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# Systematic thinking among university students

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## Abstract

The objective of the current research is to identify:

1- The level of systematic thinking among university students (research sample).

2. Differences with statistical significance for systematic thinking according to the gender variable among university students (research sample).

In order to achieve the objectives, it was necessary to prepare a tool to measure systematic thinking, so the researcher adopted a scale to identify systematic thinking, and after verifying the psychometric properties of the research scale and its items, it was applied to the basic research sample of (400) male and female students who were chosen by the stratified random method with proportional distribution, the selection of the sample in this way makes it more representative of the original research community, and gives freedom to the researcher to choose a number from each stratum in a random manner commensurate with its size in the research community, after analyzing the data statistically using the Statistical Package for Social Sciences (SPSS), the results showed the following:

1 The university students have a high level of systematic thinking.

2- There are statistically significant differences in systematic thinking according to the variable of specialization.

## Chapter One: Introduction to the Research

### Research Problem

Our current era is witnessing social, intellectual, political and economic changes and many challenges represented by the emergence of waves of violence, conflict, feelings of hatred,

selfishness and forces of destruction, it's impact has been clearly visible in human relations, causing huge losses in wealth and material, natural and human resources, it is difficult to solve problems and conflicts between individuals and groups without using scientific and psychological tools and means, including sound thinking and appropriate attention, Raymond and Peterson (2001) indicate that the weakness of systematic thinking reduces the individual's ability to find successful solutions to the difficult and complex problems he faces, which leads to a clear weakness in decision-making and the lack of creative solutions to problems (Richmond & Peterson, 2001: 123)

- Do university students have a certain level of systematic thinking?

**Research Importance**

Systematic thinking is a type of positive thinking or a form of higher levels of thinking, where, through this mode of thinking, the individual is able to see the comprehensive future of any topic without losing this topic its parts, that is, the individual's transition from thinking specifically to comprehensive thinking that makes him look at many elements which he can deal with as divergent topics, which he sees as common in many aspects (Afaneh and Nashwan, 2004: 219).

Systematic thinking helps the individual to re-analyze the situation and install its components flexibly, with a multiplicity of methods that are consistent with achieving the aims and reaching the desired within an organized framework to manage the thinking process, it also develops the ability to analyze and synthesize to reach creativity, which is one of the most important outcomes of any successful educational system (Mayer, 2000: 44).

And Sarid (Sarid 2012) confirms that systematic thinking is useful in making plans, analyzing situations and also helps in solving complex problems, it makes the individual able to see the overall picture of the problem, it also helps in solving recurring problems or problems resulting from wrong attempts in the past to fix them, as well as problems whose solutions are not clear, and contributes to solving issues in which the actions of individuals affect or are affected by the environment surrounding those issues. (sarid, 2012: 932).

And both Mani and Maharaj (Maani & Maharaj, 2002) concluded in their study that systematic thinking has a significant impact on improving the individual's performance in solving difficult problems, as it increases the individual's ability to understand and comprehend the structure of the system before initiating the development of problem-solving strategies (Maani & Maharaj, 2002: 212).

And Sterling (2004) showed that systematic thinking can be addressed as thinking based on interrelationships, that is, it is a holistic aggregative thinking that requires a comprehensive panoramic view of phenomena, things and relationships, and the whole is greater than the parts (Sterling , 2004: 219).

**Research Objective:**

1- Identifying the level of systematic thinking among university students (research sample).

2- Identifying the statistically significant differences in systematic thinking according to the specialization variable among university students (research sample).

**Research limits:**

The current research is limited to Babylon University students for primary (morning) study, for the academic year (2020-2021).

**Define terms:**

**Systematic Thinking:**

Defined by Bartlett (2001): It is a systematic thinking that aims to gather information and a comprehensive understanding about complex and difficult situations and problems through the interrelation of objects, systems and situations with each other and finding appropriate solutions to them (Bartlett, 2001: 2)

The researcher defines systematic thinking as a procedural definition:

The total score obtained by the respondent during his response to the items of the systematic thinking scale used in the current research.

**Chapter two: Theoretical Framework**

❖ **Systemic thinking**

**Features of Systematic Thinking:**

Both Assaraf and Orion (2005) see that systematic thinking has advantages and characteristics that are represented in:

1. The ability to distinguish the components of the system and the processes involved in that system.

2. The ability to identify and distinguish the relationships between the components of that system.

3. The ability to organize the components and operations of the system within one general framework of common relations among them.

4. The ability to make generalizations.

5. The ability to distinguish the dynamic relationships within the same system.

- **Characteristics of Systematic Thinking:** Ossimitz (2000) believes that systematic thinking is characterized by a number of characteristics represented by the individual as follows:

1- Seeks to understand relationships and feedback.

2- He thinks of general expressions rather than partial expressions of the system.

3- He thinks of the elements of the system as a reason for his behavior.

4- Understand the way in which system behavior is generated (Ossimitz 2000: 311).

- **Theories that dealt with systemic thinking:**

**• Bartlett's Theory (Bartlett, 2001) in Systematic Thinking:**

Bartlett developed this theory in 2001 and assumed that systematic thinking is a skill that consists of three steps:

**The first step:** identifying the largest possible number of elements that make up the system, situation or event, whether that is a problem, a solution, or a set of ideas, opportunities, or desired results.

**The second step:** collect similar elements together and describe each group of elements that leave characteristics with the other group.

**The third step:** to find a common idea that brings all these elements and groups together.

The step of finding the common idea is the process that represents systematic thinking, and systemic thinking is the opposite of analytical thinking, which is concerned with dividing things and transforming them into stages, while systemic thinking brings things together in stages, which is the first trick to deal with the obstacles facing the systematic thinking process, where the idea of In the mind that there is no common idea or pattern, as for the second trick or trick to confront and overcome the obstacles of systematic thinking, it is to realize the message that the brain tells the individual that there is no common idea that brings the components together, and that it is useless to search for one idea, and this means that the brain has not been able to find the idea yet, as for the third trick is to build a library of organizational solutions that all follow a similar pattern (Bartlett, 2001: 10-11).

## Chapter three: Research methodology and procedures

### First: Research Methodology:

The research method that the researcher used in the current research is the descriptive correlative approach, being the appropriate method in describing the phenomenon, identifying it and clarifying its characteristics and the degree of its connection with other phenomena (Adas et al., 2016: 221). It seeks to determine the amount and direction of the correlation relationship and to reach generalizations that contribute to understanding and developing reality, it is a form of analysis that depicts the phenomenon, then interprets it and subjects it to a scientific and accurate study (Franekle & Wellen, 1993: 370).

**Second: The research community:** The current research community includes students from the faculties of the University of Babylon (third stage)* of both sexes, whose number is (6035), and by (2497) males and (3538) females, distributed over (16) colleges.

**Third: Research Sample (Statistical Analysis Sample)**

A sample of (400) male and female students, distributed over eight colleges, were selected by stratified random method with a proportional distribution of (6) scientific colleges and (2) humanities colleges and they constitute (6.6%) of the total research community, a sample of these colleges was chosen by the stratified random method with a proportional distribution, as the selection of the sample in this way makes it more representative of the original research community, it also gives freedom to the researcher to choose a number from each stratum in a random manner commensurate with its size in the research community (Al-Baldawi, 2004: 66).

**Fourth: the search tool**

**Systematic Thinking Scale**

Given that the researcher did not obtain an Iraqi, Arab or foreign scale to measure the variable of systematic thinking that is compatible with the current research sample, she resorted to adopting a scale of systematic thinking among university students.

**Measurement method**

The researcher adopted Likert's five-way method in her measurement of the systematic thinking scale, as it is one of the ways that provides a homogeneous scale through which we can collect a large number of items for the trait that we seek to measure.

**Preparing the scale items in their initial form**

After defining the concept of systematic thinking in a precise light in the light of the adopted theory and defining the fields of the scale, the researcher formulated the items for each of the mentioned fields, and their number reached (36) items in its initial form, and by (12) items for the first field and (12) items for the second field and ( 12) items for the third field, according to which the opinions of experts regarding the relative weights of the areas of the scale are approved

**Scale correction and total score calculation**

The process of correcting the scale requires the researcher to put a score upon the respondent’s answer to each of the scale’s clauses, and then he calculates the total score of the scale by collecting the scores for the scale’s (36) clauses, as the researcher gave five alternatives in front of each clause, corresponding to the scale of correction scores extends from (1,2,3,4,5), in order to obtain the total score for each examinee, the scores obtained through his answers to all the

items are summed, noting that the lowest and highest score ranged between (180-36) degrees, and the hypothetical mean value of the scale is (108).

**Statistical analysis of the scale items**

The researcher applied the scale to a sample of (400) male and female students who were chosen by the stratified random method with a proportional distribution, Nunnally suggests that the size of the statistical analysis sample be no less than five individuals for each item of the scale, in relation to reducing the chances of chance in the statistical analysis process (Nunnally, 2621978), since the items of the scale are (36) items , the number of the sample members of (400) male and female students is acceptable and appropriate for the current research.

The methods used in the statistical analysis of the items of the scale:

**Extreme Groups Method (discriminatory power of the items)**

The discriminatory power of the items is the ability of that item to distinguish between individuals who possess the adjective or know the answer and those who do not have the adjective or do not know the answer for each item, the researcher applied the scale to (400) male and female students, after correcting the answers and extracting the total score for each form, the forms were arranged in descending order from the highest score to the lowest score, (27%) of the forms with the highest score were sorted, which is the highest group, and (27%) of the forms with the lowest score, which is the lowest group, this ratio provides two groups with the best possible size and differentiation as indicated by Anastasia, but the sample error becomes large if the samples are small, and for this it is preferable that the percentage of each group is not less than (25%) and not more than (33%), and Kelly believes the optimal percentage is (27%) (182, 1997, Anastasi), therefore, the number of members of each group became (108) male and female students, and the number of forms that were subjected to statistical analysis was (216) and by extracting the arithmetic mean and standard deviation for both the upper and lower groups, then applying the t-test for two independent samples to verify the significance of the differences between the averages in the upper and lower groups, and the calculated t-value was an indicator that achieves distinction between the items of the scale by comparing the computed t-value with the tabular t-value amounting to (1.96) and with a degree of freedom (214) at the level of significance (0.05).

We find that all items of the Systematic Thinking Scale are distinct, the calculated t-values ranged between (3.82-11.88), which is higher than the tabular t-value of (1.96) and at a degree of freedom (214) and a level of significance (0.05), which means that all items of the systematic thinking scale have the ability to distinguish in the attribute to be measured in respondents.

**Relationship of the item score to the total score of the scale:**

The researcher used the Pearson correlation coefficient to extract the correlation between the degree of each item of the scale and the total score of (400) forms, which are the same forms that were subjected to statistical analysis in the light of the method of the two peripheral groups, the correlation coefficient ranged between (0.268-0.518), and this shows that all correlation coefficients are statistically significant when compared with the tabular value of (0.098) and at the level of significance (0.05) and the degree of freedom (399), through this, all the items of the systematic thinking scale (36) are acceptable and distinct.

**The degree of the item is related to the degree to which it belongs**

Pearson correlation coefficient was used to find the correlation between the degree of each item of the scale and the total degree of the field to which the item belongs and for the same sample that the researcher used in the statistical analysis and the results indicated, however, that the correlation coefficients of the item's degree with the total score of the field to which it belongs were statistically significant at the level of significance (0.05) when compared with the tabular value of Pearson's correlation coefficient of (0.098) and the degree of freedom (398).

**The relationship of the degree of the field with other fields in the total score of the scale**

This type of validity was verified by using the Pearson correlation coefficient to find the relationship between the scores of individuals on each field of the scale and the other fields and with the total score of the scale, because it helps to determine the field of behavior to be measured (Anastasi, 1997:155), to achieve this, the researcher relied on the previous sample forms, and the results indicated that the correlation coefficients of the degree of each field with the other fields and the total degree of the scale are statistically significant at the level of significance (0.05) and for the field of finding solutions (0.902)

**Psychometric properties of the Systematic Thinking Scale:**

The researcher verified the validity and reliability of the scale as follows.

**First: Validity indicators of the scale:** The researcher verified the validity of the scale with the following indicators:

**A / Face Validity**

This type of validity was obtained by presenting the items of the scale in its initial form to a group of arbitrators specialized in the field of educational and psychological sciences and psychometrics.

**B/ Construction Validity**

The researcher verified the validity of Construction the systematic thinking scale through the indicators mentioned previously in the statistical analysis of the items, which are:

- Discriminatory power by the two-end group method.

- The relationship of the item's degree to the total degree of the scale.

- The relationship of the item's degree with the degree of the field to which it belongs.

- The relationship of the degree of the field to the degree of other fields and the total degree of the scale.

**Second: Indicators of stability of the systemic thinking scale (Reliability)**

The researcher relied to verify the stability of the following systematic thinking scale.

**Test _ Re _ test method**

To find a coefficient of stability for the systematic thinking scale, the systematic thinking scale was applied to a sample of (40) male and female students who were not from the research sample, they were randomly selected, distributed by gender and specialization, from two colleges, one of them is scientific and the other is humanitarian and the test was re-applied to them two weeks after the first application and in an appropriate period so that the respondent would not remember the answers the previous time, the researcher calculated the Pearson correlation coefficient between the two applications, and the value extracted by the re-test method was (0.80), which is a reliability coefficient that can be relied on in personal scales, as the coefficient of stability of the standardized achievement tests should not be less than (0.85) while it can be less than this number in personal tests (Awad, 1998: 134).

**Cronbach Alpha method:** to find the stability coefficient of the systematic thinking scale, the Cronbach equation was applied to the application sample of (400) male and female students, where the stability coefficient extracted for this method was (0.83) as obtaining a high stability coefficient in this way indicates that the stability of the test must be high.

**Standard error**

The standard error of reliability was (11.62) when it reached (0.80), and it reached (10.80) by the Alpha Cronbach method when it reached (0.83) the lower the value of this error, it means that the differences between the real and the apparent degrees are low (Al-Bayati and Zakaria, 1977: 211).

**Statistical indicators of the systematic thinking scale**

Statistical indicators of the systematic thinking scale were extracted through the Statistical Bag for Social Sciences (**SPSS**).

**Chapter Four: Presentation and interpretation of the results**

**The first aim**: The first aim (to identify the level of systematic thinking among university students)

To achieve this aim, the Systematic Thinking Scale was applied to the research sample, after correcting the scale and conducting a statistical analysis, it was found that the arithmetic mean of the sample scores reached (136.58) degrees and a standard deviation of (19.371), and the hypothetical average reached (108) degrees, in order to find out the significance of the difference between the achieved arithmetic mean and the hypothetical arithmetic mean, a one-sample t-test was used. The results showed that the calculated T-value amounted to (29,508) degrees. It is greater than the T-table value of (1.96). Therefore, it is statistically significant at a significance level of (0.05) with a degree of freedom (399).

It turns out that the university students have a high level of systemic thinking because they are affected by the changes taking place around them, or they may be exposed to various problems and pressures, so they try to awaken their mental abilities and employ them to confront those problems and pressures, this is consistent with what Bartlett suggested that systematic thinking helps the individual to choose good strategies that generate positive solutions, it makes him able to understand the complex situations he is going through by having an organized analytical view of what is happening around him, he is a person who uses more than one source to understand the information and is patient before making any judgment so that he has conviction, evidence and sufficient information to help him perceive the relationship and form an integrated, coherent and organized idea (Bartlelt, 2001:15).

The researcher believes that the university student enjoys experience, accumulation of knowledge and mental maturity, and possesses a comprehensive view that helps him to solve the problems he is exposed to, and to choose the appropriate and correct decision, he is also able to form models to transfer his acquired knowledge to his social life and develop his creative abilities, which makes him able to look at the problems facing him from different directions and angles, and all this leads to the development of mental abilities, especially systematic thinking.

**The second aim: to identify the differences in the correlational relationship in the systematic thinking among university students according to the specialization.**

For the purpose of identifying the differences in the correlational relationship of university students according to the specialization (scientific, human) in systematic thinking, the researcher used the Pearson correlation coefficient, and then the values were converted into standard degrees, and the relationship between university students in systematic thinking reached (0.68) and when the humanitarian specialization (0.71) to test the significance of these differences, these values were converted to standard values of (0.83) for the scientific specialization and (0.89) for the human specialization by referring to the table of standard values of the correlation coefficients and in order to find out the differences in this relationship, the researcher used the Z-test for testing the differences between the Pearson correlation coefficients, and the Z-value of systematic thinking was (0.56), when comparing that value with the tabular value of (1.96), it

was found that there are no statistically significant differences between university students in systematic thinking according to the variable of specialization.

It's value is (0.56), which is less than the critical value of (1.96), and therefore it is not statistically significant, it turns out to us that there are no statistically significant differences in the correlative relationship between university students in systematic thinking according to the specialization (scientific - human) this result is attributed to the fact that systematic thinking is a complex higher mental process and one of the psychological variables of a cognitive nature that is not greatly affected by the specialization, whether the specialization is scientific or humanistic with regard to students at the undergraduate level. systematic thinking is more related to the students' academic circumstances and has a link to the nature of the subjects in both disciplines, in addition to the weak correlation between university students with systematic thinking, the origin of the two variables has a weak relationship, so the differences were not statistically significant, this result is consistent with Toomey's assertion that systematic thinking increases the student's knowledge, and has a high flexibility in interacting with the study materials, and uses an organized method in the thinking process, as he is a person who is able to understand the study material well (Toomey, 2015: 16) , the researcher attributes this result to the technological development in the communications and information sector, which is represented in the Internet and satellite channels, it allowed the students of the University of Babylon to view thousands of films on what is known as (YouTube) that show responses in systemic thinking to situations and stimuli in different cultures and regions of Iraq, as well as showing examples of unique and strange behaviors and responses in different regions of the world, these observations may motivate the youth of the University of Babylon to express and think in a distinct way that is characterized by novelty and originality in light of the determinants of the culture of the province of Babylon, in addition to the existence of other justifications related to the growth of knowledge awareness of university students on the one hand, and the availability of access to the experiences of peoples through direct sensory and cognitive experience by traveling to different countries of the world, especially in the last ten years and the growth of the activity of the so-called (tourist groups), and this result It agrees with the results of several studies that indicate high levels of reasoning.

**Conclusions**:

- University students have a level of systematic thinking that exceeds the normal or natural level.

**Recommendations:**

- The need to enhance the positive aspects of the university student's personality, such as systematic thinking, through educational programs and courses, in order to achieve a better investment of his energies.

- The university takes measures to develop thinking in all its forms, such as conducting courses to develop awareness of the importance of thinking, and conducting training courses and competitions that use conceptual thinking tests and designs.

**Suggestions**: The researcher suggests conducting several studies:

- The relationship of systematic thinking with some emotional variables such as: emotional efficiency, emotional regulation.

- Conducting an empirical study that investigates the effect of a training program for the development of systematic thinking.

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