Indonesian Journal of Humanities and Social Sciences
https://ejournal.uit-lirboyo.ac.id/index.php/IJHSS
E-ISSN: 2746-2188
Volume 4 Issue 3 November 2023

Levels of Cognitive Depth and Their Relationship to Environmental Advocacy Skills Among Biology Teachers for the Preparatory Stage

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Abstract

The aim of this research is to develop a comprehensive scale for assessing the cognitive depth levels of middle school biology teachers and to construct a corresponding scale for evaluating environmental advocacy skills among teachers in the preparatory stage. The study also seeks to ascertain the cognitive depth levels of preparatory stage biology teachers and explore potential differences in these levels based on gender (male or female). Additionally, the research aims to assess the extent of environmental advocacy skills among preparatory stage biology teachers and examine any disparities in these skills based on gender. The research focuses on the relationship between the depth of knowledge levels and environmental advocacy skills among preparatory stage biology teachers. The study was conducted among biology teachers in preparatory schools under the Directorate of Education of Al-Qadisiyah for the academic year 2022-2023. The research sample comprised 150 teachers randomly selected from various schools. Two well-validated tools were utilized: the first being a measure of cognitive depth levels, and the second, a scale to assess environmental advocacy skills among preparatory stage biology teachers. The tools were applied during the second semester of the academic year 2022-2023 in preparatory schools situated in the center of Al-Qadisiyah Governorate. The obtained data underwent rigorous statistical analysis using Microsoft Excel and the Statistical Package for the Social Sciences (SPSS). The research outcomes include the successful development of a scale for measuring cognitive depth levels and another for assessing environmental advocacy skills among middle school biology teachers. The findings reveal that preparatory stage biology teachers exhibit a commendable level of cognitive depth and a high proficiency in environmental advocacy skills. Furthermore, a direct correlation was identified between cognitive depth levels and environmental advocacy skills.

Keywords: *Levels of cognitive depth, environmental advocacy skills, middle school.*

Introduction

Today's world is witnessing many variables and challenges, foremost among which is the knowledge and information revolution, which directly affects the life of society and reflects broad challenges in all spheres of life, and naturally these and changes in educational systems. Education cannot be removed from these changes and challenges in today's world. This calls for the educational objectives of educational curricula to be in line with these changes and challenges that have led to the development of the world, and for the preparation of the individual in line with these rapid and successive developments.

Experts and specialists seek to develop one's thinking, conscience and skills to adapt and adapt to variables and accelerated challenges and to keep pace with developments This is done through education, which is the instrument for the development and upbringing of the individual, Because it cares for both student and teacher, one of the goals of modern education is to prepare the teacher in a good way because of his pivotal role in the educational-learning process, He is one of the factors for the success of the educational process.

The researcher has practised his teaching profession for 13 years. And conducted several studies and research on cognitive depth, he felt that there was a problem in the depth of knowledge and environmental advocacy, so the researcher provided a questionnaire to investigate the views of biology supervisors, some biology teachers with at least 5 years' experience, and after analysing and processing the data, it was shown that the percentage 82% of teachers suffer from insufficient knowledge and skills in environmental advocacy. I therefore consider that the relationship between the levels of knowledge depth and the skills of environmental advocates can be explored. The problem of current research can be summarized in the following questions:

What is the relationship between cognitive depth levels and environmental advocacy skills of prep biology teachers and teachers? Webb has designed a paradigm of knowledge and developed Bloom's classification of the field of knowledge, called Dok "(Depth of Knowledge"), which is based on classifying the field of knowledge into several tasks that reflect a certain level of awareness and expectation. This model includes all forms of procedural, illustrative and applied knowledge [1].

Knowledge depth is a process that requires in-depth explanation of knowledge and information for the purpose of learning events, whereby learning goals, outputs and evaluations of these outputs must be defined and retained for lifelong learning. Knowledge depth is the process of examining new ideas, information and facts in a critical way to be incorporated into an individual's cognitive structures and the work of multiple linkages between them to seek meaning according to these linkages, as it focuses on arguments, basic evidence and crisis concepts to solve problems [2].

Environmental problems are one of the most prominent problems at the local and global levels, because the current era suffers from environmental degradation resulting from negative and irregular behaviour and the absence of environmental values by the individual towards the environment, which has led to many environmental problems in our time [3].

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[1] Abdul Rahman Youssef Shaheen, "The Availability of Levels of Cognitive Depth in the Book of Biology for the Secondary Stage -the Curriculum System -in the Kingdom of Saudi Arabia," *Scientific Journal at the Faculty of Education -Assiut University* 36, no. 1 (2019): 148.

[2] Norman L Webb, "Depth-of-Knowledge Levels for Four Content Areas," *Language Arts* 28, no. March (2002): 1–9.

[3] Prof Mohammed Amin H Al-qudah and Miesser Y Hindi, "Environmental Values Included in Science Books for the 10th Grade in Jordan ' An Analytical S Tudy ,'" no. January (2019).

The environmental advocate in general represents a set of planned activities aimed at influencing decision-making and influencers in order to change existing policies in favor of a marginalized group that advocates for a particular cause. It is also a process aimed at making positive changes in favour of a social group or issue through a number of activities aimed at influencing the preparation, implementation, abolition or amendment of a policy, legislation, programme or project for the service of the public good. It also expresses the attention of society to an important issue and directs decision makers to resolve it [4]. In the researcher's view, deepening the level of knowledge among individuals may contribute to environmental advocacy processes because it enables them to think in depth and understand the problems experienced by societies, in particular environmental problems that are threatening the future of human beings.

The research aims to: Building a scale intended to measure the levels of cognitive depth of biology teachers and teachers in the preparatory cycle; Building a scale intended to measure the environmental advocate skills of biology teachers and teachers in the preparatory cycle; Know the extent to which biology teachers and teachers have prep levels of cognitive depth, and the differences in their cognitive depth levels according to the sex variable (male-female); Know the extent to which prep biology teachers and teachers possess environmental advocacy skills, and the differences in their environmental advocate skills according to the gender variable (male female). And knowledge of the relationship between the levels of cognitive depth and the skills of environmental advocate of teachers and biology teachers for the preparatory stage.

Research limits were limited to: Human threshold: Biology teachers and teachers for the preparatory stage of the General Directorate of Education of Qadisiyah governorate include the Centre's schools; Spatial boundary: preparatory schools of the General Directorate of Education in Qadisiyah governorate/centre; Time limit: Second semester of the academic year (2022-2023). And knowledge threshold: all environmental advocate skills and knowledge depth levels. Definition of terminology: First: Levels of cognitive depth. Holmes (2011) defined i**t as:** "Levels of thinking that individuals must master when processing information and knowledge [5].

It is theoretically defined by the researcher as: an individual's ability to critically examine the information and knowledge he or she receives, to make links between his or her knowledge and to form deep knowledge structures. Procedurally, the researcher defines it as: the ability of preparatory biology teachers and teachers to respond correctly on the paragraphs of the current research's cognitive depth level scale, measured by the degree to which the respondent (teachers - teachers) receives on the scale of cognitive depth levels.

[4] Ritu R Sharma, "An Introduction to Advocacy: TRAINING GUIDE," *Support for Analysis and Research in Africa (SARA)*, 2007.
[5] Shelly Rankin Holmes, *Teacher Preparedness for Teaching and Assessing Depth of Knowledge* (The University of Southern Mississippi, 2011).

Second: Environmental Advocate. Hassan et al. [6] defined it as: "A series of steps and procedures in dealing with environmental issues and problems in order to highlight them and seek solutions for positive change within society and their participation in decision-making on environmental issues and problems." Theoretically, the researcher defines it as: a set of steps that enable the individual to deal positively with environmental problems to reduce them and to deal positively with them, as well as enabling the individual to participate actively in the development of the right plans to reduce the risk of negative handling of the environment and decision-making. It is procedurally defined by the researcher as: the ability of preparatory biology teachers and teachers to respond correctly to the current research environmental advocacy scale paragraphs, measured by the degree to which the respondent (teachers) receives the environmental advocacy scale.

Method

The researcher chose the descriptive research curriculum, as it is most suitable for current research purposes. The current research community is represented by a number of teachers and teachers of biology for the preparatory stage in schools affiliated to the General Directorate of Qadisiyah Education for the academic year 2022-2023. Three samples were selected: a sample of clarity of the scale's instructions of 20 teachers and schools, a sample of 300 teachers and schools for statistical analysis, and a basic research sample of 150 teachers and schools.

Scale of cognitive depth levels: Steps to build it went according to the following: Setting the scale target: The measure's goal is to measure the levels of cognitive depth of prep biology teachers and teachers; Formulation of the paragraphs of the scale: For the purpose of preparing the paragraphs of the scale, the researcher learned a number of studies, research and metrics that relate to the levels of knowledge depth, through which the researcher was able to formulate (25) a paragraph measuring the levels of knowledge depth of the teachers of biology for the preparatory stage; The metric instructions included: The instructions for answering the poverty of the scale and the instructions for correcting these responses, since the metric requires answering (yes or no), as the paragraphs are drafted in a positive direction and the scores are given (1, 0). And exploratory application of the scale: the following are:

First exploratory application: The researcher applied the scale to a sample of 20 teachers and schools on Sunday 16/4/2023) to ascertain the clarity of the scale instructions and the clarity of its paragraphs as well as the time required for the answer of 30-32 minutes. Second exploratory application: the scale was applied to a sample selected in a random manner amounting to 300 teachers and a school of biology teachers in middle schools on Sunday (23/4/2023) for the purpose of conducting statistical analyses and calculating the cycontrol characteristics of the scale paragraphs.

[6] Ali Hussein Hassan, Fatima Abdel Amir Al-Fatlawi, and Raad Mahmoud Nassif, "The Extent to Which Biology Teachers at the Secondary Stage Possess Environmental Advocacy," *Nasaq* 35, no. 4 (2022).

Sincerity: The researcher presented the cognitive depth levels scale to a number of experts and specialists in the field of pedagogical psychology and life science teaching methods as many as 10 experts, for the purpose of determining its relevance and whether it requires adjustments or additions. After data collection and analysis, all calculated c2 values (4.5) were found to be greater than 3.84, at a degree of freedom (1), and an indicative level (0.05). Constant: extracted using the FCF-CRONBACH equation as the cognitive depth scale constant coefficient (0.82) indicates that it is well-treated and acceptable. Final version of cognitive depth level scale: The measure will be finalized from (25) paragraphs, thus achieving the first objective of the current research.

Basic Principles for Measuring Cognitive Depth Levels

Determine the student's performance level at each level of cognitive depth; The teacher should show students how difficult knowledge and information is before showing how deep knowledge is needed; Achieve tasks according to the type of thinking required by the student; Determine the level of knowledge depth according to what is required knowingly in the light of the goals set; The deeper level of knowledge emerges to question if the question requires more than one level of knowledge. And the level of knowledge shows the difficulty of the required cognitive processes [7].

The defender's concept is an important and strategic topic that has captured the attention of many researchers and specialists in several fields over the past years. The defender's term extended to the field of environmental education as a result of the need to achieve support for environmental issues and problems and to gain public opinion to defend current environmental conditions and their impact on the future of human society [8]. The advocate is one of the fundamentals of active citizenship, a process through which people participate by coordinating efforts to change existing behaviors or ideas in society with the aim of changing certain decisions or policies that affect people's lives to enjoy a dignified life that guarantees equality [9].

Abdel-Aal (2014) classified environmental advocate skills into the following: Negotiation: Obtain the best possible outcome between different parties and is done by accepting a friendly middle and settlement; Persuasion: A deliberate process from the masked to the one who wants to persuade him to change the concepts or directions of his choice and satisfaction; Arguments: An individual's ability to refute the arguments of the other party with evidentiary and factual evidence; Communication: The process by which a message is transmitted from a particular source to one or more future with the aim of changing behavior; Dialogue: a process between two or more parties to

[7] Deepa Gopal, "Application of Webb's Depth of Knowledge on Learners' Responses to Probability Questions," 2021.
[8] Sharma, "An Introduction to Advocacy: TRAINING GUIDE."
[9] Democratic Control of Armed Forces, "Introduction to Advocacy A Women ' s Guide to Security Sector Reform Training Curriculum," 2017, https://www.dcaf.ch/sites/default/files/imce/Women's Guide Curriculum/InclusiveSecurity_Curriculum_Series_SSR_MOD10.pdf.

communicate information and exchange views and ideas with a view to achieving the truth; Presentation and satisfaction: An individual's ability to present information and ideas in such a way as to capture the attention of others to ensure that his message reaches. And managing conflicts and solving problems: The mechanism followed by the teacher to guide conflict between individuals and groups or when one party is exposed to the other party's objectives and prevent it from satisfying its needs. (Abdelaal, 2014:238)

Previous studies

Studies on cognitive depth levels. Kazim (2021): The study aimed to analyze the content of the chemistry books of the intermediate stage according to the knowledge depth. The researcher used the analytical descriptive approach. The research sample was the chemistry classes in the science book for the first and second grades. The study tool was the development of (41) an indicator measuring cognitive depth, and the study found that the chemistry book of the third middle grade is the most interested in the levels of cognitive depth, followed by the science book of the second middle grade, and then the science book of the first middle grade [10].

Studies on environmental advocate skills. Hassan et al., [11]: The study aimed to learn the extent to which secondary biology teachers had an environmental advocate, the two researchers used the descriptive curriculum. The study sample reached 100 teachers and schools. The study tools were measured by environmental advocate skills [12].

Result and Discussion

The researcher applied the research tools of the scale of cognitive depth levels and the scale of environmental advocacy after finalizing their version to the current research sample of 150 teachers and schools from biology teachers for the second semester of the school year (2022-2023) for the period from 26-27/4/2023. The researcher used for data processing the following statistical means: Social Science Statistical Pouch (SPSS-10) and Microsoft-Excel.

Presentation and interpretation of results: First Goal: Build a scale that measures the levels of cognitive depth of teachers and biology teachers in the preparatory cycle. It was achieved in chapter III of this research; Goal 2: Build two measurements that measure the environmental defender's skills of biology teachers and teachers at the preparatory level. It was achieved in chapter III of this research. And Goal 3: Know the extent to which prep biology teachers and teachers have levels of cognitive depth, and the differences in their cognitive depth levels according to the gender variable (male-female). To verify this goal, the researcher calculated the computational average and standard deviation of the answers of middle school biology teachers and teachers representing the current research sample which reached (150) A teacher and a school, after using the t-test

[10] Kazem, "Content Analysis of Middle School Chemistry Books According to Depth of Knowledge."
[11] Hassan, Al-Fatlawi, and Nassif, "The Extent to Which Biology Teachers at the Secondary Stage Possess Environmental Advocacy."
[12] Hassan, Al-Fatlawi, and Nassif.

equation for a single sample to determine the significance of the differences between the computational medium and the hypothetical medium, found that the difference was statistical in the scale of cognitive depth levels and for the benefit of the computational average, which indicates that the sample had a good level of cognitive depth levels. As in table (1).

Table 1. t-test results to test the difference between computational medium and hypothetical medium In the scale of cognitive depth levels

Variable	Sample	SMA	Standard deviation	Hypothetical medium	T value for one sample		Statistical significance
					Calculated	Tabular	0.05
Knowledge depth levels	150	11.74	2.331	10	27.970	1.98	Significant

Table (1) shows that teachers in pre-service preparation have multiple levels of knowledge as well as their good knowledge capabilities which have greatly contributed to raising their knowledge depth training courses prepared by the General Directorates of Education, which have contributed to raising their knowledge depth, In addition, some teachers received higher degrees. (Master's and Ph.D.) This has increased the cognitive depth of other teachers.

For the purpose of ascertaining differences in the levels of cognitive depth of teachers and biology teachers for the preparatory phase, the researcher used the T-test for two separate samples, as in table 2.

Table 2. t-test results for two independent samples to test the indication of differences between Averages of school grades and female biology teachers in the scale of cognitive depth levels.

Variable	Contrast source	Sample volume	SMA	Standard deviation	T value		Statistical significant on level 0.05
					Calculated	Tabular	
Knowledge depth level	Male	75	14.40	1.80	6.068	1.98	Significant
	Female	75	11.29	2.51			

Table (2) indicates that male teachers have higher levels of knowledge depth than female teachers. This may be due to teachers' enrolment in training courses, seminars and workshops organized by educational bodies to develop and develop teachers' skills in higher proportions of female teachers due to their high responsibilities and preoccupation with daily life compared to teachers.

Goal 4: Know the extent to which prep biology teachers and teachers possess environmental advocacy skills, and the differences in their environmental advocate skills according to the gender variable (male-female).

The researcher calculated the computational medium and standard deviation of the research sample grades of 150 teachers and schools, and after using the t-test t-test for one sample to determine the significance of the differences between the computational medium and the hypothetical medium, the results were as in table (3).

Table 3. t-test results for one sample to test difference indication Between computational medium and hypothetical medium on environmental advocate skills scale

Variable	Sample	SMA	Standard deviation	Hypothetical medium	T value		Statistical significant on level 0.05
					Calculated	Tabular	
Environmental Advocate's skills	150	14.21	3.25	10	18.3	1.98	Significant

Table (3) shows that Male and female biology teachers at the preparatory level possess a high level of environmental advocacy skills. This is due to biological scientific subjects received at the tertiary level, in particular environmental and pollution materials and environmental risks to human life. Education ", as well as information and skills received through training courses prepared by the General Directorate of Education and prepared by researchers for the purpose of upgrading the level of the teacher. Some teachers and teachers possess a master's degree and doctorate in life sciences and their teaching methods. This has made them possess ample information about the environment, pollution risks and environmental problems that have helped them to possess high-level environmental advocate skills.

To ascertain the differences between secondary biology teachers and teachers in the extent to which they possess environmental advocacy skills, the researcher used the T-test of two separate samples, the results being as shown in Table 4.

Table 4. t-test results for two independent samples to test difference indication Between Average Grades of Teachers and Biology Teachers in the Environmental Advocate Skills Scale

Variable	Contrast source	Sample volume	SMA	Standard deviation	T value		Statistical significant on level 0.05
					Calculated	Tabular	

Environmental Advocate's Skills	Male	75	91.51	11.81	6.7	1.98	Significant
	Female	75	114.68	9.54			

Table (4) shows that female teachers possess more environmental advocacy skills than male teachers. This may be due to their familiarity with sources and books that demonstrate the importance of the environment and its preservation from pollution. Moreover, more women teachers have higher degrees (master's degree - doctorate) than male teachers in life sciences and teaching methods.

Goal 5: The relationship between the levels of cognitive depth and environmental advocacy skills of prep biology teachers and teachers is known. To learn about the strength and type of correlation between cognitive depth levels and environmental advocacy skills, the researcher used the Pearson equation, which was worth (0.921).

The researcher also extracted the T value of the correlation coefficient indication and compared the T value calculated at 31.2 with the tabular T value of 2.98. This shows a statistical significance of the coefficient at an indicative level (0.05). From Table 5, there is a strong pecuniary correlation between middle school teachers' and biology teachers' grades in the scale of cognitive depth levels and their grades in the scale of environmentalist skills.

Table 5. Correlation between knowledge depth levels and environmental advocate skills

Variables	Sample	Correlation coefficient	Hypothetical medium	Standard deviation
Depth knowledge level	150	0.425	25.51	6.15
Environmental Advocate's Skills			273.47	22.84

Table 5 shows that the relationship between levels of cognitive depth and environmental advocacy skills is a strong and vocal one. This can be attributed to teachers' possession of good cognitive depth that enables them to exercise environmental advocacy skills.

Conclusions

In the light of the research findings, the researcher concluded that: The possibility of building two measurements: the first measures the levels of cognitive depth, and the second measures the environmental advocate skills of prep biology teachers and teachers; The existence of a good level of cognitive depth; Having a high level of environmental advocate skills for prep biology teachers and teachers. And there is an intrinsic correlation between knowledge depth levels and environmental advocacy skills.

In the light of the findings of the present research, the researcher recommended that: Training programmes, workshops and seminars should be established for the purpose of raising the levels of knowledge depth and environmental advocacy skills of biology teachers and teachers; Teachers should be urged to read and see the latest scientific developments that deepen their knowledge and information. And teachers and teachers should be urged to learn about the most significant environmental problems threatening the future of life. The researcher proposed other studies, as follows: The researcher recommends that similar studies be conducted for current research on the student category. The researcher recommends conducting similar studies for current research and other subordinate variables such as (generative thinking, analytical thinking, environmental problem solving).

References

Al-Qudah, Mohammed Amin H, and Miesser Y Hindi. "Environmental Values Included in Science Books for the 10th Grade in Jordan ' An Analytical S Tudy ,'" no. January (2019).

Democratic Control of Armed Forces. "Introduction to Advocacy A Women ' s Guide to Security Sector Reform Training Curriculum," 2017. https://www.dcaf.ch/sites/default/files/imce/Women's Guide Curriculum/InclusiveSecurity_Curriculum_Series_SSR_MOD10.pdf.

Frost, David, and Judy Durrant. *Teacher-Led Development Work: Guidance and Support*. Routledge, 2013.

Gopal, Deepa. "Application of Webb's Depth of Knowledge on Learners' Responses to Probability Questions," 2021.

Hassan, Ali Hussein, Fatima Abdel Amir Al-Fatlawi, and Raad Mahmoud Nassif. "The Extent to Which Biology Teachers at the Secondary Stage Possess Environmental Advocacy." *Nasaq* 35, no. 4 (2022).

Holmes, Shelly Rankin. *Teacher Preparedness for Teaching and Assessing Depth of Knowledge*. The University of Southern Mississippi, 2011.

Kazem, Hussein Sadiq Jassim. "Content Analysis of Middle School Chemistry Books According to Depth of Knowledge." *College of Education for Pure Sciences - Ibn Al-Haytham, University of Baghdad*, 2021.

Shaheen, Abdul Rahman Youssef. "The Availability of Levels of Cognitive Depth in the Book of Biology for the Secondary Stage -the Curriculum System -in the Kingdom of Saudi Arabia." *Scientific Journal at the Faculty of Education -Assiut University* 36, no. 1 (2019): 148.

Sharma, Ritu R. "An Introduction to Advocacy: TRAINING GUIDE." *Support for Analysis and Research in Africa (SARA)*, 2007.

Webb, Norman L. "Depth-of-Knowledge Levels for Four Content Areas." *Language Arts* 28, no. March (2002): 1–9.