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ABSTRACT
This research aims to identify: 1-favorite learning Styles of the study group according to Felder & Soloman Model; 2- investigate, according to Felder & Soloman Model, if there are any statistically significant differences of favorite learning style due to gender variable; 3- find out the synthetic thinking of the participants; 4-to find out if there are any statistically significant differences among participants in terms of their synthetic thinking according to gender variable; 5- investigate if there are any statistically significant differences in terms of learning styles of synthetic thinking and in Felder & Soloman model according to gender variable; 6-investigate the differences in relation to learning styles in synthetic thinking and in Felder & Soloman model according to (gender and college) variables. The participants were selected purposefully and they were composed of 275 MA students (86 males from colleges of education and sciences and 189 females from colleges of education and sciences) in the colleges of education and department of chemistry in all colleges of sciences. The researchers have made a measure for styles of learning according to Felder & Soloman model consisted of 36 items distributed on five dipole styles and test of synthetic thinking consists of 12 essay questions distributed in 6 skills. The psychometric characteristics were affirmed by face validity and validity by internal consistency. The SPSS program was used The results have revealed that 1-The research sample subjects used (serial, optical, sensual, meditation, active, intuitional, spelling, and finally total style).as the styles (optical, sensual, serial) comes at first degree and the other (intuitional, spelling and title) were not indication and came in hypothetical. 2-Not all the styles are influenced by gender and college variables and interaction between college variables for chemistry departments. 3-Weak synthetic thinking in MA students in colleges of education and colleges of science for chemistry departments. 4-Synthetical thinking is influenced by gender variables in favor of males because their average 5,1628 is bigger than females average 3.1746. Also synthetic thinking is not influenced by college variables and the interaction between gender and college. 5-There is positive extreme indication relation between styles of learning according to Felder & Soloman model on synthetic thinking in institutional and (optical) indicated for males' favor, (meditation) for education, serial in favor of sciences.

Keywords: Felder & Soloman model, synthetic thinking, departments of chemistry, Graduate.

1. INTRODUCTION

Identification of The Research

Postgraduate stage is one of the significant stages in which the student confront great challenges as it represents the results of previous study stage and any reduction in thinking levels such as synthetic thinking is considered as a defect in cognitive structure of the student and that is incarnated in the cognitive features and failure in not using productive methods and regression in preparing process to reach learning outputs .Acceptance standards for higher studies are increased in numbers ,become different and accept big numbers out of acceptance and success in competition test .Through the researcher study of master and PhD. It must learn the styles of learning that are dominated with the student which supported him in intensified reading ,good listening and active application as the student has not used the suitable learning styles shall cause decline and regression in achievement It is very significant for the teaching staff to learn obtaining the information through students learning styles because does not know students learning styles cause the teacher failure in introducing scientific material in most clear way and mind opening of the student and the ability of synthetic thinking .Felder &

Soloman saw that there are different learning styles in students and the concentrate on these styles can make the student able to learn in his private way through improve his skills of scientific research skills ,his ability to collect the information ,making decisions and activate thinking that makes the students invent ,create and renew

Importance of The Research

Styles of learning are one of the principal components of the efforts made to understand the elements that affect the learning -teaching process as it becomes the access of the concern of scholars in schools and universities. The students' learning styles can distinguish individual differences and concerns of the tudent of higher studies in learning and dealing with information (Abu Awad and Nofal, 2012: 446-447). Felder & Soloman see that the students built his learning and experiences and develop his skills according to learning skills that cope with dominated learning styles and these styles control his thinking methods by incentives and problems that he confronts through his interactions. (Felder & Soloman) made a sample of five polar dimensions (intuitive -sensing, (visual -verbal), (active-reflective), (Sequential-global (inductive -concluded). Thus this model aims to diagnose the students' preferred ways in which they learn better, in order to improve the effectiveness of teaching by diagnosing and matching the student's learning style with the appropriate educational opportunities for him. (Ben Mansoor, 2017: 127-129). Also synthetic thinking is considered one of the most significant cognitive activities as it helps the student to be active in learning process and to explore his private environment and solve the problems Al-Mansour and Mansour, 2007: 10 and create visual total concept for the parts in the learning situation to make the whole integrated for the parts and elements assemble and arrange them to be a styles of a form that never exist before .it guarantee the production of a new subject ,product a plan and suggest a group of abstract relation by formulating hypothesis based on the analyzing basic elements for the learning material then adapting these hypotheses in the light of new consideration and elements .The students if higher studies is considered the importance elite in every community .The reaction for the challenges of twenty first century with its complex learning ,environmental ,social and economic pressures required the establishments of interventional creative individuals who has have more specialized knowledge ,the knowledge are applied as a base for thinking and ,original research and solve scientific problems they confront The student use of thinking skills in all fields in general and in chemistry in private It is of great importance, as it includes a wide range of operations required by scientific activity, such as planning, hypothesis, prediction, design, conducting surveys, interpretation of results, scheduling and communication (Ben Mansour, 2017: 512).

2. THE RESEARCH OBJECTIVES

This research aims to identify;

1. Favorite learning styles according to Felder & Soloman Model in this research sample
2. Expose statistically significant differences of favorite learning styles according to Felder & Soloman Model due to gender variable (males and females and students of chemistry departments in colleges of (education, Science)
3. Synthetic Thinking in this research sample
4. Expose statistically significant differences in this research sample in synthetic thinking according to gender variable (males and females and students of chemistry departments in colleges of (education, Science)
5. Expose statistically significant differences in this research sample in collaboration relation according among learning style to in synthetic thinking and in Felder & Soloman model
6. according to gender variable (males and females and students of chemistry departments in colleges of (education, Science)
7. Expose the difference in relation among learning styles in synthetic thinking and in Felder & Soloman model according to (gender and college) variables.

3. LIMITATIONS OF THE STUDY

This research is limited to 275 MA students in the field of Science (pure chemistry) from the departments of chemistry in college of education and colleges of sciences in 2021-2022 academic year.

First: Learning styles according to Felder & Soloman model Silverman 1988.The researchers shall adopt Felder Soloman identification: a group of psychological, cognitive and emotional behaviors that works together as firmed indications for awareness, reaction and response of the student (Felder& Silverman:1988: 674).

Second: Synthetic Thinking -1910) John Dewey identifies it as the ability of the individual to use his senses and analytic and creative abilities to make various solutions for the problem to see the problem from different points of view (Houghton & Metcalfe,2010:6).

-Bloom 1956 identified it as the ability of the learner to put the parts together to make every new thought through making a plan or unique communication to derive a group of abstract relations (Krathwohl,

2002:213). Jean Piaget identified it as abstract thinking by working on mental analysis for the situation then thinking to restructure them by new collaboration in an organized way (Piske et al, 2017:505-510).
The Procedural identification of synthetic thinking and after the researcher sees the identifications of synthetic thinking and determines its skills she adopts the point of view as it is a mental ability in formulating the identification. It is a mental ability through which the student faces challenges through experimentation and adventure, building ideas, asking different and unfamiliar questions and solutions, and an integrated view of the issue or topic by reassembling and arranging the presented data or disassembled parts, reflecting on them, and avoiding imitation by searching for everything that is new. To the degree that the student obtains.

4. THEORETICAL BACKGROUND

Learning styles Felder & Soloman On 1988 Felder & Soloman Introduced a sample for learning styles (FSLMS) which was applied in many studying stages for colleges of sciences and engineering great number of fields. This sample includes eight styles for learning consist of four dimensions with dipoles as the following:
a. Perception (sensing/intuitive)
b. Inputs (visual/verbal)
c. Treatment (Active / Reflective)
d. Assimilation (Sequential / Global) (Soloman & Felder, 1997:287-289).
Felder & Brent 2005 sees that choosing this sample out of several samples is a successful matter in improving the performance of higher studies students. Thus the founders of the sample suggest that teachers are in need to suite teaching methods with students learning styles and as a result the dynamic of the teacher and the student shall be improved of the learning of students and students' strong points are considered (Tyndall,2015:10-11). The learning styles according to Felder & Soloman can be explained as in the following:

a. Perception (sensing/intuitive).

The student of sensing learns through sense thinking or the visual with directing to facts and concepts and solve the questions by use known methods meanwhile the intuitive student learns by use abstract thinking and direct towards theories or behind the meaning Felder&Silverman,1988 :676).

b. Inputs visual -verbal

The students of visual style learn better when the information introduced to him through pictures and diagrams i. e. benefits from the information introduced to him by visual means such as maps, diagrams, films. The student of verbal styles learns and remember better when the information is introduced to him visually or in written language. He benefits better from written information and classroom observation (Felder& Silverman,1988 :676-677).

c. Treatment Active - Reflective):

Active style students learn better through recall the information and understand them as well as through or apply or apply for interpretation meanwhile the reflective styles student learns through reflection or abstract thinking and individual work Felder&Silverman,1988:678-679)).

d. Sequential -Global:

Sequential styles student learns through sequenced steps by each step followed the previous step where a logical course is followed for various parts of the material to reach the correct information and the suitable solutions meanwhile the global styles student learns better when the lecture starts with global introduction by show the curriculum in parts and They can be random without the need to follow sequential steps. They also prefer to learn through exploratory groups and solve difficult problems quickly without being able to explain how they reach the solution. (Felder&Silverman,1988:679-680).

Synthetic Thinking

Synthetic thinking is the unification of elements and parts to form the whole and also it is identified as an activity to determine a new creativity with mixture of thoughts from various resources. It is an activity that integrates parts of information to form a new design and thus results from synthetic process a new communication language and a plan or and a plan or good activity (Kriswandani et al,2019).
1988) Nelson & Hayes observe that synergistic process requires several activities such as organization ,understanding ,discover and solve the problems In order to write from multiple sources, students have to coordinate a number of supportive activities and the process of synthesis is a risky endeavor, so it is not surprising that only 50% of school and university students who have been taught can successfully synthesize, and that few teachers know how to help students to connect ideas from different sources. (Lundstrom et al, 2015: 64) and from the points of view that interpreted synthetic thinking as a method: Harrisson & Bramsoon sees that synthetic thinking is one of the most significant methods on thinking process. The synthetic thinking is represented in this theory in communicate to build a new and original thoughts that are very different from others bring and connect

between disconnected sciences and knowledge and being skillful in creativity clarity and possessing the skills that perform these skills and having the skills to come up with some perspectives that might provide better solutions (Harrisson & Bramsoon,1983:19; Al-shemary, 2015: 46-47). One view that interpreted synthetic thinking as a mental ability is:

1-John Dewey and synthetic thinking:

Interest in synthetic began at John Dewey in 1910 when he said not only an analysis, but a look should be taken as It is reduced so that the problem is seen internally rather than externally by dividing the problem into elements and studying it Separately and through installation different solutions to the problem are drawn in order to see the problem from various perspectives Synthetic thinkers use their senses and analytical and creative abilities (Houghton& Metcalfe,2010:954-961).

2- Bloom and synthetic thinking:

Bloom sees installation skill as a student's ability to put parts together. This is a process that deals with elements and parts and links them together in a way that makes them a styles or structure that didn't exist giving new, innovative ideas, practice advanced and high-end mental processes and solve problems in the light of unfamiliar origins and rules (Abed, 2014:6).

3-Jean Piaget and Synthetic Thinking:

Piaget believes that the process of installation, discovery and creativity results from the interaction and balance between assimilation and adaptation in education, synthetic, innovation and creativity are not possible.(Zain&Haris:2019:76)In Piaget's view, by reaching the capacity to synthesis , an individual will be free from the perceptible aspects of any subject and work on rational analysis of the situation or problem and thus the synthesis of all possible relationships and associations in an orderly way, an individual's arrival at this stage is an significant advance in the ladder of cognitive development.

After informing the researcher about the various skills of instant synthetic thinking a set of skills suited to graduate students was used to build the test for thinking and these are:

1. Ability to confront and venture through experimentation: means that the student ventures, explores or draws inspiration from new ideas through experiments.
2. The ability to imagine depending on meditation: means to reflect and imagine the student during the problem. In order to find appropriate solutions to the problem or imagine something unusual and its consequences.
3. Ability to concentration during the achievement of the task or the challenge which means the student's concentration during the task.
4. Ability to propose unfamiliar solutions: Student's ability to propose several unfamiliar solutions to address.
5. The desire in change renews and avoids imitation which means following new methods to deal with some problem or benefit from some phenomena in an unfamiliar way.
6. Complete view for the case or the problem or the subject introduced which means the student views all aspects of the problem in a precise way to reach the suitable solution and interpretation (Abdulqadir and Ameen .2019.67).

Characteristics of the student with synthetic thinking:

After seeing the theoretical direction, the researcher came up with a set of characteristics that the student could enjoy:

1. Student of synthetic thinking is concerned with creating new things from things that in itself looks different especially the thoughts which mean if we take this thought and that though what will happen.
2. A student with synthetic thinking is characterized by being complementary and does not care about medium or customary solutions.
3. Tends to renew and create thus those who have that style of thinking tend to search and view in the contrast, changes and different matters which led to creativity and invention.
4. The student with synthetic thinking is challenging, skipping, using meditation and planning and using (Razoqi et al, 2016: 251-253).

5. METHODOLOGY AND PROCEDURES

The research design

The researcher depended on the collaborative descriptive methodology in order to suit the problem and objectives of this research as well as it is one of the scientific research methods that is suitable to study collaboration relations among the variables.

Research group

The current research group consisted of all master's students in the faculties of education. The total number (297) is

127 students in the colleges of education and 170 students in the colleges of science are divided into within universities of Iraq for the studying year 2021-2022.The research sample reached 275 students as 57 male student from colleges of education,39 males from colleges of science,70 female students from colleges of education and 109 female students from colleges of sciences.

The research instrument

Measure of styles of Learning According to Felder & Soloman model. After the researcher review of many researches and studies related to this research subjects and objectives and as there is suitable instrument to measure styles of learning according to Felder Soloman model, the researcher The researcher resorted to building the scale based on previous literature and studies.

Felder & Soloman measure for learning style consisted of four styles and each style has four dimensions:

a. The first dimension: Sensing -intuitive

Learning in this style is through sensory or eye thinking with an orientation towards facts and concepts against abstract thinking and directing to the theories of beyond the meaning and it consisted of 9 items.

b. Second dimension: Visual -verbal

In this styles the learning is through depending on visual figures such as pictures and diagrams against verbal and written interpretation and it consists of 9 items.

c. Third dimension: Active - reflective

The active styles students who are better learn by recalling the information, understand it and apply it reflective styles persons are learning by reflection, abstract thinking and individual work and it consists of 9 items.

d. Fourth dimension: Sequential - global

The learning in this dimension is through previous sequential steps against global or total thinking consisting of 9 items (Elder & Soloman :1988: 674-681).

Formulate, substitute and correct the Items

After determine the measure styles the researcher formulate several items that represented by learning styles according to Felder & Soloman (1988) for each style as the researcher formulated for each style 9 items for the measure items to be 36 items and the researcher made two alternatives for each item (a)and(b).One of the alternatives shall take 1 and the other shall take 0 degree .The respondent shall choose one of the two alternative from(a) and (b) in each item then conclude the psychometric characteristics of the measure for validity and reliability and the correction is made by make to alternative for each item that is assigned by choose (a) or (b) by put right sign or circle around it according to this sample the student does not belong to certain style but all the styles are exist in the student in gradual rates ranged from strong to balance to weak within the four dimensions, the ILS is corrected by giving a score of (1) for the paragraph, and definitely this score will be either for alternatives (a) or for alternative (b).

When the subject is required to answer one alternative for each item one of the alternative take 1 degree which is chosen by the subject and the other takes 0 degree which is not chosen by the subject then the degrees of all the poles for the items of each dimension then we shall subtract a from b to conclude the degree of each students on each style and compare the final degree on a scale made for each style between 11+ and 11- with 2- towards negative and +2towards positive.

Items formulation and correction method:

After the researcher was informed about the literature and previous studies, the researcher did not found any test that measure the synthetic thinking or deals with the skills that suits this research sample and as the research needs a test that measure synthetic thinking for Master student in the colleges of education and colleges of sciences the researcher determine several skills that suits this research sample and build a test for synthetic thinking according to the skills that are determined (capability for adventure through experiment ,capability of imagination through reflection ,concentration through achieving the task or challenge

The ability to propose unfamiliar solutions, the desire for change and innovation and avoiding imitation, the integrated view of the issue, problem or topic at hand) and the method of correcting the test.

6. RESULTS

On the basis of response scarcity and scarcity here is attributed to the actual responses that emerged from the performance of the study sample by taking into account the logical answers and neglecting the illogical answers, the results can be interpreted and presented as in the following.

First

Favorite Learning styles according to Felder & Soloman model in the research sample. The results indicate that the favorite learning styles are (sequential, verbal, reflective, sensing, active, verbal and finally global).

Second
Statistically significant differences. Favorite Learning styles according to Felder & Soloman model according to the gender value (male and female) and students of chemistry departments (education and science) and the results shows:
a-Gender: No statistically significant differences in Learning styles according to Felder & Soloman model according to gender variable of the F value accounted for all the styles is less than table value (3.48) at function level (0.05) and degree of freedom (271,1).
b-Global: No Statistically significant differences in Learning styles according to Felder & Soloman model. According to the college variable the F value accounted for all the styles is less than table value (3.48) at function level (0.05) and degree of freedom (271,1).
c-Interaction between gender and college: Statistically significant differences in Learning styles according to (interaction between gender and college) if the F value for all interaction values accounted for all the styles between college and gender is less than table value (3.48) at function level (0.05) and degree of freedom (271,1).

Third objective
Synthetic thinking of this research sample .The results indicates that arithmetic mean for the degrees of this sample (3.7964) with standard deviation (4.55806) and to know the function of of the difference between arithmetic average and hypothetic average that reached (30) which is more than arithmetic average as it explained that the difference is statistically indicative level 0.05 in favorite of hypothetical average and the T value accounted reached (-95.334) is more than table T value (1.96) with freedom degree (274) and that mean the sample has no synthetic thinking

Fourth objective
The differences of statistical importance in synthetic thinking according to gender value (males and females) and the students of chemistry departments in colleges of (education and science) and the results of discrepancy analysis show:
a-Gender: The differences of statistical importance in synthetic thinking according to gender value as the F value accounted for all the styles (11.61) is less than table value (3.84) The mean of squares for males was (5.1628), which is greater than the average of squares for females of (3.1746).
b-Global: No statistically significant differences in Learning styles according to college variable as the F value accounted for all the styles (0.094) is less than table value (3.48) at function level (0.05) and degree of freedom (271,1).
c-Interaction between gender and college: No statistically significant differences in learning styles according to (interaction between gender and college as the F value for all interaction values (1.767) is less than table value (3.48) at function level (0.05) and degree of freedom (271,1). This absence is interpreted by the absence of significant moral differences, i.e. that the level of the two variables between groups have no analogue effects within the interaction in terms of gender (males, females) and college (education, science), and this led to the absence of interaction between gender and college.

Fifth objective
Global: Statistically significant differences in collaboration relation among learning styles according to Felder & Soloman model and synthetic thinking according to gender (males, females) and college (education, science) variables. The results show that the T value accounted according to (gender -college) is higher than table T value and that mean the relation between learning style (1.96) according to Felder & Soloman model and synthetic thinking significantly indicative which means the more the student has of learning styles according to Felder & Soloman model their capability of synthetic thinking is increased.

7. RECOMMENDATIONS

The researchers recommend the following:
1. Make obstructive sessions to make the students aware of the learning styles importance, how to identify them and its effects.
2. The necessity of include the studying curriculums in Master stage inputs that provide the students with several various learning styles that support them in cognitive treatment of information
3. The necessity of include the skills of synthetic thinking for various stages in order to increase their awareness and culture with it.
4. Concern in standards of acceptance for higher studies and the marks average is the general standard for acceptance and concern in quality not quantity in choosing procedure.

To complete the study, the researchers also suggest the following:
1. Make a research study to expose the relation among the learning styles and the studying practices.
2. Synthetic thinking and its relation with the ability to solve problems by the university students

3. Develop curricula to foster synthetic thinking skills for various studying stages.
4. Make study on age stages from university and secondary school students and compare its results with the results of this study.

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