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Biological literacy among university students and its relationship to information processing skills

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***Abstract*---**The research aims to reveal (biological literacy and its relationship to information processing skills among students of Biology departments at the University of Al-Muthanna). To achieve the goal of the research, the researchers adopted the descriptive research method, and by reviewing the literature and previous studies related to the research, the two research tools were built. The first research tool was a test consisting of (46) items of the type of multiple choice to reveal the biological literacy among university students, and the second research tool was a scale consisting of (45) five-item alternatives to detect information processing skills among university students. The validity and reliability of the two research tools and the psychometric properties of them were verified, and the research sample amounted to (229) male and female students, who were divided according to gender and academic level. The first research tool (Biological Literacy Test) was applied to the research sample on Monday 3/1/ 2022, and the second research tool (Information Processing Skills Scale) was applied to the research sample on Thursday 6/1/ 2022, and the results showed: 1) The existence of biological literacy among the students of the Biology Departments at the University of Al-Muthanna according to the variables of gender and academic stage for the benefit of the students; 2) There is a correlation between biological literacy and information processing skills among students of the Departments of Biology at the University of Al-Muthanna.

***Keywords*---**Biological literacy, Information processing skills, relationship.

Introduction

The rapid scientific progress in various fields of life raised many issues that aroused the interest of people in different societies, and to the extent that science contributed to solving the problems of society and the benefits it produces for the individual, as much as the damage and dangers that threaten his life poses, and among the issues that increased attention to resources The environment and ways to benefit from it and the damages resulting from it, the impact of scientific progress and its connection to society, genetic engineering and its application to humans, and the concerns raised by these issues such as human cloning, and many mysterious issues and secrets revealed by biology experiments, which accompanied a scientific uproar and great controversy among society circles, Which led to the pursuit of spreading science and making it simple among the members of society in proportion to the progress of science, and in light of this, the researcher conducted a survey to find out the research problem and presented a questionnaire to a sample of twenty students from the University of Muthanna, Appendix (2). the following results:
1- 70% of students have no knowledge of biological enlightenment.
2- 60% of students have no knowledge of information processing skills.

The research problem was identified with the detection of biological enlightenment and its relationship to information processing skills among Al-Muthanna University students. The impact of scientific progress that the world is experiencing today on the various aspects of life, social, economic and scientific...., as scientists confirm that there are changes that have occurred in the nature of human life that lead to a change in scientific education, so it is necessary for students to possess the minimum amount of scientific information and skills In the field of biology to keep pace with various developments, and given the importance of the biological revolution and its providing solutions to many problems facing society, especially problems related to human life and health and the continuity of the human species, the spotlight is now on biologists. (Mazen, 1999: 95) The reason for the great scientific and technological progress in the various fields of life is that there are many health problems that directly affect human life and that have aroused the interest of societies. Therefore, scientists and researchers have sought to find solutions to these problems by following scientific methods in research and investigation. about its causes and directing members of society to the correct behavior that limits environmental pollution, and how to take advantage of different resources, as well as providing them with different skills in how to deal with emergency situations and various life problems and what is right and what is wrong, and knowledge of different issues and topics that are related to life person or threaten it. (Abdul Salam, 2001:332).

Education bears a great responsibility in light of this scientific progress and development in preparing cadres capable of keeping pace with the wheel of continuous scientific progress and adapting to changes in various fields. Education prepares individuals for integrated and parallel preparation and development of all social, physical, mental and spiritual aspects to become useful to their societies and happy in their lives. (Al-Heila, 2003: 19) Scientists and researchers pointed to the role of scientific education as the important pillar and main pillar in preparing an individual who possesses a degree of scientific

knowledge and various skills that enable him to keep pace with developments and various issues and to exercise his role in society (Nasr, 1997: 69). It is a major source for researchers to rely on in teaching biology, employing biological information in our daily lives, developing motivation and acquiring practical skills. (Nashwan, 1994:351) .It is clear from the foregoing that it is necessary to pay attention to the biological enlightenment of students in the departments of life sciences in particular and university students in general by paying attention to the programs of preparing students of faculties of education and faculties of science. (Khalil, 1998: 178) The preparation of educational programs in general and the preparation of student-teacher programs in faculties of education and faculties of science in particular was due to the society's need to address its problems and problems of education, and to reach good educational results with the least time and effort, and this can be achieved through preparing Educational programs that keep pace with the development and scientific revolution, more attractive programs that make the student the center of the educational process active and more effective. (Al-Zind, 2004: 178) This establishes a good education that ensures that students acquire the necessary information and knowledge and ensures the transmission of the impact of education and the students' ability to apply what they have learned in their daily lives or in various institutions and fields that they can join after their graduation.(Al-Ghazali and Maree, 2010:81)

Information processing skills facilitate the process of education, and because the method of obtaining knowledge and information is different, and this difference can affect its employment, use and output. Therefore, these skills help to classify information within the brain using written and drawn tools and provide the student with diagrams and forms of new knowledge, arouse the student's interest and develop his skills. and his experiences. (Nawfal, 2010:32) The student's acquisition of knowledge, information, skills and the ability to apply them in different life situations represents the student's academic success level or the final output. Here we can say that the educational program has achieved the goals set for it, or the general goals that are achieved at the end of the semester or academic year The stage, and the achievement of these goals is called achievement, and it is measured by Bloom's cognitive categorization, because it targets a complete scientific subject through its results, the student moves to another stage. (Zayer and Dakhil, 2012: 160). This research seeks to show the importance of the topics of biological literacyin light of the Corona pandemic, which required the individual to possess a set of biological knowledge and information that would enable him to deal with this epidemic and how to prevent it and stay away from the wrong habits and practices that spread among members of society.

Research Objectives

The current research aims to:

1 Detection of biological literacy among students of Al-Muthanna University, according to gender and educational level.
2 Revealing the existence of a correlation between biological literacy and information processing skills.

Research Limits

The current research includes students from the Departments of Biology at the University of Al-Muthanna for the 2012-2022 academic year / first semester.

Theoretical framework
1 - Biological Literacy

1-1 The concept of Biological Literacy
Biological enlightenment is part of scientific enlightenment, so it has become necessary to pay attention to educating the individual biologically, especially as we live in the era of the biological scientific revolution. Biology deals with many necessary topics related to health, nutritional, sexual, environmental, genetic and human culture, and it has become a major goal in teaching and science education. contemporary. (Al-Bawi and Al-Shammari, 2020:30)

Teaching biology aims to provide individuals with a biological culture that leads to raising their awareness of what enables them to improve their lives, as well as understanding life applications in their daily lives and participating in political, social and scientific decision-making that directly depends on the life sciences. (Zidane, et al., 2004: 19)

2 Information processing skills

2.1 Information processing

Scientific developments in the field of communications and computers have helped to pay attention to the field of information processing and to benefit from these developments in this field, and the interpretation of what is going on in the processes and processing of information in computers and communications devices began as being similar to what is done in the processing of information in humans, where information passes through several stages to be processed , the receiving stage, the encoding stage, the storage stage, and the output stage, and this is similar to what happens in communications devices from converting energy into different forms and forming the response that suits it. (Abdul-Hadi, 2010:41)
There is no theory that is able to give an integrated understanding and a clear picture of information processing, which is natural because it is an unobserved behavior, and theories vary in this field and the theory (Carroll Theory, 1976) in information processing sees that performance on mental tests can be explained and Carroll examined the main tests in research Cognitive and psychometric and relied on logical deductive analysis, while the model (Schmech, 1977) covered this theory in theory and practical application, and the theory (Brown, 1978) divided basic cognitive processes into metacognitive processes, which are executive skills used to control and direct the information processing process In the individual, and cognitive processes, which are skills used in employing strategies to perform information processing tasks, and (Ganne) presented a theoretical model in information processing and sees that stimuli and stimuli affect the senses of the learner, so learning in this case is a series of processes between the stage of receiving stimuli and obtaining responses. As for (Sterberg Theory, 1985) it

proposed a cognitive system that consists of three elements, the first is beyond the elements, which is a control and control process used to implement the planning and performance control function, and the second is performance elements, which are minimal processes used to implement the different response when performing the task, and the third elements of knowledge acquisition, which is a learning process Acquiring new information and storing it in memory. (Razzooqi et al., 2016 : 90-104)

2.2 The importance of information processing in the learning process

- It enhances academic success, especially learners who struggle with learning difficulties and fail to remember the subjects, by improving their memory of the subject matter.
- Helps learn students with special needs and learning difficulties.
- It can be used with different academic disciplines and learners with educational disabilities.
- It helps to address the educational failure of some students in learning a section of the academic subjects.
- It helps to form links to information that is not clearly related to the learner. (Al-Atoum, 2010: 141)

Search procedures and tools
The research method

The researchers adopted the descriptive research method, as an appropriate approach to studying the correlational relationships between variables in describing and analyzing the phenomena studied, because it "helps to clarify and explain the phenomenon as it exists in reality, with the intention of diagnosing it, revealing its aspects, and determining the relationships between its elements or between them and other phenomena."

The research community

Determining the research community is one of the basic steps in educational research and requires high accuracy in determining it, as all research procedures, design of its tools and the adequacy of its results depend on it. The current research community included all the students of the departments of life sciences (the second stage, the fourth stage) in the faculties of (basic education, education for pure sciences, science) at the University of Muthanna for the academic year (2021-2022). The data and preparation of students were obtained from the life sciences departments in The faculties mentioned, according to the book facilitating the task (Appendix 1), and their number reached (809) male and female students, distributed by college, academic level and gender. Table (1)

Table (1) Description of the research community

N	College	Preparation of second stage students			Preparation of fourth stage students			Total
		female	male	Total	female	male	Total	
1	Basic Education	58	52	110	69	51	120	230
2	Education for	77	68	145	76	58	134	279

	pure sciences							
3	Science	98	62	160	78	62	140	300
	Total	233	182	415	223	171	394	809

The research sample

The sample of the research amounted to (229) male and female students from the departments of life sciences in the faculties of Basic Education, the College of Education for Pure Sciences and the College of Science at the University of Al-Muthanna (the second and fourth phases), with (64) male and female students from the College of Basic Education, and their percentage was (27.94). And (78) male and female students from the College of Education for Pure Sciences, and their percentage was (34.06), and (87) male and female students from the College of Science, and their percentage was (37.99), and the percentage of the sample represented the members of the community real representation. Table (2)

Table (2) Preparing the members of the research sample by college, study stage and gender

N	College	Preparation of second stage students		Preparation of fourth stage students		Total
		female	male	Female	male	
1	Basic Education	16	15	16	17	64
2	Education for pure sciences	21	19	19	19	78
3	Science	24	22	20	21	87
	Total	61	56	55	57	229

Search tools

For the purpose of achieving the objectives of the research, there must be tests and measures that are compatible with the objectives of the research and the nature of its society, and have psychometric characteristics, so the researchers took several steps to build the current research tools, 1 - Biological Literacy test, 2 - Information processing skills scale and the first research tool (test) was applied Biological Literacy) on the research sample, on Monday 3/1/ 2022, and the second research tool (Information Processing Skills Scale) was applied to the research sample, on Thursday 6/1/2022.

Presentation and interpretation of results

The researchers used the t-test for two samples, to verify this goal, and compared the average of the students (36,79) with a standard deviation (6,36) with the arithmetic mean of the students of (30,85) with a standard deviation (5,45), and it was found that the t-value The calculated value is (7.59) greater than the table t-value of (1.97) at the significance level (0.05) and the degree of freedom (227). These results indicate that there are statistically significant differences in biological literacy between male and female students, Table (3).) shows the

results of the T-test for two independent samples to measure biological literacy according to the gender variable (male - female) and statistical significance, among students of the departments of life sciences at the University of Al-Muthanna.

Table (3) The results of the t-test for two independent samples to detect biological literacy according to the sex variable

six	Sample Number	the average	Standard deviation	Degree of freedom	Significance level	Calculated t value	Tabulated t value	Statistical significance
Female	116	30.85	5.45	227	0.05	7.59	1.97	Function
male	113	36.79	6.36					

It is clear from the results of Table (3) that the calculated t-value of the gender variable, amounting to (7.59), is less than the tabulated t-value amounting to (1.97) at a significance level (0.05) and a degree of freedom (227), and this result indicates that There are statistically significant differences according to the gender variable (males - females) in the biological enlightenment among students of the Departments of Life Sciences at the University of Al-Muthanna, and thus rejecting the second null hypothesis and accepting the alternative hypothesis: There is a statistically significant difference at the level of significance (0.05) according to gender among university students. In the Biological Enlightenment Test, the researchers attribute this result to the fact that biology topics are topics that students tend to study more than female students.The researchers used the t-test for two independent samples, to verify this goal, and compared the arithmetic mean of the second stage of (30,80) with a standard deviation of (5.46) with the arithmetic mean of the fourth stage of (36,90) with a standard deviation of (6.29).), and it became clear that the calculated t-value of (7.84) is greater than the tabular value of (1.97) at the level of significance (0.05) and the degree of freedom (227), and this result indicates that there are statistically significant differences for the biological enlightenment between the two stages. (second - fourth) in favor of the fourth stage, table (4) shows the results of the T-test for two independent samples indicative of biological enlightenment according to the variable of the study stage among students of the departments of life sciences at the University of Al-Muthanna.

Table (4) The results of the two-sample t-test for the detection of biological literacy according to the educational stage variable

educational stage	Sample Number	the average	Standard deviation	Degree of freedom	Significance level	Calculated t value	Tabulated t value	Statistical significance
Second	117	30.80	5.46	227	0.05	7.84	1.97	Function
fourth	112	36.90	6.29					

The researchers attribute this result to the fact that the students of the fourth stage have almost completed most of the study subjects, and thus they have

accumulated knowledge and experiences through their study of various biological materials during the previous school years. And the research increased the enlightenment of the students of the fourth stage.
The researchers used the Pearson correlation coefficient to detect the existence of a correlation between biological literacy and information processing skills, and the value of the correlation coefficient between biological literacy and information processing skills was (0,161) at a significance level (0.05) and a degree of freedom (227), which is greater than the tabular value of (0.130), that is, there is a positive correlation between enlightenment, biology, and information processing skills. Table (5)

Table (5)The value of the Pearson correlation coefficient between biological literacy and information processing skills

Variables	The value of the Pearson correlation	
	Calculated value	Tabulated value
biological literacy and information processing skills	0.161	0.130

Conclusions

1- The presence of biological literacy among students of the departments of life sciences at the University of Al-Muthanna according to the gender variable in favor of the students.
2- The presence of biological literacy among students of the departments of life sciences at the University of Al-Muthanna according to the variable of the study stage (second - fourth) in favor of the fourth stage.
3 - There is a correlation between biological literacy and information processing skills among students of life sciences departments at the University of Al-Muthanna.

Recommendations

1. Paying attention to the programs of preparing and developing life sciences students, and evaluating them periodically and continuously, to keep pace with the biological scientific development.
2. Paying attention to modern teaching methods, in which the student's role is effective, such as exploration, and which motivate students to learn and develop their practical skills.

Suggestions

1. Conducting a study similar to the current study for students in various stages of university studies.
2. Preparing a proposed educational program for the development of biological literacy among university students.

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