

## **Digital culture skills of chemistry students at the Faculty of Education for pure science Ibn al-Haytham in Iraq**

**Zainab Mohammed Monshid**

**Prof. Dr. Basma Mohammed Ahmed**

University of Baghdad / College of Education for pure science Ibn al-Haytham  
chemistry department

[zainab.mohammed1205b@ihcoedu.uobaghdad.edu.iq](mailto:zainab.mohammed1205b@ihcoedu.uobaghdad.edu.iq)

**Abstract :** The aim of this research is to know the digital culture skills of chemistry students in the Faculty of Education for Pure Sciences in Iraq. The descriptive research method was adopted. The research sample consisted of (200) male and female students from the Faculty of Education for Pure Sciences/ Ibn Al-Haytham - University of Baghdad from the Department of Chemistry (Senior year ), i.e. 62% of the research community was chosen in the randomly. The research tool was the digital culture test consisting of (22) paragraphs. The statistical portfolio of social sciences (SPSS) was adopted to address the results of the research. The statistical results showed that the skills of digital culture were medium on the test as a whole, and that my information and media cultural skills were weak and that the skill of information and communication technology was high when the research sample student. The researchers recommended the integration of digital culture skills into the content of chemistry courses in faculties of education, and the employment of teaching methods that adopt different views to consolidate media culture.

**Keywords** Digital Culture, Preparing the 21st Century Teacher, Media Culture, Information Technologies

### **Problem of the Research**

The research problem highlights that chemistry students lack the ability to research or benefit from information and manage it. Digital technologies will be used as tools to communicate information in their field of specialization or medicine. The fundamental understanding of the ethical and legal issues related to access to media messages has been noted that when students of the fourth stage under graduation at the Faculty of Education for Pure Sciences/ Ibn Al-Haytham are assigned to prepare graduation research reports or projects, they face difficulty in being able to study skills using technology in chemical information searches and being able to use the minimum of digital technology represented by electronic research tools and their applications. This was achieved by surveying the opinions of a random sample of students under graduation with an open questionnaire. Therefore, the research problem was identified by answering the question : "What are the skills of digital culture about chemistry students in the Faculty of Education for Pure Sciences Ibn Al-Haytham in Iraq?."

### **Importance of Research :**

Information and communication technology contributes to helping educational institutions to transform the educational process into an active and effective process linked to the reality of life, and preparing outputs from educated students to suit the requirements of modern life and the labor market. The process of including technology in the educational system has opportunities to use teaching methods that encourage research and investigation, opening the doors of self- and individual learning, and information management, (Al-Omari,2015: 368-370). Achieving the skills of the twenty-first century in educational institutions requires the presence of a teacher who is able to apply scientific thought and modern technological methods in teaching, by providing an interactive, multi-source learning environment for the interaction between him and the student and motivating him to develop himself with all the technology available to him. This requires him to use interactive information and communication technologies such as "the Internet, email, new computers, teleconferences and others ", (Hafni,2015: 28-29 ). Here comes the role of faculties of education in preparing the teacher of the twenty-first century and enabling them to reach high scientific and professional levels in their specializations for teaching in secondary schools by developing methods of preparing and constantly renewing them (Narrator,1990: 16), and attention to teaching methods is an urgent necessity that contributes to the success of the educational process and enables the teacher to reap the fruits of the content of the subject to raise the student's ability and highlight his positive role and contribution to the activation of the educational process, especially if it is compatible with technological development on the one hand and the desires and tendencies of the student on the other hand (Fathia,2018: 272-273). The 21st century students are surrounded by digital means. They need to understand how to best apply the resources of available means of learning, and use these to create effective communication products, such as videos, audio files, and websites .and others (Treling and Waddell,2013: 69). Of course, in this era, it has become necessary for educational institutions, including teacher training institutions, to have a role in educating students digitally

(A group of academics in the field of human sciences,2018: 43), and digital culture enables the evaluation, use and creation of information effectively to achieve personal, social, professional and educational goals (UNESCO,2005). It means "the student's use of technological skills and technical means, which contribute to increasing the cognitive and practical productivity of e and improve his performance" (Abdel Qader,2018: 1545).With digital tools, the student of the network generation will have the need to develop their abilities to think, learn, communicate, cooperate and innovate, which necessitates the need to learn appropriate skills to address the huge amount of information and technical means (Turling and Fadel,2013: 65).The THM Digital Culture in the development of the student's sense of positivity through participation and the interaction and creativity in the production of ideas and perceptions provided by the digital text, as well as that it THM in the development of the student's self-learning skills by researching different learning sources, and the development of electronic and social communication and problem solving, and the skills of dealing with multiple means of communication, and innovative thinking skills, and works to achieve sustainable development that is fed by digital learning (Fayed,2018: 196).Several conferences were concerned with the topic of digital culture and its ancillary skills, including the international conference on the "Use of ICT in Education" : under the title "Innovation for Quality, Openness and Inclusion", which was held in the city of Petersburg, Russian Federation, in 2016, and one of the main objectives of the conference was:

- Analysis of trends and challenges in the use of ICT in education, including "traditional and open learning methods, distance learning, e-learning and smart learning, and learning to use mobile devices".

- Studying new technologies that contribute to the formulation of future education policies, and exchanging experiences in the use of information and communication technologies to ensure the quality of education.

- Identify the potential for ICT use in education and promote an accessible learning environment for all, as well as the opportunities presented by the use of multimedia technologies and resources in education (UNESCO,2016). In the same context, the second scientific conference entitled "The Spaces of the Digital Age: Reality, Challenges and Prospects for the Future", which was held in 2022, sought to achieve a set of goals, including "adopting mechanisms for the dissemination of digital culture, strategies for marketing the scientific and research product, highlighting the most important opportunities and challenges for distance education in the digital age, and emphasizing the ability of science to coexist, integrate and continue in the digital age, as well as the extent to which digital transformation contributes to providing a scientific vision that contributes to the service of society" (Al-Manara Foundation for Development and Education,2022).

It also conducted several studies in the field of digital culture aimed at investigating the digital culture of university students in primary or postgraduate studies, as well as investigating the competencies of the science teacher in the field of information and communications technology, such as a study (Knox,2014), a study (Abdul Qadir, 2015) and a study (Gouset,2017). The study of (Tawlebah, Samih 2017) and the study of (Mahmoud Al mughrby ,2019).

#### **Research assumes theoretical significance as:**

- 1- Highlights the digital culture and its tools and describes the techniques used in education.

- 2 - Provide a description of the appropriate skills that the student needs to access the digital culture and necessary for students to access information and evaluate it, analyze and manage it.

#### **In practice, research assumes importance as :**

- 1- It is useful in developing a pre-service teacher in the faculties of education in Iraqi universities as they are responsible in the future for raising generations that will be more affected by future changes in the information and technological revolution in all its fields and dimensions.

- 2- The attention of faculty members at universities is drawn to the need to develop the content of the subjects so that they adapt to the developments of modern information technology, the needs of the labor market and new learning patterns.

- 3 - Contributes to directing the student's behavior to the advanced scientific level in the face of the changes and challenges that occur in the digital world.

- 4- It is hoped that its results will benefit the supervision and evaluation body in the Ministry of Higher Education and Scientific Research to direct the evaluation of the content of academic courses and the inclusion of The digital culture and its dimensions in chemistry in the faculties of education for pure sciences.

- 5 - There is a digital culture test that has been prepared in this research to be revealed to university students.

#### **Research Objectives : is to know :**

- 1-Digital culture skills on the whole test among chemistry students at the Faculty of Education for Pure Sciences Ibn Al-Haytham in Iraq

- 2-The skills of digital culture at the level of (the culture of informatics,the culture of media, the culture of information and communication technologies) among chemistry students at the Faculty of Education for Pure Sciences Ibn Al-Haytham in Iraq

#### **Determination of Terms :**

**Digital Literacy:** Defined by :

\_ (Napeti,2012)“The skills and knowledge necessary to participate in an active use of information and communication technology is the use of computers and their means to retrieve, store, produce and provide information as well as to communicate and participate in online collaborative networks” (Napeti,2012: 2080).

The **procedural definition of digital culture:** the ability of students of the fourth stage of the Department of Chemistry in the Faculty of Education for Pure Sciences/ Ibn Al-Haytham to use digital applications with their skills represented in (information culture, media culture, information and communication technology culture) and measured by the degree that the student obtains in the digital culture test prepared for this purpose.

**Background to Theoretical Background:**

❖ **Dimensions of digital culture:** The dimensions of digital culture are represented by :

- **The Cognitive Dimension:** It includes functional information and knowledge related to modern technologies and their applications, and includes the scientific basis for the applications and concepts related to them, which should be provided to the student.
- **The skill dimension psychomotor Dimension:** It is defined as all types of skills that should be acquired by the student within the framework of his digital and technical education and includes :
  - **Mental Skills** : The skills of science processes are called "observation, classification, reasoning, prediction, interpretation" and the skills of scientific thinking, critical thinking and innovative thinking
  - **Social Skills:** The skills of working in a team and cooperating with others are at all levels of the skills aspect Observing, Readiness, Directed Response, Automation, Complex Response, Adaptation and Creation .
- **Affective Dimension:** It includes a Technical awareness, technical sense, and inclinations for technology and digital technologies and their appreciation and Ball levels of the emotional aspect represented in "reception and response and represent values and organization "Formation of a value system "and discrimination "Access to a value system to the extent of faith"
- **Social Dimension:** It includes all the experiences that should be gained by the student, which are related to the social effects and issues resulting from modern technologies and digital technology and the extent to which these reflect on customs, traditions and social values.
- **Ethical Dimension:** This dimension refers to giving the student the standards of ethical behavior when using digital technology applications, and means that this dimension focuses on developing the student's abilities to understand and analyze the causes and results of ethical issues related to digital culture.
- **After deciding Decision Making Dimension:** This dimension focuses on giving the student the ability to select or make a logical choice between a set of alternative solutions, judgments, or opinions and choose between them when faced with any situation, problem, or issue related to digital technologies or technological innovations (A group of academics in the field of humanities,2018: 46 ).

❖ **Digital culture skills Digital culture skills:**

The skills of digital culture are divided into the skills represented can be reviewed as follows

**First: Information Culture: Information** culture is defined as the student's access to the information he needs and to understand how to organize and prepare the sources of this information and use technology in research operations and benefit from this information efficiently and effectively, (Khalil,2015: 16). So I should be able to :

- Access information efficiently and effectively
- The information is fully evaluated critically
- Uses a wide variety of electronic and printed sources.
- Manages the flow of information from a wide variety of sources, analyzes it and shares it with others
- Clarifies the ethical/legal issues associated with access to and use of information and applies the associated laws

(Shalabi,2016: 64).

**Second: Media Culture:**

The media culture indicates that it is a process of learning and education that is achieved for the student through his dealings with the various media, as it enables him to judge objectively and choose the consciousness of the media programs presented to him, and thus develops his potential in the positive use of the media(Fakhro,2010: 221).

So I should be able to :

- Analyzes the media and understands how to build media messages and why and for what purpose.
- Examine how others interpret messages differently, how values and views are included in messages or not, and how media influences criticisms and behaviors.
- Applies a fundamental understanding of the ethical and legal issues associated with access to and use of media messages.
- Creates media products, understands and uses the most appropriate tools and norms for media production.

- Understands and uses expressions and interpretations of the most appropriate in diverse and multicultural settings (Treling and Waddell,2013: 70).

**Thirdly: Culture of information and communication technologies**

Evaluating the risks of using personal photos and commercial music on social media requires critical thinking, logical judgment and understanding of future results (Turling and Wadel,2013: 70-71). Therefore, the father should be able to effectively use technology as a tool for research, organization and evaluation .

- Uses digital technologies (technologies) as tools to communicate information.

- Take into account the ethical/legal issues associated with access to information when using technology(Shalabi,2016: 65).

In this research, the classification of the three dimensions represented in the skills of "Information Culture, Media Culture, and ICT Culture" is adopted when preparing the digital culture test items for chemistry students at the Faculty of Education for Pure Sciences/ Ibn Al-Haytham

**Research procedures :**

**Methodology B HD:** The descriptive research method was adopted to suit the goal of the research and its problem.

**Research community:** The research community consisted of all the students of the Department of Chemistry in the Faculty of Education for Pure Sciences/ Ibn Al-Haytham - Senior year in the morning and evening school , numbering (318), with (171) students and (147) students distributed over (4) divisions for the academic year (1,202-2,202).

**Research sample:** It was represented by the selection of a sample of students from the Department of Chemistry, stage 4 /morning and evening study from the Faculty of Education for Pure Sciences/Ibn Al-Haytham - University of Baghdad , from (200) students at random, that is, (62%) of the research community.

**Research Tool :** The digital culture test was prepared, as follows :

**1-Determining the goal of the test:** -The goal of the test is to know the abilities and skills that the fourth stage student possesses for the Department of Chemistry in the use of computers and electronic services in the teaching of chemistry .

**2-Determining the sub-skills of testing the digital culture:** After reading the literature related to the research topic, three skills were identified, namely the information culture, the media culture, and the culture of information and communication technologies .

**3-Formulation of test paragraphs and instructions:** - Test paragraphs of the type of multiple choice with four alternatives were formulated, and reached (22) paragraphs, with the formulation of instructions for testing students with instructions to correct the test by giving one grade for the correct answer and zero grade for the wrong answer, and the total grade was determined by the range from (0-20).

**4- Test validity:** To ensure the validity of the test, its paragraphs were presented to a group of arbitrators specialized in chemistry and methods of teaching chemistry .

**5- The exploratory experience of the digital culture test:** The purpose of this procedure is to verify the clarity of the instructions and paragraphs for students, and to determine the time required to answer and the average time for test answers was (30) minutes .

**6- Statistical analysis of the test items:** - The test was applied to the sample of statistical analysis, which consisted of (200) male and female students who were randomly selected from the students of the Faculty of Education for pure sciences/IbnAl-Haytham - Phase IV. The difficulty coefficient for objective questions was extracted and it was found that it ranged between(0.29-0.63). As for the coefficient of distinguishing the paragraphs, it ranged between(0.33-0.77). The effectiveness of each wrong alternative was calculated for each test item , whose values were found to be between (-0.03, -0.29). As for the stability of the tests, two methods were adopted for calculating it reached (0.790) by applying the Coder-Richardson equation -20 .The other method was the adoption of the method of halving, and since the number of individual test items adopted the Rolon method, the coefficient of stability was (0.630), as stability is acceptable in descriptive studies, and thus the digital culture test in its final form consisted of (22) paragraphs, and the total degree of the test is at its highest (22) degree, and at its lowest(0) degree and with a default average (11) degree, and thus the scale is ready to be applied to the research sample

**Presentation of results View results:** After calculating the scores obtained by the research sample at the level of digital culture skills as a whole, the T-test was adopted for one sample, Table (1).

**Table (1) T-test results for one sample of digital culture test scores**

Variable	The Sample	Arithmetic mean	standard	Hypothetical average of	Value	Significance level	Difference
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			deviation	thetest	Calculated	tabular		Significance
<b>On digital culture</b>	200	12,415	4.093	11	4.889	1.960	0.05	Informativ e

Table (1) shows that the calculated T-value reached (4.889), which is greater than the tabular T-value (1.960). Therefore, it is a statistical function at the level of (0.05) and with a degree of freedom (199). This means that there is a statistically significant difference in favor of the arithmetic average of the sample. When comparing this arithmetic mean of the scores of the sample (12.415) with the hypothetical average of the test of (11)degrees, it was found that the difference is statistically significant in favor of the arithmetic average of the sample, **i.e. that students have an average numerical culture** on the test as a whole. To judge at the level of each digital culture skill, the digital culture test was classified into three levels (high, medium, weak) by adopting the criterion of judgment ((), which was determined by relying on the arithmetic means of digital culture skills and specifying (from 4.03) and below for the weak level, and for the average level of (4.04.4 5), and for the high level of (4.45). (4.04), more than the high level, table (2).

Table (2) Arithmetic averages, standard deviations and the criterion of judgment

To test the skills of digital culture

Digital Culture Skills	Arithmetic mean	standard deviation	Referee criterion
Informatics	3.920	1.397	Weak
Media	3.610	1.202	Weak
Information and communication technology	4.870	-1.995-	High

### Interpretation of results:

The statistical results indicate that the students of the research sample have the skills of digital culture to a medium degree on the scale as a whole and is attributed to a number of influences, perhaps the most prominent of which is the weak ability of educational institutions to provide the requirements of adaptation to contemporary technology, and the failure of their educational programs to achieve the requirements of digital culture, and students may have high skills in unscientific dealing with technology as a result of the continuous practice of these technologies .

The statistical results of each digital culture skill showed that the level of information and media culture skills among the students of the research sample was weak, and the ICT culture skill obtained a high degree, and these results can be interpreted as follows:

Returning to the digital culture test, it was found that students have a weakness in the skill of information culture. It was noted that (82%) of students lack knowledge of the quickest ways to use the dictionary of chemical terms. (73%) showed their lack of knowledge and skills to read chemical posters that represent the behaviors in the laboratory and safety procedures for conducting laboratory experiments. It was attributed to the lack of interest in the years of schooling in providing students with the necessary technical skills to deal with modern means and tools. (Khalil, 2015) indicated that "the lack of ability of students to obtain appropriate sources of information, or the necessary technical skills to deal with modern means and tools leads to weakness in information culture" (Khalil, 2015: 13).

The statistical results showed that students have a weakness in the skill of media culture due to the fact that (69%) of the sample showed their lack of knowledge in interpreting and including values and views in the messages to the media , and (89%) showed their lack of ability to choose the appropriate method to present the media message that enables them to make the appropriate decision. The reason is due to the weak interest in integrating media education into the content of academic materials and the use of critical thinking skills in the teaching of chemistry, or the use of teaching methods that adopt different views on chemical issues or the use of the active learning model. ( Al-Saleh , 2007) indicated that "the use of teaching strategies, including critical thinking skills and the study of different views, and the use of the active learning model that begins with the stage of awareness of a particular issue and then analysis and reflection and then response leads to the formation of experience towards the media message" (Al-Saleh , 2007: 3). The weakness can also be attributed to the failure to integrate the cognitive aspects of the concept of the media message during the teaching of the chemical courses, which makes them lack their analysis. (Fleming, 2014) confirmed that the weakness of the media culture is due to the lack of students' acquisition of the cognitive aspects of the concept of the media message, or their ability to evaluate and analyze media texts correctly "(Fmingle, 2014:155) .

As for the skill of information and communication technology, it has obtained a high degree due to technological reasons, including the great acceleration that this field is witnessing. E-learning on the Google Classroom platform and its programs contributed to the development of some of the technological capabilities of students and contributed to enabling students to use technology effectively as a tool for research, organization and evaluation, he indicated (Moroccan and Mahmoud,2019). The technological development has led to the improvement and exchange of information and its educational and cultural applications and associated software ” (Moroccan and Mahmoud,2019: 25). In the same context, (Abdul Qader,2018) confirmed that "the technological development and the spread of technological innovations, including smartphones and digital boards, contributed to the development of technological capabilities among students " (Abdul Qader,2018: 1549) , and the results of this study agreed with both the study of (Moroccan and Mahmoud,2019) and the study of (Abdul Qader,2018) .

**Conclusions :** According to the results of the research, it was reached :

- 1- The level of digital culture was medium among the students of the research sample on testing the skills of digital culture as a whole
- 2- My level of information and cultural skills among the students of the research sample was weak.
- 3- The level of ICT skill among the students of the research sample was high .

**Recommendation:**

Directing faculty members in Iraqi universities to promote and pay attention to digital culture among students in teaching chemistry courses.

- 1- Integrating digital culture skills into the content of chemistry courses in faculties of education
- 2- The need for faculty members to pay attention to students' use of a wide variety of electronic and paper sources.
- 3- Directing students to prepare posters in chemistry so that they analyze them and share them with others , as well as employing teaching methods that adopt different views to consolidate the media culture.
- 4- Providing research halls equipped with Internet and allocating them to students in the initial stages, and setting specific hours for electronic research.
- 5- Utilizing the digital culture skills test as a tool to reveal how much university students have acquired these skills .

**Suggestions:** To complement the research, the researcher proposes the following: -

1. Conducting another similar study in stages of study and other subjects.
- 2- Conducting a study to identify the skills of digital culture among students and its relationship to sustainable development.

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