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Student Culture in the Department of Chemistry at a Faculty of Education for Pure Science (Ibn Al-Haytham) in Iraq

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In this research, a descriptive research methodology was adopted. The research community consisted of all students of the Chemistry Department - Phase IV in the College of Education for Pure Sciences/ Ibn Al-Haytham. In this society, the research tool was prepared, which is a measure of chemical culture, which consisted of three dimensions: cognitive, skill and emotional dimension. The emotional dimension includes 16 poverties, and each paragraph has three alternatives (I agree, I do not know, I disagree).

Keywords: Descriptive Research, Skill Dimension, Poverty

Introduction

These paragraphs represent the trend toward chemistry. In light of the results, the researcher reached conclusions and made some recommendations and suggestions.

1. The chemical culture among students of the Department of Chemistry in the Faculty of Education for Pure Sciences/Ibn al-Haytham.
2. The percentage of students in the Department of Chemistry in the Faculty of Education for Pure Sciences/Ibn Al-Haytham for the chemical culture.

To achieve the objectives, the researcher formulated the following questions:
1. Do the students of the Department of Chemistry in the Faculty of Education for Pure Sciences/Ibn Al-Haytham have chemical culture?

2. What percentage of students in the Department of Chemistry in the Faculty of Education for Pure Sciences/Ibn Al-Haytham have chemical culture?

Research problem

All modern educational systems pay particular attention to the issue of preparing and training teachers before and during service, as the teacher is an essential element in the educational process. An educational system is considered as successful and productive if there are sufficient numbers of teachers in the system. The community expects to progress as a result of raising its members correctly. The emphasis is on the training of teachers in the programs, which leads to its upgrading.

As well as the role of educational systems in the rehabilitation of qualified staff, especially at the secondary level, there is a need for the teacher to enjoy the chemical culture, which is part of the scientific culture. Since the chemical culture of the teacher is the product of teaching, and learning processes in the academic preparation stage, it falls on institutions Preparation of teachers. The biggest burden in the preparation and rehabilitation of a chemically educated teacher is to enable teachers to disseminate to their students. The researcher believes that it is necessary to pay attention to the extent of what the students of the Department of Chemistry - the fourth stage of the chemical culture. The research question was addressed as follows.

Do the students of the Department of Chemistry in the Faculty of Education for Pure Sciences/Ibn Al-Haytham have chemical culture?

Research Structure

Science and technologies have become necessary for every learner to become a productive citizen. This means that educational institutions must help the students to learn the elements of scientific culture, including chemical culture and eradicate scientific illiteracy, as the spread of chemical culture, especially among the categories Young learners, a pillar to improve the quality of life in society and a means of scientific advancement desired, to participate with knowledge, thinking, skills and attitudes effectively in his environment and society (Ali, 2009).

Based on this, science education, in the light of scientific progress, is concerned with the preparation of the learner. It is also concerned with the formation and growth (mentally, emotionally, Maha Raya) to meet the challenges of the twenty-first century, and able to use knowledge to make daily decisions and be able to participate in issues related to science and technology. Their respective impacts on society and the environment (Sheikh, 2009).

Today, we live in a world where the effects of chemistry are increasing in an unprecedented and unprecedented manner. This science has many daily uses and applications in our modern life, and its influence on the environment, human life and the earth, whether positive or negative, including pesticides and fertilizers, Garment and industry, pharmaceutical industry, food industry, agriculture and other chemical industries.

The preparation of individuals to be chemically educated has become one of the main objectives of chemistry education to understand the natural environment and manage the public debate. That would help people to deal with these effects and make the right decisions about them, and to live effectively in a world full of chemical processes and products, to make the most of them and reduce their damage at the same time. It revolves around societies on issues related to chemistry, understanding the basics of chemical knowledge and following up on their developments (Abu Al Wafa, 2018). In other words, there is a need for a learner, who can adapt to all the variables that occur according to the desired values and goals and contribute in one way or another to solve the problems on the one hand and facing the requirements of the learner himself and the community on the other hand and adapt to the variables. And current events in the world as a whole (Zeitoun, 2010).

Therefore, it became necessary to have students of the Department of Chemistry/fourth stage and pre-service chemistry teachers possess chemical culture. They are on the part of citizens in the community and on the other entrusted with the formation of chemical culture among students, and preparing them for the twenty-first century. It also enables them to understand the nature of science and the possession of higher skills that help them deal with the situations facing them in their environment, and the formation of positive attitudes towards chemistry and its applications, and contribute to reduce the scientific gap within the community, in which he feels that chemistry and technology contribute effectively to improve his social life, Cultural, and environmental.

From the above, the importance of research is reflected in:

1. the first attempt at the local level (to the knowledge of the researcher) to reveal the level of chemical rumours among university students;
2. the attention of those in charge of preparing students in the faculties of education to develop their preparation programs to cope with the rapid developments, chemical innovations, and make the formation of chemical culture among students a major objective; and,
3. provideing an evaluation tool for the chemical culture for students of the Department of Chemistry in the faculties of education and science, and teachers of chemistry at the secondary level.

Research Aims

The research aims to detect:

1. The chemical culture among students of the Department of Chemistry in the Faculty of Education for Pure Sciences / Ibn Al-Haytham; and,
2. The percentage of students in the Department of Chemistry in the Faculty of Education for Pure Sciences / Ibn al-Haytham for chemical culture.

The following questions were formulated to verify the objectives of the research:
1. Do the students of the Department of Chemistry in the Faculty of Education for Pure Sciences/Ibn Al-Haytham have chemical culture?
2. What percentage of students in the Department of Chemistry in the Faculty of Education for Pure Sciences/Ibn Al-Haytham for chemical culture?

Search Limits

1. Students of Chemistry Department - the fourth stage in the Faculty of Education for Pure Sciences/Ibn Al-Haytham;
2. Dimensions of chemical culture (cognitive dimension, dimension Mahari, emotional dimension); and,
3. The academic year 2016-2017.

Identification of terms: -

Chemical Culture

What a learner should know about chemical key concepts, and what he or she should be able to deal with, and differentiate between chemical knowledge and the skills practised by the use of that knowledge (Shwartz, 2004).

Shwartz, Ben-Zvi and Hofestein (2006a) defined the chemical culture as understanding the basic concepts of chemistry, which help explain and explain natural science, and have a realistic view of chemistry.

According to Shwartz, Ben-Zvi and Hofestein (2006a), the procedural definitions of chemical culture are the ability of students of the Department of Chemistry to understand and deal with chemical knowledge and its applications in daily life in decision-making related to chemistry and measured by the degree they get on the scale of chemical culture in three dimensions (cognitive dimension, the cognitive dimension, emotional dimension) prepared for this research.

Theory Background

The first objective of science education is to prepare citizens with lifelong learning skills, to make decisions and to participate in societal debate on scientific issues, i.e. to prepare scientifically educated citizens. Chemistry is one of the branches of natural sciences that plays a significant role in the formation of scientific culture in an integrated manner and thus is a chemical culture—a component of scientific culture and part of it. Ali (2007) states that "Preparing a learner capable of contemporary, that is, possesses a degree of integrated knowledge from different sources, and mastered many of the skills that enable him to take personal positions and views expressing himself, which helps him to interpret, forecast and decision-making. In this sense, culture encompasses many areas, including scientific, economic, aesthetic, ideological, linguistic, mathematical, chemical, physical, and so on."

Shwartz et al. (2005) note that one of the qualities that must be enjoyed by intellectual chemist is to be able to:

1. understand chemistry, how a chemist works, and how he thinks;
2. understand the chemical concepts and theories and the main ideas in them;
3. understand the relationship between chemistry and chemical technology that changed the world;
4. interpret the phenomena related to chemistry; and,
5. evaluate the role of chemistry in society and its impact on it.

In the same context, Shwartz et al. (2006b) added the characteristics of the chemical intellectual must be able to understand:

1. the content for chemistry which includes the ability to understand:

a) Scientific ideas such as (experimental chemistry science, follow the scientific investigation, explain the phenomena according to other sciences such as physics, life sciences); and,
b) Characteristics of chemistry where chemistry attempts (explain the phenomena within the molecular structure of the material, the investigation of the mechanics of chemical reactions and energy changes in them, the investigation of life changes and interpretation in the context of chemical structures).

2. Intellectually capable of determining the importance of chemical knowledge, understanding the relationships between innovations and community processes, making the right and effective decisions to participate in the discussion of chemical issues.

3. Higher learning skills (such as asking questions about phenomena related to chemistry, search for information and linking between them); and,
4. Emotional Aspects: Intellectual chemist possesses a realistic view of integrated chemistry, and expresses his interests in chemical topics.

From the previous presentation of the characteristics of the cultured chemist will determine the dimensions of the chemical culture that will be committed to the researcher in the current research.

In light of this, the preparation of the chemical culture scale according to these dimensions.
First: The cognitive dimension, which includes:

1. The nature of chemistry and includes (branches of chemistry, characteristics of chemistry);
2. Concepts such as (molecular and atomic structure of matter, gases, acids, bases, salts)
3. The interrelationship between chemistry, society and technology. There is an interactive interaction between chemistry, technology, society and the environment. Chemistry and the human body, medical chemistry, industrial chemistry).
4. Problems resulting from chemical technology include (air pollution, thermal pollution, noise pollution, nuclear waste and disposal methods, food pollution, radiation pollution, and electromagnetic).

Second: The Mahariy Dimension:

It includes the processes of science, namely observation, measurement, classification, inference, prediction, communication, use of numbers, the use of space and time relationships.

Third: Emotional dimension:

It represents trends towards chemistry science, which are interested in issues related to chemistry, an estimate of the role of chemistry in society, a poll to see things that he observes, an appreciation of the role of scientists and science, readiness to change opinion, belief in scientific methods, and other issues.

Levels of Chemical Culture

Their levels are determined by the following:

1. Practical and functional chemical culture: It is needed by the individual to live normally in various areas of his daily life.

2. Citizenship culture: It is needed by the individual to participate in the debate on issues and topics related to chemistry, or chemical technology.
3. Professional chemical culture: It is the appreciation of chemistry being a significant part of the scientific human activity, and this level includes the ability to hold a professional dialogue with a chemist about chemistry (Shwartz et al., 2006).

Search procedures:

This research adopted the descriptive approach to suit the purpose of the research and the problem as the research aims to reveal the level of chemical culture and determine the proportion of possession.

Research community:

The research community consisted of all students of the Department of Chemistry, the fourth stage in the College of Education for Pure Sciences/Ibn Al-Haytham for the two morning and evening studies. The fourth stage (200) students, as shown in Table 1.

Table 1: Number of students of the fourth stage in Department of Chemistry

total	studying	female	male
100	Morning	70	30
100	Evening	64	46
200	----	134	76

The Research Sample

The research sample consisted of 50 male and female students of the fourth stage in the chemistry department of the morning and evening studies; they were randomly selected. The sample was equal to 25% of the original community. 20% is taken from a relatively small community (a few hundred), 10% for a large community (a few thousand), and 5% for a very large community (tens of thousands) (Odeh & Fathi, 1992).

Search Tool

The researcher prepared the chemical culture scale according to the following steps:

1. Determine the goal of the scale:
Determine the goal of the measure by measuring the level of chemical culture among students of the Department of Chemistry in the Faculty of Education for Pure Sciences/Ibn Al-Haytham.

2. Determine the dimensions of the scale:
The scale included three dimensions: cognitive, Mahari and emotional.

3. The formulation of the paragraphs of the scale:
The paragraphs of the scale of the two dimensions, including cognitive and Mahari, were formulated in the form of multiple-choice questions with four alternatives, which are one alternative is true, and the other three are wrong. The emotional dimension included positive and negative paragraphs, and responded to Likert scale The triple according to the gradients (OK, no management, disagree), with instructions for answering the scale in three dimensions with an example solution, and was given one grade for the correct answer for each paragraph of the two dimensions (cognitive and Mahari), and give a score (zero For the wrong answer, the test score is between (0-32). We were given weight for each alternative (3,2,1) for the positive paragraphs, (1,2,3) for the negative paragraphs, so the total score is between (16-48). Therefore, the test score as a whole in its three dimensions becomes between (16-80) and a hypothetical average of 48 degrees.

4. Determine the validity of the scale:

A) the scale was presented to a number of arbitrators and specialists to identify the sincerity of the virtual scale, and after the views of arbitrators and specialists and the agreement rate of more than 80% amended some paragraphs as shown by the amendments.

B) The validity of the internal consistency of the dimensions of the scale and its paragraphs was calculated by the value of the Pearson correlation coefficient between the degree of each dimension and the total degree of the paragraphs of the scale. The correlation coefficient between each paragraph and the dimension to which it belongs was calculated by the correlation coefficient (Byserial). The scores were confined to the cognitive dimension between (0.23-0.45) statistically.

A) The scale was applied to a first exploratory sample of 15 students of the fourth stage in the Department of Chemistry similar to the sample of the research, to ensure the clarity of the paragraphs and instructions of the scale, and determine the time required to answer the scale, and the paragraphs of the scale and instructions are clear with the sample and determine the time to answer The test is 50 minutes.

B) The scale was applied to a second exploratory sample, 30 male and female students, to calculate the statistical analysis of the paragraphs of the scale. After correcting the scale, students' responses were arranged after descending order to a higher group after 27% of the higher grades and 27% of the students were taken. After conducting statistical analyses, it is found that:

The discriminatory coefficients of the vocabulary scales in the cognitive dimension ranged from (0.25-0.51), while the coefficients of discrimination of the scales in the metrological dimension ranged between (0.21-0.70). These values are acceptable. The t-test of two independent samples equal to the number (upper and lower group) because the alternatives were positive (1,2,1) and negative (1,2,3) found that the calculated T value was greater than the tabular at the degree of freedom. Thus, the three dimensions of the chemical culture scale are distinctive.

C) The difficulty coefficients of the paragraphs were calculated, which means the proportion of students who answered the wrong answer to the paragraph to the total number of the paragraph found that:

The difficulty coefficient of the cognitive dimension (0.33-0.67) and the coherent dimension (0.36-0.69) are, therefore, good scales in terms of their difficulty coefficient.

D) Calculation of the effectiveness of the wrong alternatives for the fact that the paragraphs of the scale in the two dimensions (cognitive and Maharii) of the type of multiple-choice and after applying the equation of the effectiveness of the wrong alternatives to the answers of students, in the upper and lower groups found that the values of the effectiveness factor are all negative, so the alternatives were kept as they are.

E) Stability of the scale:

After the application of the Cudor Richardson equation to calculate the stability of the two dimensions (cognitive and Mahari) was found to be equal to the cognitive domain (0.82), and the stability of the Mahari dimension (0.81). 0.71) thus counting y scale and good stability.

6. Apply the chemical culture scale to the research sample, with the number of 50 students.
Statistical means:

The following statistical methods were used:

1. Pearson correlation coefficient (to calculate the internal consistency of the dimensions of the scale and paragraphs).
2. The correlation coefficient (to calculate the correlation coefficient between each paragraph and the degree of dimension to which it belongs).
3. Difficulty coefficient to calculate the coefficients of the difficulty of the paragraphs of the scale of the two dimensions (cognitive and skills).
4. Coefficient of discrimination to calculate the power of discrimination of the paragraphs of the scale of the two dimensions (cognitive and skills).

5. Equation of the effectiveness of the wrong alternatives to calculate the effectiveness of the wrong alternatives to the paragraphs of the scale of the two dimensions, including cognitive and skills.
6. T-test for two independent samples to calculate the discriminatory power of the scale items in the emotional dimension.
7. T-test for one independent sample to calculate the extent of students of the Department of Chemistry for chemical culture.
8. Ciodorrichson equation to calculate the stability of the paragraphs of the scale in the two dimensions (cognitive and Mahari).
9- Alpha Cronbach equation to calculate the stability of the paragraphs of the scale in the emotional dimension.

Presentation and Interpretation of Results

To make sure that the research objective is achieved and answered its question, the following result was displayed:

- Do the students of the Department of Chemistry in the Faculty of Education for Pure Sciences/Ibn Al-Haytham have chemical culture?

- After calculating the grades obtained by the students of the Department of Chemistry, and to determine the extent of their possession of chemical culture, the T-test was adopted for one sample, as shown in Table 2.

Table 2: Arithmetic mean, standard deviation and T value of one sample of chemical culture scale for chemistry students

Statistical significance	Value t table	Value t calculate	Free of degree	Hypothetical mean	standard deviation	SMA	No.	measure
fun	2	2.429	49	17.5	11.53	51.96	50	

Table 2 shows that the calculated T value was 2.429, which is greater than the (T) value of 2.00 at the level 0.05 and the degree of freedom 49 and when comparing between the arithmetic average of the grades of students (51.96) and standard deviation (11.53) In the hypothetical mean of (48), there was a difference between the two averages. The calculated T value is a function in favour of the hypothetical mean, which indicates the weakness of the students of the Department of Chemistry - the fourth stage of chemical culture.

The Second Question

- What percentage of students in the Department of Chemistry in the Faculty of Education for Pure Sciences / Ibn Al-Haytham for chemical culture?

- The number of correct and wrong answers was calculated. The percentage of students owning chemical culture was (52%). This indicates that students' possession of chemical culture is below an acceptable level.

- This may be due to the lack of teaching in the Department of Chemistry from clarifying the essence of chemistry. His interpretation of the various chemical phenomena are theoretical and do not practice, as well as the lack of emphasis on the nature of chemistry along with the use of chemical science knowledge and thinking skills and practical skills. And not to link the chemical concepts contained in the course of the context of daily life and environmental problems related to chemistry, and not to involve students in decision-making processes and judgments, and the participation of students in identifying problems and propose solutions and discuss them, and trained to reach an understanding of chemistry and In chemical works, and how to think about the chemical by emphasizing the practice of scientific thinking and investigation.

Conclusions

The weak chemical culture among chemistry students in the College of Education for Pure Sciences/Ibn Al-Haytham, as it was below the acceptable level (52%).

Recommendations

In light of the study's findings and conclusions, the following recommendations were made:

1. Developing the programs of preparing students and paying attention to the cognitive side, along with the emphasis on developing scientific and practical skills, scientific investigation skills, and decision making.

2. Attention to the integration of students activities that require them to use chemical knowledge in the interpretation of the phenomena of daily life and emphasis on the practice of the scientific method of research and thinking, to solve problems, and manage a scientific discussion on community issues.

3. Attention to include programs to prepare students of the Department of Chemistry dimensions of chemical culture and composition of students and make it a primary goal of

the programs to prepare teachers in colleges of education to do their work in the education of a generation of chemically educated.

Proposals

To complement the current research, the researcher suggested the following studies:

1. Chemical culture for middle school students;

2. A training program for chemistry teachers in accordance with the chemical culture and its impact on their teaching practices and the achievement of students and their environmental awareness; and,

3. Chemical culture of chemistry teachers and their relationship with some variables such as (moral, scientific awareness, solving chemical problems, environmental values, environmental culture).

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