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## **The effectiveness of (Suchman Inquiry Model) over personal intelligence of the third intermediate grade students in the subject of chemistry**

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**Abstract.** The research aimed to know the effectiveness of (Suchman Inquiry Model) in personal intelligence among third-grade intermediate students, and for the purpose of achieving the goal of the research, the experimental method was adopted, as a quasi-experimental design with partial control for two equal groups was used with a post-test for personal intelligence. The design was applied to (61) students, the group Experimental (30) students and control (31) students of the third intermediate grade in Al-Riyadah Secondary School for Outstanding Students of the General Directorate of Education in Baghdad Al-Karkh/3 for the academic year (2021-2022). And the formulation of behavioral objectives and the preparation of study plans, and the research relied on a tool which is the personal intelligence scale, the experiment was applied in (2021-2022), for a full academic year, the two research groups were studied by the researcher, and the two research groups were rewarded with (the chemistry degrees for the past year, and the information test The personal intelligence scale, which consisted of (50) items, was used to find honesty and reliability, the chemistry book for the third intermediate grade was selected to teach students, and after completing the experiment, analysis of the results were statistically obtained through the statistical package SPSS, and a set of results appeared on the basis of which the researcher put several recommendations as well as some suggestions.

**Keywords.** Suchman Inquiry Model, Effectiveness, Personal Intelligence, Third Intermediate Grade Students, Chemistry

### **Research Problem**

There are traditional methods that are dominant in the teaching of science, especially chemistry, as it relied on primitive methods, including memorization and indoctrination, ignoring the students' thinking and their personal intelligence, which includes social intelligence and self-intelligence. Therefore, there was a need to search for a new model that addresses this problem in order to be addressed through the exploratory questionnaire. Developed for this purpose, which included paragraphs on the level of personal intelligence of students for the third intermediate grade, which were directed to a group of (10) teachers of chemistry who have teaching experience, and the results of the questionnaire analysis showed that:

1) 94% of teachers do not use teaching models that increase the effectiveness of students' personal intelligence.

2) 100% of them don't know this model.

3) 95% of teachers use the traditional method of teaching.

Therefore, the (Suchman Inquiry Model) was chosen in this research to show its effectiveness in the experimental group. The research problem is summarized in the following question:

### **To What Extent Is the Effectiveness of (Suchman Inquiry Model) Over Personal Intelligence of the Third Intermediate Grade Students in the Subject of Chemistry?**

#### **Research Importance**

Education has a major role in changing the behavior of learners in a positive way and directing them towards a desirable direction, in addition to its great role in feeding students with knowledge through educational institutions, and teaching methods are an important pillar of education. Their existence and their application are of exceptional importance in carrying out any organized and purposeful work. Because it reflects the organization of a set of interventions, which, if used effectively and within the limits of the available capabilities and the specified time, would lead the educational process to the best desired results in light of the planned goals (Dakhlallah, 2017: 57). Therefore, the school has to use modern teaching methods for scientific subjects, including chemistry, in order to enhance the effectiveness of learning skills, develop thinking skills and personal intelligence among students and understand knowledge away from using methods that are not suitable at the present time because they do not care about the role of the student (Salameh et al., 2009: 17). The role assigned to the teacher is an educational role that must help and guide students in desirable and effective ways, which is reflected in the students' level and results (Rida, 2012: 365). Since society has evolved from an economy based on industry and agriculture to an enlightened society, the students who live in this society need educational needs, including the expansion of intelligence based on talents and talents.

Accordingly, the concept of intelligence opens up a field for creativity in various aspects, and reveals the latent intelligence capabilities of learners, which need to be improved and developed. It is also an entry point for establishing effective classroom relationships capable of learning by self and collective methods to achieve specific goals.

The teacher can also play a prominent role in this field, especially in the application of certain teaching models that are consistent with the type of intelligence that he wants to develop or improve among a group of learners (Afaneh and Naela, 3: 2003 ratios in education). Dealing with developed models for the purpose of developing education and changing the old and monotonous situation in most schools, to activate the tasks of the teacher and increase the tasks of the students and make their role passive and non-participating. Through the technique of inquiry, to help them find previously unheard-of solutions by offering experiences contrary to what they have, in order to raise doubts in them in order to re-learn them in an advanced way, in which the student is active and active and has developed his personal intelligence at the same time (Farhan and Al-Amri, 2012: 240).

Therefore, the most important things in the research could be mentioned as follows:

Attention to chemistry, as it is the science through which society can develop and solve its problems.

- Using modern teaching methods and models to reduce the difficulties that students face, increase their personal intelligence and employ direct scientific experiences.

- The role of the teacher in the educational process is affected by education using structural models. Instead of the teacher being the whole (information provider and controller), he will be directing the learning process and a learner at the same time.
- Trying to increase the learning experiences of the learners.
- Looking to increase the level of cooperation between the teacher and students.

### **Research Objectives**

Realizing the Effectiveness of (Suchman Inquiry Model) Over Personal Intelligence of the Third Intermediate Grade Students in the Subject of Chemistry

### **Research Hypothesis**

In order to achieve the goal of the research, the researcher puts the following hypothesis:

There is no significant difference at the level of significance (0.05) between the average scores of the students of the experimental group (the first) who were taught according to (Suchman Inquiry Model) and the average of the scores of the students of the control group (the second) who were taught according to the usual methods in personal intelligence.

### **Research Limits**

1. Human Limits: Students of the third intermediate grade in one of the excellent morning schools in Baghdad.
2. Spatial Limits: The General Directorate of Education, Baghdad, Karkh III.
3. Time limits: the academic year (2021-2022).
4. Cognitive Limits: the chemistry book for the third intermediate grade (for the curriculum adapted for the academic year in question). Written by: Al-Dujaili, Ammar Hani and others (2016), 4th edition, General Directorate of Curricula, Ministry of Education, Republic of Iraq, Baghdad.

### **Terminologies**

#### **1) Effectiveness:**

1. (Qatami, 2004) defined it as: (the ability to make an impact and the effectiveness of one thing is measured by the effect it makes on something else) (Qatami, 2004: 475).
2. (Atiya, 2007) defined it as: (the tool that shows the strength of the performance of both the teacher and the student and its reflection on learning outcomes) (Atiya, 2007: 61).

The definition of (Qatami, 2004) was chosen as a theoretical definition.

As for the procedural definition, the researcher defined it as: the change caused by (Suchman Inquiry Model) in the personal intelligence of the third intermediate grade students (the experimental group) after applying the experiment and it is measured in the research tool (the personal intelligence scale) prepared by the researcher for this purpose.

#### **2) Suchman Inquiry Model:**

1- (Khataiba, 2005): (a method of investigation used to help students develop theories that give the best explanations for the contradictory events they witness, and this method centers around the student, as he himself will ask questions) (Khataiba, 401: 2005).

2- (Ghabawi and Abu Shaira, 2010): It is (one of the educational models that adopt the investigative approach in teaching, which is the approach in which the learner is a cornerstone of the scientific mission by placing him in an educational position that requires him to think,

organize ideas and present them in a logical and sound way to reach knowledge) (Ghabawi and Abu Shaira, 2010: 27).

Theoretical definition: The researcher adopted the definition of (Ghabawi and Abu Shaira, 2010: 27).

Procedural definition of (Suchman Inquiry Model):

A set of interconnected and interrelated educational procedures and steps adopted by the researcher in the classroom, which help students (experimental research sample) to investigate according to the stages and steps described by (Richard Suchman) to reach the desired goals of enhancing personal intelligence among students in the third stage.

Interpersonal intelligence: (Kardner, 2004) defined interpersonal intelligence in the light of his classification of interpersonal intelligences into: intrinsic (internal) interpersonal intelligence and social (external) interpersonal intelligence, as follows:

1. Interpersonal Intelligence

He defined it as “the ability to notice the distinctions between people, between their temperaments, their natures, their motives, and their intentions, and then having the ability to act according to this knowledge” (Kardner, 2004: 430-431).

2. Intrapersonal Intelligence

He defined it as “the ability to orient to the emotional life (the development of the inner aspects of a person) the arena of his feelings or emotions, i.e., the ability to directly distinguish between these feelings and then name and bear them in a network of symbolic signs, which allows one to identify and encode complex and highly differentiated sets of feelings.” (Gardner, 2004: 430).

Theoretical definition: of interpersonal intelligence:

Gardner's theory of multiple intelligences, which represents the reference framework in measurement and interpretation, has been adopted in this research. Therefore, the theoretical definition of "personal intelligence" is the multiple intelligences theory's definition of the “Intrapersonal-Intrapersonal” intelligence variable.

Procedural Definition: Personal Intelligence “Intrapersonal-Intrapersonal”:

It is the level that is calculated by the sum of the final marks that the learner gains from the members of the sample represented by his personal intelligence, which is used in the current research to measure personal intelligence, and personal and social intelligence.

Theoretical Background: The goal of constructivist philosophy is to take care of the student and change his role from passive and passive to active, by helping him encode his information in the main memory and store it correctly, so that he can use it to understand the phenomena surrounding him and solve his life problems (Abu Riash, 287: 2007).

Investigative (Suchman Inquiry Model):

It is an investigative model based on the constructivist theory, in which a shift is made from transferring knowledge to participating in its construction, and the learner is a positive active person responsible for his learning (Jaber, 2003: 206). What they can of ideas and attempts in research and investigation to reach real results at a high level of understanding and awareness, and since this style depends mainly on the idea of scientific research, it tries to provide students with the skills and terminology of scientific investigation. When developing the style, Richard Suchman made a careful analysis for the methods and procedures used by innovative researchers, especially in the field of sciences, and after defining them, he formed an educational style that he called training or investigative education (Marei, 2005: 153).

The stages of the (Suchman Inquiry Model) investigative teaching: The (Suchman Inquiry Model) consists of the following stages:

**The first stage: (the stage of presenting the problem or event and confronting it):**

There must be a problem, question, or issue where the teacher presents this problem, indicating to them the procedures to be followed in the search for a solution or an explanation for this problem. The number of learners, and the teacher should take into account these factors when choosing the problem (Al-Saifi, 2009: 167).

It is preferable that the problem be of the type that arouses the students' curiosity. There are several forms, and the stage includes the following procedures:

- Presentation of the problem by the teacher.
- Clarify the question training strategy to be used.
- Clarify the type of questions used (yes or no questions).
- Adaptation of the problem to the developmental characteristics of the students.
- Preparing problems that require investigation and questioning.
- Starting with simple problems, moving to more complex problems.
- Testing events or issues that contradict the students' logic to ensure the continuity of the questioning process.
- Avoid addressing familiar or traditional topics.
- Create the appropriate atmosphere to ask a large number of questions.
- Increase students' ability to ask questions.

**The second stage: (data and information gathering stage) and includes the following:**

- Students are trained to obtain new knowledge about the educational situation in question, by asking questions to the teacher, who in turn answers (yes) or (no).
- Science should stimulate students' ability to contribute to a large number of multiple, diverse and differently oriented questions directed towards providing an adequate amount of experience and information.
- Students are trained to use distinctive creative ideas.
- The teacher helps students to find information by experimenting and testing.
- The teacher takes into account the continuity of the students in experimentation and gathering information and not stop trying. Students are trained to experiment based on what they have developed from a specific hypothesis as much as possible (Al-Falah, 2013: 166).

**The third stage: (trial and testing stage) and includes the following:**

The questions posed by the students form the initial hypotheses.

These hypotheses are formulated in the form of questions, and may be true or false.

- Discovering new knowledge.
- Find out what can happen after changes to new discoveries.
- Directing students to form and improve their hypotheses.
- Exercising and controlling the elements of the situation, to test and test the hypothesis.

- Helping students be disciplined and not jump to results quickly.
- Increasing opportunities for students to be tested and verified (Abu Dayyeh, 2011: 149).

**Fourth stage: (interpretation stage) and includes the following:**

- Students have difficulty bridging the mental gap between the information they have collected and providing a clear explanation.

- Students are asked to provide scientific explanations for the phenomenon under discussion.

- Students at this stage face the problem of forming ideas, based on the relationship between ideas, experiences, or available information, and the correct interpretation of that.

- Students need training situations that help them distinguish between causal relationships (cause and effect) and correlation (something related to something because there is a common relationship or similar properties between them).

- Students need to intensify the theories they develop from them and encourage their inclusion in order to arrive at a single theory that explains the event, and this investigative training activity concludes with the fifth stage (Al-Sarayra, 2015: 699).

**The fifth stage: (the survey process): It includes the following:**

- This stage aims to deepen the investigation and understanding of the phenomenon.

- Training students to conduct operations related to the questions that were asked and the results achieved, and the method for formulating the hypothesis and building the theory.

- Training students on a specific mental process, such as the process of discrimination, linkage, inference, and judgment according to specific criteria.

- Training students to formulate generalizations related to the experiences they experienced while practicing mental investigation (Abu Dayyah, 2011: 149-150).

**Interpersonal Intelligence:** (Gardner, 2004) defined in his book *Frames of Mind* both social intelligence and subjective intelligence within the term interpersonal intelligence, and devoted an entire chapter to it, as he reviewed the role of Sigmund Freud - Austrian neurologist and founder of the school of psychoanalysis - and William James - American philosopher One of the pioneers of modern psychology - in crystallizing this concept.

We find it indicated that Freud chose to focus on the development of the individual's self and its struggle for independence, while James emphasized the importance of relationships with other individuals as means to achieve ends and bring about progress and self-knowledge.

He also referred to the point of unification between Freud and James, which is the belief in the importance and centrality of the self and the conviction that psychology must be built around the concept of the person, his personality, his development, and his destiny. The two scholars emphasized that the ability to self-growth is an important starting point for the individual's interaction with the environment around him (Gardner, 2004: 228-229).

Gardner described two types of interpersonal and agency intelligence:

1) Social: It is "the ability to notice the distinctions between people, between their moods, natures, motives, and intentions."

2) Personal-self intelligence: It is "the ability to go towards a private emotional life, the arena of his feelings or emotions, i.e., the ability to directly distinguish between these feelings, then name them, and encapsulate them in a network of symbolic signs, and rely on them as means to understand and direct behavior." (Gardner, 2004: 430).

Components of personal intelligence:

Gardner justifies the reason for linking two different forms of intelligence into one kind is that these two forms of intelligence intermingle in any culture, where one's self-knowledge is always dependent on its ability to apply lessons learned from observing others while knowledge of others is based on the individual's internal distinctions usually. (Gardner, 2004: 433).

The difference between the two types of personal intelligence:

Each intelligence has its own characteristics and characteristics that distinguish it from other intelligences.

The table below shows the most prominent differences between the two components of interpersonal intelligence (social intelligence, intrapersonal intelligence):

**Table (1): Differences between the two components of interpersonal intelligence**

| Axes                                      | Intrapersonal intelligence  | Self-intelligence   |
|---|---|---|
| Sensitivity to                            | Body language, moods, voice, feelings   | Strengths and weaknesses of the individual himself, goals, desires.   |
| Tilting for                               | Observe the feelings and personality of others and respond to them.   | Setting goals, assessing personal capabilities and responsibility, observing one's thinking.  |
| The ability to                            | Working with others, helping others recognize and overcome problems   | Meditation, conflict resolution, self-regulation, maintaining composure, bringing out the best in oneself.                          |
| The cells responsible for it in the brain | Frontal schizophrenia, temporal schizophrenia, peripheral system  | Frontal schizophrenia, parietal schizophrenia, peripheral system  |
| learning materials                        | Games, shared learning aids.  | Self-examination materials, notes or diaries.   |
| Learning activities                       | Collaborative work Participating in photography and imagining Interviewing others Participating in role-playing Peer teaching Participating in strategies | Writing in a diary, expressing values and attitudes, reflecting on relationships with other students, conducting a self-assessment. |
| Education activities                      | Discussions, people-centered issues, social activities, guest of honor.   | Private spaces, a time to choose.   |

(Saad and Walid, 2006, 26-28); (Afaneh and Naila, 2009, 114 162-163).

**Research Procedures and Methodology**

1) Research Methodology: Since the current research has an independent variable which is ((Suchman Inquiry Model)) and a dependent variable is (personal intelligence), the quasi-experimental design was chosen for two equal groups (the experimental group that studied (Suchman Inquiry Model) and the control group that studied in the usual way) with Post-test of personal intelligence. As shown in diagram (1)

|    | Group        | Parity   | Independent variable    | Dependent variable    | Post Test                   |
|----|--------------|--|-------------------------|-----------------------|-----------------------------|
| .1 | Experimental | Test of previous information in chemistry, chemistry score for the second grade, average personal intelligence | (Richard Suchman) Model | Personal intelligence | Personal Intelligence Scale |
| .2 | Control      |  | The USUAL Way           |                       |                             |

**Diagram (1) Experimental Design of the Research**

**Second: Research Procedures:**

**Defining the Research Community and sample:**

Research community: The research community consisted of all students of the third intermediate grade in government secondary schools within the Baghdad Directorate of Education Karkh / third for the academic year (2021-2022).

Research sample: The researcher chose (Al-Riyadah High School for Outstanding Students) by the intentional way to apply the current research experience.

### Validation of the internal integrity of the experimental design:

The researcher worked on controlling or identifying the extraneous factors that could affect the results of the experiment, as follows:

#### 1- Equalization of the research groups:

The researcher equalized the two research groups in a number of extraneous variables, as follows:

1- Information of the past year: In order to know the characteristics of the students for the two research groups (T and Z) from past knowledge in chemistry for the previous grades (first and second intermediate), the researcher prepared a test consisting of (20) items in the form of multiple choice, and statistical work was conducted for both groups (v and z), and T-test calculation.

3- The level of chemistry for the second stage: In order to find out the equivalence of the two research groups (experimental and control) in the academic year exam score (first and second courses) in chemistry for the academic year (2020-2021), the statistics for both groups (T and Z) were calculated. T value. The equivalence between the two groups (experimental and control) can be shown in Table (2).

**Table (2) The equivalence of the experimental and control groups in a number of variables**

| The Group<br>Variables   | Experimental<br>(30) students |              | Control<br>Student (30) |              | Degr<br>e of<br>freedo<br>m | T-Value        |         | Significa<br>nce at<br>0.05 |
|--------------------------|-------------------------------|--------------|-------------------------|--------------|-----------------------------|----------------|---------|-----------------------------|
|                          | Avera<br>ge                   | Varian<br>ce | Avera<br>ge             | Varian<br>ce |                             | Calculat<br>ed | Tabular |                             |
| Previous information     | 12.97                         | 14.36        | 13.32                   | 12.25        | 59                          | 0.705          | 2.000   | Insignific<br>ant           |
| Chemistry degree (prev.) | 64.9                          | 174.76       | 63.8                    | 170.04       |                             | 0.675          |         | Insignific<br>ant           |

Table (2) shows that the calculated “t” value for all variables was less than the tabular “t” value, and it is a sign of the equivalence of the two groups with these variables.

3- Intelligence Scale: Equivalence was found between the two research groups in the two components of personal intelligence: (social - subjective).

The paragraphs of the Multiple Intelligences Scale, which was prepared by (Manoukh and Wassan, 2012) in two areas, namely, social intelligence and self-intelligence, were applied to the research sample first and it was modified to suit the environment and the stage belonging to the students, and it was presented to a group of arbitrators, and the psychometric properties of the scale were verified. Before applying it to the research sample, and after applying it to the experimental sample for the purpose of achieving equivalence, the answers on the scale were corrected with two sub-aspects, and the result was as follows:

#### 1- Social intelligence:

The average social intelligence of the students of the first group was (20,947) and with a standard deviation of (3,179), while the average of social intelligence of the students of the second group was (21,263) and with a standard deviation of (3,446). At the level of significance (0.05), the computed T-test was (0.41) which is smaller than the tabular T-test (2,000) with a

degree of freedom (64), and Table (3) shows this, and this result confirms that the two groups are equivalent in social intelligence.

2- Interpersonal Intelligence:

The average self-intelligence of the students of the first group was (18,737), with a standard deviation of (3,554), while the average of the self-intelligence of the students of the second group was (20,5), with a standard deviation of (4,144), and after applying the T-test for two independent samples to find the extent of the difference between them, it shows that It was not statistically significant at the significance level (0.05), as the calculated T-test was (1,964), which is smaller than the tabular T-test (2,000) freely (59), and Table (3) shows this, and this result confirms that the two groups are equivalent in self-intelligence.

**Table (3) The arithmetic mean and standard deviation of the two research groups and the calculated T value of the equivalence variables**

|   | Variables                  | Media              | 1 <sup>st</sup> Group T | 2 <sup>nd</sup> Group Z | Calculated T Value | Tabular T Value | Significance  |
|---|----------------------------|--------------------|-------------------------|-------------------------|--------------------|-----------------|---------------|
| 1 | Intrapersonal Intelligence | average            | 20,947                  | 21,263                  | 0,41               | 2,000           | Insignificant |
|   |                            | standard deviation | 3,179                   | 3,446                   |                    |                 |               |
| 2 | Interpersonal Intelligence | average            | 18,737                  | 20,5                    | 1,964              | 2,000           | Insignificant |
|   |                            | standard deviation | 3,554                   | 4,144                   |                    |                 |               |

Table (3) shows that the calculated "T" value for the two types of intelligence was less than the tabular value, and this indicates their equivalence.

2- Duration: The experiment took a full academic year, the first semester and the second semester of the academic year (2021-2022), and the experiment lasted for (20) weeks, and the number of classes was four classes per week for both research groups (T and T). Z), an average of two lessons per week for the two groups (T and Z), and the researcher was keen that the study material given in each lesson is equal for the two research groups.

As for the lessons, it was two lessons for each group, from the beginning of the experiment on (2/11/2021) AD, until its end on (11/4/2022) AD.

3- The teacher: the students of the research sample were taught by the researcher personally to ensure the safety of the experiment from the students being affected by different teachers.

4- Study subject: The two research groups studied the third intermediate chemistry book (conditional material), 4th edition, for the year 2016.

5- Experimental extinction: the phenomenon of student absenteeism or interruption of work (experiment), and while the researcher was carrying out the experiment, no case of interruption, leaving or transfer of any student of the research sample occurred during the experiment period. External validation of the experimental design:

The researcher worked on controlling the external safety, as follows:

1- The interaction of experimental situations: the students of the experimental group were not exposed to more than one experimental process during the research period, and the impact of the experimental procedures was removed by the researcher teaching himself (the researcher is

a member of the school's teaching staff, and he has studied the third grade for more than three years).

2- The interaction of the test with the experiment: This influence was reduced by the researcher selecting the people that represented the research sample, which are (Division "B", Division "C") randomly by lottery, so that Division "C" was the first group that was taught with (Suchman Inquiry Model ) and Division "B" was the second group, which was taught in the traditional method.

3- The interaction of the test with the experiment: the researcher's application of the personal intelligence scale for the purpose of equivalence of the two research groups may lead the two research groups to know the nature of the experiment before its application. He told the students that this is a procedure from the school to know the levels of the students.

4- The interaction of experimental conditions: the researcher studied the students of the two research groups himself with natural and non-artificial situations, and the experimental situations included the adoption of one experimental variable, which is the method of teaching for each group separately, for the purpose of excluding the effect of the interaction of experimental conditions with the experiment.

3- Preparing the research requirements:

The current research requires the preparation of a set of requirements for the purpose of implementing the research procedures, and these requirements include:

a. Selection of the scientific subject:

The scientific material for the students of the first and second research groups was determined over the period of conducting the research (for two full semesters) of the academic year (2021-2022), and it included the adapted material for the chemistry book for the third intermediate grade, how to distribute classes on the academic content and the number of pages for each chapter.

B. Formulating Behavioral Objectives:

The researcher formulated (320) behavioral objectives in the light of the specific scientific material in the adapted material of the chemistry book for the third intermediate grade. The researcher prepared (42) behavioral objectives in the cognitive aspect, and the researcher presented the behavioral objectives to the specialized experts.

T. Preparing teaching plans:

In light of the content of the chemistry curriculum for the third intermediate stage, (40) study plans for the (Suchman Inquiry Model) were prepared for the experimental group and (40) plans in the usual way for the control group.

The researcher presented a plan for each of the experimental group and a plan for the first group to experts and specialists in chemistry teaching methods to express their views on the suitability of the plan to the teaching method used for the two experimental groups and the control group, as well as its suitability for the content of the study material and behavioral purposes. Teaching plans for the experimental group and the control group.

4- Setting up the search tool:

The current research required the preparation of a tool to measure personal intelligence, and the tool was (the measure of personal intelligence), and the researcher decided to adopt the measure of personal intelligence for (Manoukh and Wasn, 2012) as it is based on the Iraqi environment. Dependent Variable (Interpersonal Intelligence):

According to Gardner's theory of multiple intelligences, interpersonal intelligence represents two forms of intelligence: social intelligence (peer recognition), and intrapersonal intelligence (self-awareness), as follows:

1) Intrinsic intelligence:

Awareness and the ability to act in an adaptive manner through specific knowledge, and this knowledge includes possessing an accurate image of oneself (the positives and negatives of the individual), discovering the internal psychological situation, influencing tendencies and motivation, internal need and goals, as well as self-control and self-control, and understanding and appreciating ourselves” (Armstrong, 2006: 3).

2) Social (external) intelligence:

The ability to perceive and distinguish the moods, intentions, motives and feelings of other people, and this intelligence can include sensitivity to facial expressions, voice and gestures, the ability to distinguish between many different types of interpersonal signals, and the ability to respond effectively to these signals in a realistic way, for example: Influencing a group of people to follow a certain course of action” (Armstrong, 2006:3)

Finding honesty: It is considered one of the most important things that should be found in the scale, and for the purpose of verifying the validity of the scale, its content was presented to specialists in the methods of teaching chemistry. The scale is unchanged, so it is not considered an old scale, and thus more than (80%) of the experts advised to keep the scale as it was used, and thus the scale enjoys apparent validity.

Finding stability.

The stability of the scale means that it gives the same results if it is used several times and under the same conditions. The stability of the scale has been verified in the following two ways:

Cronbach Alpha method: This method was used to calculate the stability coefficient of the scale, and it was found that its stability coefficient is equal to (0.85), which is a good stability coefficient, as the value of the stability coefficient from (67.0) and above is good, (Al-Nabhan, 2004: 240).

The method of re-applying the scale: The researcher applied the same scale to the same students twice after two weeks (that is, after fourteen days) under the same conditions, and to one of the middle third graders, which numbered (100) students. Then he found the Pearson correlation coefficient between the students’ scores in the first and second applications, which represents the scale’s stability coefficient, and its value was (0.87), which is a good stability coefficient, as the reliability coefficient’s value from (67.0) and above is good, (Al-Nabhan, 2004: 240).

Experimental application procedures:

The experiment was applied to the students of the two research groups (first and second) in the light of the following procedures:

A- The experiment began with the application of (intelligence test, personal intelligence scale and previous information test) on the two groups (experimental and control) on 4-10/11/2021.

B - The researcher began the actual teaching on November 5, 2021 for the two groups (experimental and control), as the experimental group studied with the teaching plans prepared by the researcher with the teaching plans prepared by the researcher according to (Suchman Inquiry Model), while the control group studied in the usual way and also in light of the teaching plans prepared by the researcher for this purpose.

C- The dimensional personal intelligence scale was applied on 11/4/2022 AD corresponding to (Monday) on the research sample at one time, and students' scores were obtained for the two research groups (T and Z).

**Viewing and Discussing the Results**

Presentation of the results: For the purpose of verifying the hypothesis, the researcher calculated the results of the T-test for the scores of the students of the group (T and Z) in the personal intelligence scale as in Table (4).

**Table (4): The results collected from finding the t-test for the two research groups in the Personal Intelligence Scale**

| GROUP        | SAMPLE NO. | AVERAGE | STANDARD DEVIATION | VARIANCE | DEGREE OF FREEDOM | CALCULATE T VALUE | TABULAR T VALUE | SIGNIFICANCE AT 0.05      |
|--------------|------------|---------|--------------------|----------|-------------------|-------------------|-----------------|---------------------------|
| Experimental | 30         | 21.27   | 2.37               | 5.61     | 59                | 5.21              | 2.00            | Statistically Significant |
| Control      | 31         | 17.23   | 3.53               | 12.46    |                   |                   |                 |                           |

The average scores of the students in the experimental group were (21.27) with a variance of (5.61), as for the average scores of the students in the control group (17.23) with a variance of (12.46), the researcher found out the significance of the difference between the average scores of the two groups to test the validity of the hypothesis. Using the t-test for two independent samples, it became clear that the difference between them was statistically significant at the significance level (0.05), as the calculated t-value was (5.21), which is greater than the tabular t-value (2.00) with a degree of freedom (59), thus rejecting the null hypothesis and accepting the alternative hypothesis is that there is a difference.

**Interpretation and discussion of the results:**

By observing the results of the research, it was found that there are statistically significant differences between the average scores of the experimental group that studied (Suchman Inquiry Model) and the average scores of the control group that studied using the usual method in the personal intelligence scale, where the difference was in favor of the first group, and this difference is due to Using the (Suchman Inquiry Model) according to steps (presenting the problem, gathering information, formulating hypotheses, providing explanations in order to solve problems, and making judgments on chemical issues).

The researcher justifies this superiority by the fact that the use of (Suchman Inquiry Model) in teaching helped the experimental group students to noticeably enhance their personal intelligence and it worked to arouse their attention, in addition to that, it helped to provide an atmosphere of fun and excitement for students, and (Suchman Inquiry Model) worked ) on the students' interaction with the lesson, which led to an increase in their activity, which affected their personal intelligence, and the results it reached are in agreement with the results of previous research such as the study (Al-Zoghbi, 2007) and (Habib, 2017), which indicated the progress of the first group over the second group thanks to the use of (Suchman Inquiry Model), and self- and group learning and teaching models work on the development of personal intelligence, through meditation, goal setting and behavior control by the learner, his self-intelligence is developed, and through interaction between the teacher and the learner or with peers, participations and group discussions, social intelligence is developed.

**Conclusions:**

Teaching using (Suchman Inquiry Model) is effective in developing the personal intelligence of third year middle school students.

### **Recommendations:**

There are several recommendations, including the following:

- 1- Training male and female teachers on how to use the (Suchman Inquiry Model) in-service in their schools by conducting in-service training courses for female and male teachers of chemistry for the third intermediate grade.
- 2- Informing the specialized supervisors of the use of the (Suchman Inquiry Model) and emphasizing it upon their evaluation visit to the teachers of chemistry in the middle school.
- 3- It is necessary to prepare the requirements for effective and interesting teaching such as furniture, equipment, teaching aids and laboratories for the success of the teaching process on the (Suchman Inquiry Model).
- 4- Paying attention to activities that help develop students' personal intelligence.

### **Suggestions:**

There are several suggestions, including:

- 1- The effectiveness of teaching using (Suchman Inquiry Model) in teaching chemistry and in other variables such as structural thinking, and science processes in the preparatory stage.
- 2- The effectiveness of (Suchman Inquiry Model) in acquiring chemical concepts and logical inferences among middle school students.

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