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The Extent to Which High School Students Possess Systemic Thinking Skills in the English Language Subject

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Abstract

The current research aims to identify the extent to which high school students possess systemic thinking skills in the English language subject. The study was limited to sixth-grade scientific (biological branch) students for the 2022-2023 academic year. The research population consisted of (975) male and female students, from which the researcher selected a sample of (200) students. The researcher applied the descriptive approach.

To achieve the research objective, the researcher designed a systemic thinking skills test comprising (17) systems with a total of (56) blanks. The test was administered on (February 9th, 2023) for female students and on (February 11th,2023) for male students. The appropriate statistical methods were used to verify the validity, discriminatory power of the items, and the reliability of the test.

After completing the test administration, the results indicated that the level of systemic thinking among students was moderate, with no significant statistical differences between students' genders (male-female).

Keywords : Systemic Thinking Skills, High School, Teaching Methods English Language.

Chapter One:

First: Research Problem: The educational system faces numerous challenges due to traditional teaching methods that are often ineffective and unsuitable for both the subject matter and the students' level. Additionally, curriculum developers sometimes prepare course content in a rigid and unengaging manner, without considering students' needs and cognitive abilities. This lack of adaptability in teaching methods, which should be tailored to different age groups, results in many students learning without sufficient motivation. Consequently, they develop a sense of boredom and aversion toward school, along with negative attitudes toward their teachers. (Al-Khatib, 2009: 9).

In response to these issues, Iraqi Ministry of Education has implemented significant and fundamental changes in the content of various subjects, including English language curricula across different educational stages. These reforms have given English a new and distinct structure, emphasizing its importance as a core subject. English plays a crucial role in acquiring fundamental scientific knowledge and essential cognitive skills, which are necessary for fostering students' intellectual growth in alignment with modern technological advancements. (Badendi & Shawahin, 2010: 15).

The researcher identified the research problem after reviewing several studies, including the study by Shawn & Al-Omrani (2015) and the study by Yahya & Ameer (2016), both of which highlighted the necessity of developing students' systemic thinking skills.

Based on the above, the research problem is defined by the following question: To what extent do high school students possess systemic thinking skills in the English language subject?

Second: The Importance of the Research: Science is an organized and classified body of knowledge that emerges through observation, repeated experimentation, and prediction. It

involves systematic studies aimed at identifying principles, foundations, or laws governing a particular field of knowledge. Science consists of an interconnected body of established facts, governed by general laws and discovered through reliable methods and approaches. (Al-Samak, 2008: 6)

Also, there has been significant interest in studying thinking and its skills, particularly how to develop them among learners. Many scholars emphasize that teaching thinking skills should be a fundamental goal in educational content, and teachers should actively integrate systemic thinking into classroom instruction. (Al-Heila, 2009: 175)

One of the critical thinking skills that can be effectively cultivated in students through engaging and scientific methods is systemic thinking. This skill helps students recognize relationships between different concepts and understand subjects holistically rather than in isolation. The systemic approach views educational components as interconnected and interactive, allowing students to grasp relationships between different elements of a subject. (Fahmy & Lagawsk, 2000: 3)

Hamadat (2008) highlights the benefits of systemic thinking, stating that its applications lead to mastery, professional growth, and a deeper, more comprehensive perspective. It enhances learning speed, helps students analyze relationships between concepts, and encourages adaptability to change. (Hamadat, 2008: 34)

Fahmy & Muna (2001) explain that systemic learning involves preparing students for educational units by connecting new information with their prior knowledge. This process fosters general and systemic thinking skills by encouraging students to explore information, link it to new concepts, and extract multiple relationships between previously known and newly introduced concepts. (Fahmy & Muna, 2001: 131)

The researcher believes that developing students' thinking abilities is essential for evaluating the effectiveness of curricula and their contribution to cognitive growth—particularly in systemic thinking skills. This approach enables students to gain a comprehensive understanding of subjects, analyze relationships, and apply structured thinking to educational content, especially in the English language curriculum. (Johnson, 2006: 4)

English as a subject consists of structured knowledge and interrelated concepts that can be understood through unified frameworks, relationships, and organized topics. Systemic thinking aligns with constructivist learning theory, which suggests that fragmented, unconnected information has little value unless it is integrated into a student's cognitive framework in a meaningful way. True knowledge is actively constructed by the learner through understanding interrelated concepts and recognizing connections between them. (Obeid & Afaneh, 2003: 63)

The Research Importance can be summarized as Follows:

1-This research aims to raise awareness among curriculum developers in the Ministry of Education about the importance of systemic thinking skills and the need to incorporate them into English language textbooks.

2- It emphasizes the necessity of fostering systemic thinking skills among students, ensuring that English language curricula align with contemporary scientific and technological advancements.

3- The study provides a measurement tool for assessing systemic thinking skills, which can be useful for other researchers in designing their assessment tools.

4- It contributes to developing students' ability to think systemically, allowing them to analyze subjects comprehensively without losing sight of their essential details.

Third: Research Two Objectives: The objectives of this research are to:

1- Identify the extent to which sixth-grade biological students possess systemic thinking skills.
2- Examine the extent to which sixth-grade scientific students possess systemic thinking skills according to gender (male/female).

Fourth: Limits of the Research The limits of the research is limited to:

1- Human limit: Sixth-grade scientific students (biological branch).
2- Spatial limit: High schools affiliated with Al- Rifa'i Education Department, Thi Qar Education Directorate, Thi Qar Governorate.
3- Temporal limit: The 2022-2023 academic year.

Fifth: Terminology

Thinking Skills: Abu Jado & Mohamed (2007) define thinking skills as "precise and calculative mental operations that interact with each other when we begin thinking. These skills form the foundation for effective and influential thinking." (Abu Jado & Mohamed, 2007: 76)

The researcher defines systemic thinking skills as a set of skills used by the researcher in teaching English to handle information within the subjects of this material according to systemic thinking for each skill.

Systemic Thinking: Obaid (2002) defines it as "a type of thinking that involves managing the thinking process and thinking about thinking itself. It requires advanced thinking skills, such as analyzing the situation, then reconstructing its components flexibly, using various organized ways to reassemble them to reach the desired outcome." (Obaid, 2002: 5)

The researcher defines systemic thinking operationally as a set of systemic thinking skills that should be included in the content of English textbooks for high school students (sixth-grade biology). These skills include recognizing relationships, analyzing systems, constructing systems, and evaluating systems, all of which students need to enhance their ability to process thinking and solve the various problems they encounter.

Chapter Two:

Theoretical Background and Previous Studies:

Section One:

1- Thinking Skills: Before go into the details of thinking skills and their types, it is important to define the concept of thinking, as this will provide a clearer understanding and guide how to handle it and its related processes and types. Thinking has been defined in many ways:

Linguistically, thinking is the use of the mind to organize and process information. The Al-Mujam Al-Waseet defines it as: "The act of organizing what is known to reach the unknown." It also mentions that thinking in a problem involves using the mind to find a solution. (Atya, 2015: 34)

Philosophically, De Bono (1998) defines thinking as "a structured exploration of experience in order to achieve a goal, such as understanding, decision-making, planning,

problem-solving, or judgment. It is a scientific skill where intelligence relies on experience." (De Bono, 1998: 42)

Effective school teaching requires stimulating various thinking skills in students. Modern educational studies indicate that students often lack the appropriate methods and mental skills to simply memorize and recall topics for solving problems. (Mustafa, 2013: 16)

2. Systemic Thinking: According to McNamara (2006), systemic thinking is a way to help individuals view systems from a broad perspective, offering a clear vision of the system's components. This approach helps identify the root causes of problems within the system and serves as a suitable starting point for addressing them. It provides intelligent solutions to long-term problems and simplifies them for real-world application, enabling individuals to act on them effectively. (McNamara, 2013: 405)

3. Importance of Systemic Thinking:

Systemic thinking is crucial because it provides a comprehensive understanding of situations and helps solve complex problems by analyzing their similarities and unifying information to find appropriate solutions. Its importance includes:

1-Helping students recognize problems and identify solutions effectively.

2-Assisting students in making correct decisions and taking actions to solve problems.

3-Enabling students to identify the true causes of problems. (Al-Fail, 2011: 6-7)

4-Developing students' future vision and ability to analyze and synthesize information to reach creative solutions. (Al-Kubaisi, 2010: 86-87)

The researcher believes that the significance of systemic thinking lies in the skills students can acquire to help them analyze problems, understand relationships among elements, reconstruct them flexibly, and evaluate them. This process leads to acomprehensive perspective on various life situations.

4. **Systemic Thinking Skills**: Systemic thinking skills consist of four main skills, which contain 12 sub-skills, as follows:

1. Skill of Recognizing Systemic Relationships:

- Recognizing relationships within a sub-system.
- Recognizing relationships between one system and another.
- Recognizing relationships between the whole and its parts.

2. Skill of Analyzing Systems:

- Deriving sub-systems from main systems.
- Drawing conclusions from a system.
- Investigate errors within a system.

3. Skill of Constructing Systems:

- Constructing a system from multiple concepts.
- Deriving generalizations about a system.
- Writing a report on the system.

4. Skill of Evaluating Systems:

- Judging the correctness of relationships between parts of a system.
- Developing systems.

- Comprehensive view of a situation through a system. (Al-Saeed & Mohamed, 2006: 124).

Section Two: Previous Studies:

The researcher reviewed several studies related to the variables of the current research. However, no study has combined all of these variables (to the best of the researcher's knowledge). Below are two related studies:

1- **Al-Kamil Study (2003)** The study aimed to clarify the concept of systemic thinking for learners, how systemic thinking is taught within the framework of curricula, and how this thinking contributes to students' learning. The study was conducted in Germany, with a sample of 200 students from ninth and tenth grades in German schools, focusing on biology, chemistry, and mathematics subjects. The results showed an increase in student achievement, and systemic thinking demonstrated progress in using tests, building quantitative models, and researching causal relationships.

2- Al-Zubaidi Study (2011) The goal of this study was to examine whether second-year intermediate students possess certain types of intelligence, whether they have systemic thinking skills, and the relationship between their scores on the mathematical intelligence scale and their systemic thinking skills. The study used a descriptive approach, with a sample of 217 students from second-year intermediate students in Al-Qadisiyah Governorate. The results revealed that students possessed some types of intelligence, particularly mathematical and spatial, but there was a weakness in their systemic thinking skills.

Benefits from Previous Studies:

The researcher benefited from the reviewed studies in various ways, including:

1-Determining the research methodology.

2- Using appropriate research tools.

3-Employing suitable statistical methods to achieve the research objectives.

4-Interpreting research results and using the literature to explain these results.

Chapter Three:

Research Methodology and Procedures:

This chapter presents the research methodology and procedures used, including the preparation of the systemic thinking test and verifying its validity.

First: Research Methodology: The researcher followed a descriptive methodology in this research to collect data on the level of systemic thinking skills possessed by the sample students in the English language subject.

Second: Defining the Research Community: The research community includes sixth-grade preparatory students (biological branch) who are currently studying in preparatory schools in the Rifa'i Educational Department, Thi Qar Directorate of Education, during the academic year 2022-2023. The total number of students in the community is 975, consisting of 539 male students and 436 female students, as shown in Table (1).

Table 1: List of Schools in the Research Community

No.	School's Name	Location	Number of Students
1	Al-Alama Preparatory for Boys	Al-Rifa'i	128
2	Sada Al-Najah Preparatory for Girls	Al-Rifa'i	132
3	Al-Najah Preparatory for Boys	Al-Rifa'i	84
4	Al-Rifa'i Preparatory for Girls	Al-Rifa'i	98
5	Al-Rifa'i Preparatory for Boys	Al-Rifa'i	109
6	Sheikh Al-Waeli Preparatory for Girls	Al-Nasr	112
7	Al-Nasr Preparatory for Boys	Al-Nasr	113
8	Al-Zuhur High school for Girls	Al-Nasr	94
9	Al-Raqeem High school for Boys	Al-Nasr	105
	Total		975

Third: Selection of the Research Sample: After determining the research community and becoming familiar with the high schools of the Rifai Education Directorate in Dhi Qar Governorate, the researcher selected a random sample. This was after visiting the schools, where the school administrations and English language teachers showed cooperation with the researcher and provided the necessary facilities to conduct the research. The sample consisted of (200) students, which is (20%) of the original community, distributed according to gender variables: (115) male students and (85) female students, as shown in the following table:

Table (2) The research sample.

No.	School's Name	Location	Number of Students
1	Sada Al-Najah Preparatory School for Girls	Rifai	17
2	Al-Najah Preparatory School for Boys	Rifai	25
3	Rifai Preparatory School for Girls	Rifai	21
4	Rifai Preparatory School for Boys	Rifai	31
5	Sheikh Al-Waeli Preparatory School for Girls	Al-Nasr	23
6	Al-Nasr Preparatory School for Boys	Al-Nasr	29
7	Al-Zohour school School for Girls	Al-Nasr	24
8	Al-Raqeem high School for Boys	Al-Nasr	30
Total			200

Fourth: Research Tool: One of the requirements of the current research is a tool that can measure the systemic thinking skills of the research sample individuals in the English language subject. Since the researcher was unable to find such a test (to the best of his knowledge), the researcher decided to create a test following the steps outlined below:

A. The aim of the Test: The test aims to assess the extent to which sixth-grade science students possess systemic thinking skills.

B. Determining the Number of Test Items: The researcher created a test for measuring systemic thinking skills, designed in a "systematic format." The test consists of (17) items, each item covering multiple concepts that measure the four main systemic thinking skills and the 12 sub-skills. The test was designed to be appropriate for the students' level.

C. **Formulating the Test Items:** After identifying the four systemic thinking skills, the researcher formulated (17) test items (in a systemic format) containing (56) blanks, distributed across the systemic thinking skills, as shown in Table (3):

Table (3) Distribution of Systemic Thinking Test Items.

Skill	Number of Systems (Questions)	Number of Blanks	Percentage of Skill
Skill of Recognizing Relationships	5	10	17.8%
Skill of Analyzing Systems	6	19	33.9%
Skill of Constructing Systems	4	20	35.7%
Skill of Evaluating Systems	2	7	12.5%
Total	17	56	100%

D. **Test Instructions:** The instructions represent general information about answering the questions, providing an idea about the goal of the test, the time allocated for answering, and the inclusion of items related to systemic thinking skills. These were then reviewed by a group of teaching experts, who were asked to assess the suitability of the questions for the skills. Based on their feedback and observations, some modifications were made, and the questions became ready for application.

E. **Correction Instructions:** The researcher relied on conceptual scores for grading the test items, which were divided as follows: (main concepts 3 points, secondary concepts 2 points, and sub-concepts 1 point). Since this is a "systemic format" test, the correct answer receives a score based on the conceptual points. Incorrect or unanswered questions receive a score of zero. Therefore, the total score for the test ranges from (0-63).

F. **Test Validity:** The researcher used face validity, which addressed the general appearance of the test. The test was presented to experts and specialists (Appendix 1) to gather their opinions on the suitability of the test items for the study's goals and their alignment with systemic thinking skills. The experts agreed that all the questions and instructions were clear, well-phrased, and appropriate for measuring the students' systemic thinking skills in the sixth-grade science – biological branch in the English language subject, based on an agreement rate of (80%).

D. Test Exploratory Application:

1. Applying the test to the first exploratory sample: The test was applied to the first pilot sample on Wednesday, (8/2/2023), consisting of (20) students from the research population, not part of the main sample. After answering, the clarity of the test items and their wording were verified. The researcher also measured the time taken by students to answer by calculating the time between the first three students and the last three. The time taken was found to be (40 minutes).

2. Application of the Second exploratory sample: To measure the psychometric properties of the test items, the researcher applied the test to the second pilot sample, consisting of (120) students from the research population.

Statistical Analysis of the Test Items: To assess and calculate the psychometric properties of the test items, the test was applied to (120) students from the research population, selected from (Sada Al-Najah Preparatory School for Girls and Al-Alama Preparatory School for Boys), located in the center of Rifai District. After applying the sample, the answers were corrected, and grades were calculated for all students.

1. **Discriminative factor:** The researcher worked on finding the discriminative power of each question to verify its ability to distinguish between strong and weak students.

The discrimination coefficients ranged from (0.62 to 0.29), which is statistically acceptable, as it is preferred that the discrimination coefficient be (0.20) or higher (Alam, 2006: 114).

2. **Test Reliability:** The test is considered reliable when it gives the same results approximately every time it is applied to the same group under the same conditions (Abu Labda, 2008: 227). To measure test reliability, the researcher used the Cronbach's alpha coefficient to calculate the internal consistency and homogeneity between test items. The reliability coefficient obtained by this method was (0.88), which is a good reliability coefficient, as a reliability coefficient of (0.67) or higher is considered acceptable (Al-Nabhan, 2004: 237).
3. **Test Application:** The researcher applied the test on (9/2/2023) for girls and (11/2/2023) for boys to measure systemic thinking skills. The researcher also clarified the study's objective and explained how to answer all the test items.
4. **Statistical Methods:** The researcher used the following statistical methods:

A. The discrimination coefficient for items to extract item discrimination.
B. The t-test to find statistical differences.
C. The Statistical Package for Social Sciences (SPSS).

Chapter Four:

Presentation of Results and Interpretation:

The following presents the results reached by the researcher, which aimed to measure systemic thinking skills in general among preparatory stage students. The results will be discussed in light of the research objectives.

1. Results related to the first objective: What is the extent of sixth-grade science students' possession of systemic thinking skills in the English language subject? To verify the first objective, the researcher conducted a test on systemic thinking skills and applied it to the sample, which consisted of (200) students. The mean, standard deviation, and t-value were calculated using the independent t-test at a significance level of (0.05) for systemic thinking skills as a whole among the research sample. The mean score for the students was (37.52), and the standard deviation was (9.303). To determine the difference between the mean score of the students' test and the theoretical proficiency level (80%), the researcher used a one-sample t-test, as shown in Table (4).

Table (4) The mean, standard deviation, and t-value for students' scores on the systemic thinking skills test, along with the theoretical mean and statistical significance.

Sample	Number of Participants	Mean	Standard Deviation	Theoretical Mean (80%)	Degrees of Freedom	T-Value (T)	Table T-Value	Significance Level (at 0.05)
Students	200	37.52	9.303	50.4	199	-19.571	1.65	Statistically Significant

It is clear from Table (4) that the results of the test showed that the calculated t-value was (−19.571), which is higher than the table t-value of (1.65) at a degree of freedom of (199) and a significance level of (0.05). This indicates a statistically significant difference between the mean and the theoretical mean, in favor of the larger value (theoretical mean). This means that the students' possession of systemic thinking skills is less than the proficiency threshold

(80%). The researcher believes that this result is logical because students at this age, particularly in early adolescence, are not inclined to organize and analyze life situations. Moreover, they are not interested in expressing their complete personalities in front of others, especially their schoolmates. In the same context, the researcher believes that the students' level of systemic thinking skills is due to several reasons, including the weak academic preparation of English language teachers in relation to systemic thinking skills and the lack of development in their skills through training courses related to the curriculum.

2. Results related to the second objective: What is the extent of sixth-grade science students' possession of systemic thinking skills according to the gender variable (Male/Female)?

To verify the second objective, the researcher calculated the mean, standard deviation, and t-value for both genders (Male and Female) using the independent t-test at a significance level of (0.05) for systemic thinking skills according to the gender variable. The data is presented in Table (5).

Table (5) The mean, standard deviation, and t-value for the research sample according to the gender variable in the systemic thinking skills test.

Group	Number of Students	Mean	Standard Deviation	Degrees of Freedom	T-Value (T)	Table T-Value	Significance Level (at 0.05)
Males	115	36.66	9.22	198	1.533	1.97	Not Statistically Significant
Females	85	38.69	9.32				

The theoretical average (80%) x the highest score obtained by students in the test (63) = 50.4

(Alyan, 2012: 93)

It is clear from Table (5) that the level of systemic thinking according to the gender variable for the students, where the mean for males was (36.66) with a standard deviation of (9.22), and for females, the mean was (38.69) with a standard deviation of (9.32). Using the independent t-test, the calculated t-value was (1.533) at a significance level of (0.05) and a degree of freedom of (198). This means the table value is greater than the calculated value, indicating that there are no significant differences between males and females regarding systemic thinking skills, according to the gender variable, as all students are exposed to the same curriculum and the same teaching methods used in teaching the English language subject.

Conclusions:

Through the results of the research, the researcher has reached the conclusion that the level of students in the English language subject in the sixth scientific grade (biology branch) in systemic thinking skills was lower than the theoretical proficiency threshold, which is (80%) of the total score of the systemic thinking skills test.

Recommendations:

Based on the results of the research, the researcher recommends the following:

1-Focus on the neglected systemic thinking skills and work on integrating them into the English language textbooks for the preparatory stage.

2-Include systemic thinking skills in the teaching of English at the preparatory stage, as they have an impact on improving thinking in general and systemic thinking in particular.

3-Provide English teachers and students with modern tools that can increase thinking and develop systemic thinking skills.

Suggestions:

Building upon this research, the researcher suggests the following:

1-Conduct a study to understand the reasons for the students' low level in the English language subject in the preparatory stage regarding systemic thinking skills.

2-Develop a training program for teachers based on systemic thinking skills.

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