All of them were at advanced level and all provided their consent to be included in the study.

3.3 Instruments

The researchers have used different instruments for getting different types of information. In this sense, the best instruments to collect the information were reading comprehension texts and tests, interviews, and a questionnaire. To ensure that all participants were at the same level and homogeneous, the Oxford Quick Placement Test (OQPT) consisting of 60 multiple-choice questions was also administered to them. Two academic reading comprehension texts were used as reading instruments in the current study. Both academic texts were in the English language.

The questionnaire of this study was a combination of Smith et al. (2021), Dr. Allan Wigfield and Dr. John Guthrie's MRQ questionnaire. It contained 42 closed-ended Likert scale questions that inquired about the students' main problems in the process of reading comprehension, the different factors they considered affect their reading comprehension and also about the reading strategies these students applied when reading.

At last, a semi-structured interview was designed in order to elicit the main reading comprehension problems and perceptions of biology EFL learners. The interview was semi-structured as some of the questions were posed directly to the subjects, whereas some were formulated after a preliminary analysis of the data.

3.4 Procedure

The data were collected from 67 advanced EFL learners from two universities in Iran. For the purpose of this study, all the participants were asked to take Oxford Quick Placement Test (OQPT) to ensure that they are homogeneous (two participants with extremely high levels of proficiency and three with extremely low levels were excluded from the study). The experiment was conducted over three months and all the sessions were held during a course for biology

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students for three hours per week. Planning for the study was as follows: Week 1: Administration of Oxford Quick Placement Test/ Week 2: Treatment session (text one) /Week 3: Treatment session (text one)/ Week 4: Test one /Week 5: Treatment session (text two)/ Week 6: Treatment session (text two)/ Week 7: Test two/ Week 8: Administration of the questionnaire/ Week 9: Semi-structured interview.

Two academic texts were used in this study and there were two sessions for teaching each text. At the third session the participants took a comprehension test of 12 questions. The treatment which was the REVOLUTION strategy was applied only in the experimental group whereas in the control group, the teacher read out the text and asked students to listen, the teacher was supposed to answer the students' important questions and no special teaching processes were provided. The teacher administered the newly introduced strategy (REVOLUTION) step by step for the EFL students in the experimental group. The texts used in this study were two academic texts in the field of biology, which prepares biology EFL students for reading academic texts and articles in their field of study. The two comprehension tests in the study were scored by allocating a mark for every correct answer to the reading comprehension questions. There was no mark awarded for the wrong answers or if the answer was not provided. To find out the students' main reading comprehension problems and perceptions, a combination of Smith et al. (2021), Dr. Allan Wigfield and Dr. John Guthrie's MRQ questionnaire was given to them. The results from the questionnaire for each item were analyzed and exhibited in different tables.

At last, to elicit the main reading comprehension problems and perceptions of biology EFL learners, a semi-structured interview was conducted in Persian and lasted between 10 to 15 minutes for each student.

4.0 Results

This section presented the results of the study. The first research question sought to find out whether using the REVOLUTION strategy has any effect on the biology EFL learners' reading comprehension performance or not. Table 1 showed the maximum and minimum scores of the experimental and control group in both test one and test two. The experimental group and control group were taught with different procedures. The experimental group was taught using the REVOLUTION strategy as the treatment, whereas in the control group, the teacher read out the text to the class and EFL learners were asked to listen, so no special strategy was used for the control group.

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Table 1. Maximum and minimum scores in test one and test two

		Test one		Test two	
Group	N	Maximum	Minimum	Maximum	Minimum
Experimental group	34	12	6	12	6
Control group	33	11	4	11	3

According to Table 1, the minimum score for the experimental group is 6 in tests one and two and the maximum score for the experimental group is 12 in both tests. It means that the range of the scores for the experimental group in tests one and two is from 6 to 12. The minimum score for the control group is 4 in test one and 3 in test two and the maximum score is 11 in both tests. So, the range of the scores for the control group in test one is from 4 to 11 and in test two is from 3 to 11. Therefore, Table 1 indicated that the scores of the experimental group who received the treatment of the study (using the REVOLUTION strategy) is higher than the control group in both tests.

The collected data displayed in Table 2 and Figure 2 was taken from the results of biology EFL learners' scores in tests one and two. The comprehension tests that were given to students had the same characteristics and the same questions. These tests were conducted in both experimental and control groups. Table 2, shows the mean scores of the experimental and control group in each reading comprehension test. Based on Table 2, the mean score of the experimental group in test one was 9.32 while in the control group was 6.58 (See Figure 2). The mean score of the experimental group in both tests one and two is higher. Moreover, the standard deviation of the experimental group was 2.17 and 2.31 for the control group in test one. The standard deviation of the experimental group was 2.13 and the control group was 2.47 in test two.

Table 2. Descriptive findings for experimental and control group in reading comprehension tests

		Test one		Test two	
Group	N	Mean	SD	Mean	SD
Experimental group	34	9.32	2.17	8.76	2.13
Control group	33	6.58	2.31	6.21	2.47

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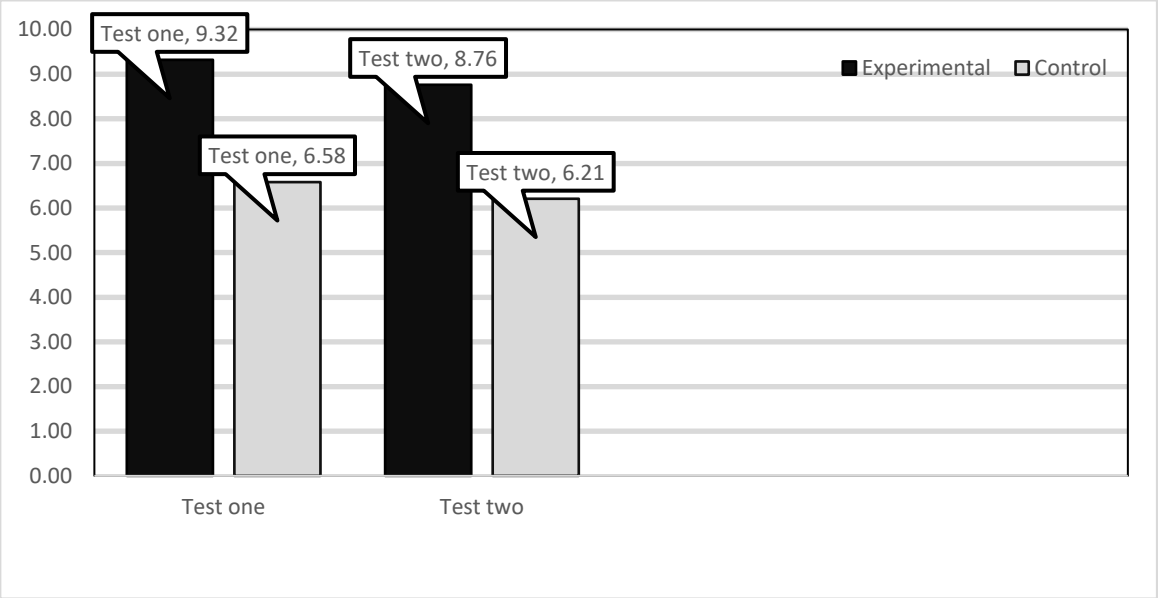

Figure 2. Mean differences in experimental and control group in test one and test two

To answer the first research question, an independent samples t-test analysis was conducted to explore the effectiveness of the REVOLUTION strategy on the participants' reading comprehension performance. Table 3 and Table 4 presented the independent samples t-test results for the effectiveness of the REVOLUTION strategy on biology students' reading comprehension (Tests one and two). The results revealed a significant difference with higher mean score belonging to experimental group [test one: $t = 5.0248$, $df = 65$, $p < .000$ and test two: $t = 4.5299$, $df = 65$, $p < .000$]. According to Table 3 and Table 4, it can be stated that REVOLUTION" strategy has a powerful and positive effect on biology EFL students' reading comprehension performance.

Table 3. Independent samples t-test results for the effectiveness of REVOLUTION strategy on biology students' reading comprehension (test one)

Group	Mean	t	df	Sig.(2 tailed)	Std. Error Difference
Experimental	9.32	5.0248	65	.000	0.547
Control	6.58				

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Table 4. Independent samples t-test results for the effectiveness of REVOLUTION strategy on biology students' reading comprehension (test two)

Group	Mean	t	df	Sig.(2 tailed)	Std. Error Difference
Experimental	8.76	4.5299	65	.000	0.563
Control	6.21				

As the above tables displayed, according to the results of the independent samples t-test, there is a significant difference in participants' mean scores. That is to say, the experimental participants' mean scores and performance is different to a great extent compared to the control group. The mean score of the experimental group in test one was 9.32 and in test two was 8.76 which is significantly higher.

In order to answer the second research question, and investigate the biology students' reading comprehension problems and perceptions, a combination of Smith et al. (2021), Dr. Allan Wigfield, and Dr. John Guthrie's MRQ questionnaire was given to the participants. The above-mentioned questionnaire consisted of Likert scale items in which the learners were asked to mark the alternative that best corresponds to their opinion. To analyze the data, the following values were assigned to each response: 'Strongly Agree': 5, 'Agree': 4, 'Unsure': 3, 'Disagree': 2, and 'Strongly Disagree':1.

Table 5*. Descriptive statistics for the biology students' reading comprehension problems and perceptions*

	Item	Strongly Disagree	Disagree	Unsure	Agree	Strongly Agree
1.	I can read but I don't understand the main idea of the text.	14.03%	19.29%	14.03%	15.78%	36.84%
2.	Teachers should use new learning devices to teach new things in class.	0%	7.01%	14.03%	26.31%	52.63%
3.	I don't like reading something when the words are too difficult.	7.01%	7.01%	17.54%	22.80%	45.61%
4.	I feel anxious when there are a lot of noise around me while reading a text.	10.52%	8.77%	14.03%	28.07%	38.59%
5.	If the teacher discusses something interesting I might read more about it.	3.50%	5.26%	21.05%	36.84%	33.33%
6.	I have trouble understanding the gist of the text.	7.01%	3.50%	14.03%	33.33%	42.10%
7.	I try very hard, but I just can't link my information to what I read.	15.78%	10.52%	22.80%	19.29%	31.57%

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8.	Skimming and scanning can help me to have a better performance in reading comprehension tests.	3.50%	8.77%	19.29%	21.05%	47.36%
9.	I can comprehend the text better in a silent place.	10.52%	10.52%	29.82%	22.80%	26.31%
10.	I can't analyze the information in the text very well.	7.01%	12.28%	19.29%	24.56%	36.84%
11.	If I discuss about the topic of the text before I begin to read, I will comprehend it better.	12.28%	15.78%	8.77%	22.80%	40.35%
12.	My friends and I often discuss the books we have read.	15.78%	17.54%	24.56%	15.78%	26.31%
13.	The use of computer technology in the classroom improves student learning of new concepts and ideas.	7.01%	8.77%	10.52%	31.57%	42.10%
14.	The environmental conditions can affect my reading comprehension.	8.77%	15.78%	17.54%	22.80%	35.08%
15.	I prefer to discuss about the text with my classmates before I begin to read.	5.26%	10.52%	5.26%	33.33%	45.61%
16.	Texts with highlighted key words help me to understand it better.	3.50%	5.26%	10.52%	28.07%	52.63%
17.	It is easier for me to understand what I am reading if pictures, charts, and diagrams are included.	0%	3.50%	3.50%	31.57%	61.40%
18.	I like to read books that have pictures.	0%	3.50%	0%	26.31%	70.17%
19.	Every reader should know some reading strategies for a better reading comprehension.	5.26%	7.01%	3.50%	24.56%	59.64%
20.	Encountering unfamiliar words is the hardest part of reading.	5.26%	8.77%	8.77%	28.07%	49.12%
21.	When I read I usually get tired and sleepy.	14.03%	15.78	19.29%	17.54	33.33%
22.	I like to read in a quiet place.	10.52%	17.54%	21.05%	22.80%	28.07%
23.	I have a lot in common with people who are poor readers.	15.78%	14.03%	15.78%	17.54%	36.84%
24.	I like to analyze new information about topics that interest me.	5.26%	7.01%	10.52%	29.82%	47.36%
25.	I like to learn more reading strategies.	1.75%	7.01%	14.03%	35.08%	42.10%
26.	Reading texts that have different pictures are really interesting for me.	0%	0%	3.50%	38.59%	56.14%
27.	Reading is one of my favorite activities.	26.31%	17.54%	5.26%	21.05%	29.82%
28.	Talking about the text's topic is not helpful.	8.77%	14.03%	21.05%	26.31%	29.82%
29.	I don't like vocabulary questions.	1.75%	5.26%	15.78%	28.07%	49.12%
30.	I get a lot of enjoyment from reading.	17.54%	17.54%	29.82%	12.28	22.80%

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31.	I can't analyze the text sentences well.	14.03%	15.78%	12.28%	26.31%	31.57%
32.	The use of new technologies in the classroom will decrease the amount of stress and anxiety.	14.03%	17.54%	21.05%	28.07%	19.29%
33.	I can't easily find the reference of pronouns.	15.78%	19.29%	10.52%	26.31%	28.07%
34.	The use of computer technology in the classroom Increases academic achievement.	7.01%	5.26%	8.77%	17.54%	61.40%
35.	Knowing reading strategies can help to increase my reading speed.	10.52%	14.03%	5.26%	24.56%	45.61%
36.	I can't identify the gist of short sections of the text.	10.52%	22.80%	0%	29.82%	33.33%
37.	Reading is one of the most interesting things which I do.	26.31%	14.03	1.75%	19.29	38.59%
38.	Pictures help readers to comprehend and remember texts better.	0%	1.75%	6%	21.05%	66.66%
39.	I like having the teacher say I read well.	0%	0%	8.77%	33.33%	57.89%
40.	I am a good reader.	14.03%	17.54%	28.07%	10.52%	29.82
41.	I often feel anxious when I have a lot of reading to do.	19.29%	19.29%	17.54%	17.54%	26.31%
42.	I have favorite subjects that I like to read about.	5.26%	8.77%	1.75%	28.07%	56.14%

The items of the questionnaire sought to find out biology students' main problems and perceptions in reading comprehension. This section presented the means and the standard deviations of the items in the questionnaire. The data from this questionnaire was gathered before the administration of the REVOLUTION strategy. The results indicated in Table 5 and Table 6 pointed out that university learners faced several problems in their reading comprehension processes. After the administration of the REVOLUTION strategy, there was a semi-structured interview about students' difficulties and ideas in reading comprehension. The results of the questionnaire and the participants' responses during the interviews revealed that after the implementation of the REVOLUTION strategy some of the problems were removed and some decreased to a great extent. Moreover, during the interview, the participants reported that they were satisfied with the new strategy and they gained more confidence in reading comprehension in English class.

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Table 6. Descriptive statistics (means and the standard deviations) of the biology students' reading comprehension problems and perceptions (questionnaire)

Item	N	Mean	SD
1. I can read but I don't understand the main idea of the text.	57	3.42	1.49
2. Teachers should use new learning devices to teach new things in class.	57	4.24	0.95
3. I don't like reading something when the words are too difficult.	57	3.92	1.25
4. I feel anxious when there are a lot of noise around me while reading a text.	57	3.75	1.34
5. If the teacher discusses something interesting I might read more about it.	57	3.91	1.03
6. I have trouble understanding the gist of the text.	57	4	1.16
7. I try very hard, but I just can't link my information to what I read.	57	3.40	1.43
8. Skimming and scanning can help me to have a better performance in reading comprehension tests.	57	4	1.16
9. I can comprehend the text better in a silent place.	57	3.43	1.28
10. I can't analyze the information in the text very well.	57	3.71	1.27
11. If I discuss about the topic of the text before I begin to read, I will comprehend it better.	57	3.63	1.45
12. My friends and I often discuss the books we have read.	57	3.19	1.41
13. The use of computer technology in the classroom improves student learning of new concepts and ideas.	57	3.92	1.23
14. The environmental conditions can affect my reading comprehension.	57	3.59	1.34
15. I prefer to discuss about the text with my classmates before I begin to read.	57	4.03	1.19
16. Texts with highlighted key words help me to understand it better.	57	4.21	1.06
17. It is easier for me to understand what I am reading if pictures, charts, and diagrams are included.	57	4.50	0.73
18. I like to read books that have pictures.	57	4.63	0.67
19. Every reader should know some reading strategies for a better reading comprehension.	57	4.26	1.15
20. Encountering unfamiliar words is the hardest part of reading.	57	4.07	1.19
21. When I read I usually get tired and sleepy.	57	3.40	1.44

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22. I like to read in a quiet place.	57	3.40	1.34
23. I have a lot in common with people who are poor readers.	57	3.45	1.50
24. I like to analyze new information about topics that interest me.	57	4.07	1.16
25. I like to learn more reading strategies.	57	4.08	1.00
26. Reading texts that have different pictures are really interesting for me.	57	4.52	0.57
27. Reading is one of my favorite activities.	57	3.10	1.63
28. Talking about the text's topic is really helpful.	57	3.54	1.29
29. I don't like vocabulary questions.	57	4.17	1.00
30. I get a lot of enjoyment from reading.	57	3.05	1.39
31. I can't analyze the text sentences well.	57	3.45	1.44
32. The use of new technologies in the classroom will decrease the amount of stress and anxiety.	57	3.21	1.33
33. I can't easily find the reference of pronouns.	57	3.31	1.46
34. The use of computer technology in the classroom Increases academic achievement.	57	4.21	1.23
35. Knowing reading strategies can help to increase my reading speed.	57	3.80	1.41
36. I can't identify the gist of short sections of the text.	57	3.54	1.45
37. Reading is one of the most interesting things which I do.	57	3.29	1.70
38. Pictures help readers to comprehend and remember texts better.	57	4.52	0.75
39. I like having the teacher say I read well.	57	4.49	0.65
40. I am a good reader.	57	3.24	1.41
41. I often feel anxious when I have a lot of reading to do.	57	3.12	1.48
42. I have favorite subjects that I like to read about.	57	4.21	1.17

Each of the 42 items of the above questionnaire is related to the elements of the REVOLUTION strategy. There were 15 items, items 2, 15, 16, 17, 18, 19, 20, 24, 25, 26, 27, 29, 34, 38, 39 and 42, whose means are over 4.0, and whose standard deviations are not too high. Moreover, items 27 (reading is one of my favorite activities) and 37 (reading is one of the most interesting things which I do) are the items that most of the students (15 out of 57) disagreed with. This showed most of the students do not like reading comprehension and experience proved that generally, people don't like what they can't do well. Getting enjoyment from reading and reading in a silent place are two items that the students were unsure about

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them and this reveals that teachers should use a model to make the reading comprehension process enjoyable for them.

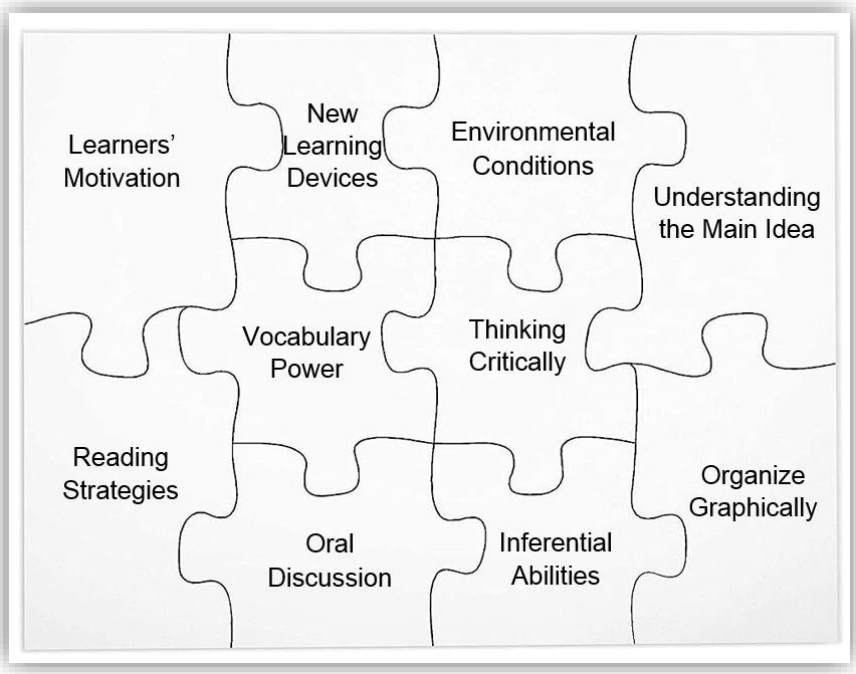

Figure 3. Ten necessary items in teaching reading comprehension

According to the data gathered from the interview and Table 6, it was demonstrated that Biology students' main problems in reading comprehension are directly related to the ten stairs of the REVOLUTION strategy, which included reading strategies, environmental conditions, vocabulary power, oral discussion, learners' motivation, understanding the main idea, thinking critically, inferential abilities, organize graphically, new learning devices (See Figure 3). Based on the interview, EFL students indicated that the new strategy helps them to overcome their problems, and the strategy was beneficial for them. This strategy is to make university students interested in reading comprehension, rather than a classroom strategy in teaching.

5.0 DISCUSSION AND CONCLUSION

The exploration of learning strategies has been a warm issue in the field of English language learning. This study introduced an innovative strategy for enhancing biology students' academic achievement in reading comprehension. Several studies showed that university students with reading comprehension difficulties need direct and systematic instruction,

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especially when coupled with explicit strategy instruction (Ahmadi & Pourhosein, 2012; Katemba & Sihombing, 2023; Khataee, 2019; Nurie, 2017; Rahmani & Sadeghi, 2011; Sase, 2014). Likewise, O'Reilly & Sabatini (2014), reported that nurturing students to enhance reading and comprehension skills can promote societal order and social interaction and enable them to succeed in their future careers. The more awareness students have about the reading strategies and various factors that affect their academic achievement, the more they are successful in text comprehension. In order to make students more engaged in the reading comprehension process, the teachers can use the REVOLUTION strategy for adult learners. The analysis of the data gathered from the administration of the REVOLUTION strategy, interview, and also the questionnaire revealed that biology EFL students in the experimental group performed significantly better on reading comprehension tests, therefore it can be concluded that the REVOLUTION worked well as a strategy for improving biology students' reading comprehension performance. Based on the results of the interview, most participants had favorable attitudes towards the use of this strategy for reading comprehension in their class and the majority of them enjoyed learning texts using this strategy. The participants of the study believed that the strategy has provided easier and faster access to the texts' information.

The results of this study have several pedagogical implications. All in all, this strategy provides useful information to the teachers about the learners' weaknesses to help them improve their reading comprehension. The findings also suggest that the strategy encourages the learners to gain a deep understanding of different texts. It is important to emphasize that all the stairs of the new strategy mentioned in this research, explicitly or implicitly and directly or indirectly affected biology students' reading compression performance and the importance of them settled in the percentage of each factor in the questionnaire. These findings help university learners in extracting and organizing new information and comprehending texts better. All in all, the findings of the research suggest that if the REVOLUTION strategy is implemented in the class, a teacher can make a revolution in the learner's mind.

There are some limitations concerning this study. The participants of the study were selected from two universities in Iran. Therefore, it is a little difficult to generalize the findings to all biology EFL learners in Iran. It is suggested that the new strategy be applied in different universities of different countries to shade more light on this specific area. Another limitation was the number of participants. There were 67 biology EFL students in this study. To gain more generalizable results, future studies should include more EFL learners to participate.

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