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The level of critical thinking of a Jordanian sample of blind students and its relationship with some variables

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The present study aimed to find out the level of critical thinking skills of a Jordanian sample of blind students and its relationship with some variables, namely the gender and class level variable. To achieve the objectives of the study, the researcher developed the California Critical Thinking Scale in line with the characteristics of the blind, with the help of several teachers of blind students with experience and expertise. First, the indications of validity and reliability of the scale were extracted by applying the tool to an exploratory sample of (30) male and female blind students. After that, the scale was applied to the final sample from all the governorates of Jordan, which amounted to 66 students from grades tenth, first secondary, second secondary. Then, the data were collected and analyzed. The results indicated that the arithmetic average of the blind students' responses to the California Critical Thinking Test was less than the educationally acceptable standard of (80%); for the five critical thinking skills that were included in the scale, the arithmetic averages of all skills were below the educationally acceptable level, and the highest mean was for the induction skill, then the evaluation skill, inference skill, analysis skill and finally the deduction skill. It is indicated that there are no differences attributed to the gender and class level variables. The study recommended the necessity of providing blind students with critical thinking skills, and providing training courses for blind teachers to activate the critical thinking skills of blind students.

Key words: Critical thinking, blind, California critical thinking scale.

INTRODUCTION

Educational institutions' interest in thinking has emerged by enriching the study materials with many activities that stimulate and motivate students to think in various fields. In addition to the interest in preparing and developing the capabilities and skills of teachers through rehabilitation programs educational workshops, and educational forums, to raise them intellectually and scientifically to achieve the desired general goals of them, which are: Creating a tangible and desirable change in students' behavior and working on developing their thinking skills and methods to reach a normal, balanced personality (Tafesh, 2004).

Since critical thinking is the key to solving the daily problems individuals face, individuals are exposed to

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situations in which they are forced to make decisive decisions. Where decisions are sound if they are properly considered; consequently, it leads to satisfactory results, as the higher the level of critical thinking skill of the individual, the more skill he has in dealing with daily problems and issues. Blind individuals are no different from the ordinary in the skill of critical thinking, as the blind is exposed to more obstacles than the ordinary. They need to represent the stimuli they are exposed to daily to deal with them appropriately. Therefore, the blind have varying capacities of critical thinking that require those who provide services to the blind to know their levels, especially since the blind individuals are now enrolled in graduate studies programs, and some of them occupy sensitive positions at the state level; some of them are teachers, including university professors, and some are musicians, and all of these professions require critical thinking skills. Some believe that it is limited to the gifted, and that people with disabilities are excluded from this ability. There is no doubt that the blind have different levels of intelligence that significantly helps the environment to develop it among blind individuals. We can identify indicators of intelligence among the blind, such as: expressing a desire to know the relationships between reasons and causes, classifying various things and putting them into categories, making inference and experimenting. The desire to discover errors and their reading is characterized by the demand for science and mathematics books more than others, as well as the ability to organize relationships and use figures and abstract symbols skillfully in addition to the power of deduction and classification. They like to do scientific, arithmetic, logical and thinking activities; they like games that require thinking such as chess, logical puzzles, and arithmetic stories. They like to measure, classify, weigh, analyze things; can think of abstract concepts in words or pictures, and enjoy numbers, shapes, patterns, and relationships (Gerlid, 2003).

Knowing the level of critical thinking among the blind helps provide appropriate educational programs for the blind consistently with their intellectual levels. It also helps in providing educational strategies suitable for blind children, using critical thinking skills to address multiple aspects according to the curriculum presented to the students. Also, knowing the levels of critical thinking and activating it enhances the blind children's access to the opportunities they deserve, which is reflected in the society's view of blind individuals.

Study problem

Knowing the critical thinking of blind students and activating it in the educational process is very important. Whereas the blind, due to the loss of the sense of sight, are exposed to more obstacles in society than the sighted, and they need to activate the critical thinking skills in practical life, as critical thinking leads to a deeper understanding of the cognitive content and a high sense of the society in which they live. It improves students' achievement in various academic subjects. It encourages the practice of a wide range of thinking skills, such as problem-solving and creative thinking, and provides opportunities for growth, development, and creativity. It leads to independence in thinking and freedom from dependence and self-centeredness. And it increases the ability to cope with emergencies or news they are exposed to. Furthermore, it leads blind students to monitor and control their thinking, which helps them to make important decisions in their practical life. Knowing and strengthening the level of critical thinking of the blind leads them to achieve their goals and reach their goals in life. This leads to improving society's attitudes towards blind children.

Hence, the researcher aims to answer the following questions:

What is the level of critical thinking skills among blind students?
Are there statistically significant differences in the level of critical thinking among blind students due to the gender variable?
Are there statistically significant differences in the level of critical thinking among blind students due to the school grade variable (tenth, first secondary, second secondary)?

Study importance

The importance of the study lies in the following two aspects:

Theoretical Importance

1. Knowing the level of critical thinking among the blind
2. Providing specialists with information based on the critical thinking skills of the blind, contributes to providing them with the necessary services to develop their capabilities.
3. Providing teachers and parents with the necessary guidance to develop critical thinking skills.
4. Giving a perception for those responsible for educating people with visual impairment on the importance of including teaching people with disabilities critical thinking skills.
5. Adding an authentic addition to the Arab Library, few studies dealt with thinking among people with visual impairments in general and critical thinking, particularly among the blind.
6. Knowing the differences in the level of critical thinking among the blind.

Practical Importance

1. Providing a scale for evaluating the critical thinking skills of people with visual impairment.
2. Providing information about the level of critical thinking of blind students, which is reflected in the methods of education, teaching methods, activities provided to the blind, and the possibility of applying inclusion.
3. Providing appropriate training programs to develop critical thinking among the blind.
4. Encouraging workers with the blind category to build appropriate training programs for the blind category.

The study objectives

The current study aims to:

1. Knowing the level of critical thinking of a sample of blind people in Jordan.
2. Knowing the effect of the class level on the level of critical thinking of the blind.
3. Knowing the effect of gender on the level of critical thinking of the blind.
4. Finding a measure of critical thinking for the blind that has connotations of validity and reliability appropriate to the Jordanian environment.

Procedural definition of terms

Critical thinking: it is defined as reflective, inferential, self-evaluation thinking, which includes a set of strategies and interconnected cognitive processes such as interpretation, analysis, evaluation, and deduction, to examine opinions, beliefs, evidence, evidence, concepts, and claims that are relied upon when making a judgment, solving a problem, or deciding, considering the views of others. It is defined as procedural: the degree obtained by the blind on the California Test of Critical Thinking Skills used in this study (Abu and Nofal, 2017).

1. Critical thinking (Procedurally): The degree that the blind obtains on the California scale developed by the researcher to measure critical thinking among the blind.
2. Blind people: in theory, they cannot write or read except through the Braille method (Al-Hadidi, 2009).
3. Blind people: (procedurally) are the individuals who lose their sense of sight, read and write in Braille, and enroll in schools and centers for the blind in Jordan.

The study limitations

1. How serious are the study sample respondents on the scale?
2. The size of the study population (the blind in the second stage) is approximately 80 students.

The limits of the study

1. Spatial Limits: The study will be applied in all governorates (center, north, and south) in Jordan.
2. Temporal limits: The study will be applied during the 2019/2020 academic year.
Human limits: The study will be applied to the blind in the academic stage (tenth, first secondary, and second secondary).

Theoretical framework

Critical thinking

Critical thinking is considered as one of the higher mental processes due to its association with many behaviors such as logic and problem solving and its close association with abstract thinking. So, paying attention to it is urgent and necessary in individuals' lives in particular and societies in general; the individual uses critical thinking to confront the situations that plague him, whether academic or social. Critical thinking skills are present for everyone without discrimination or differentiation, but they need training and practice to produce the desired results (Saadeh, 2003).

Definition of critical thinking

Critical thinking is one of the human mental activities of importance to the development of humanity's march on the face of the earth, and it is one of the forms of thinking most approached by researchers in study and research. Therefore, we may not find a specific definition upon which researchers agree. However, Astleitner (2002) defined critical thinking as: “One of the higher thinking skills that deals with evaluating arguments and the ability of the individual to self-organize to carry out the skills of evaluation, analysis, and deduction.

Based on those above, critical thinking can be defined as a cognitive mental activity that includes several sub-skills of knowing assumptions, interpretation, evaluating arguments, deduction, and it works on an accurate and objective analysis of any claim or belief according to certain criteria to judge the validity of its acceptance or rejection.

The importance of critical thinking

The importance of training in and learning critical thinking is one of the essential ways to ensure effective cognitive

development that allows an individual to use his maximum mental energies to interact positively with his environment, in addition to the importance of critical thinking in building a critical personality capable of distinguishing between right and wrong, reasonable and unreasonable, and not to be led by the opinions presented without deliberation or thinking (Ramer 1998).

Ball (2002) stresses the importance of critical thinking as a tool to face the times' changes. Through it, an individual's beliefs, tendencies, and outlook are formed. The design of critical thinking usually leads to an understanding of the relationship between language and logic. This leads to mastering the skills of analysis and criticism, inductive and deductive thinking, and reaching real and realistic deductions through clear expressions of knowledge and beliefs. The importance of critical thinking lies in the fact that it helps the individual to be more self-understanding and realistic in his dealings with others and the issues he has to tackle. It also helps to imagine how others think. It leads the individual to monitor and control his thinking, which helps him make decisions and take them in his life. The process of training and learning critical thinking includes activating the intellectual processes of the individual based on situations and experiences that require more thinking and not relying primarily on the individual's sensory experiences, which are usually simple experiences that do not require more effort (Abu and Nofal, 2017).

Critical thinking skills

Critical thinking as a cognitive concept includes several sub-skills; there are many classifications of critical thinking skills, according to the multiplicity of its definitions and the theoretical frameworks explaining it. Perhaps the most famous of these classifications is Watson and Glaser's classification of critical thinking skills mentioned in Al-Hallaq (2007). These skills are:

1. Recognizing assumptions refers to the ability to distinguish between degrees of truthfulness or lack of truthfulness of specific information and to distinguish between truth and opinion and the purpose of the information given.
2. Interpretation: It means the ability to define a problem, recognize logical explanations, and decide whether generalizations and results based on certain information are acceptable or not.
3. Deduction: It means the ability to draw a deduction from certain facts or suggestions, and the individual can perceive the correctness of the result from its error in light of the information given.
4. Argument evaluation: the ability to evaluate an idea, accept it, or reject it, distinguish between primary and secondary sources, strong and weak arguments, and pass judgment on the information's adequacy.

While Facione (1990) classified it according to the findings of American educational scholars at the Delphi conference as follows:

1. Analysis skill: It is the ability to analyze the situation into its elements in order to reveal the existing relationships between them and establish new ones between those parts.
2. Evaluation skill: it means the mental activity that is based on making a judgment about the value, integrity, and quality of ideas or things.
3. Inference skill is a mental reasoning process or new knowledge based on hypotheses or established introductions and available information.
4. Reasoning skill: It is a mental inference process aimed at reaching deductions or generalizations that exceed the limits of available evidence or information provided by prior observation.
5. Induction skill: It is a mental skill that moves the learner from the part to the whole, from examples to the base, and from sub-ideas to total ideas.

While Beyer mentioned in Al-Atoum et al. (2007) believe that critical thinking skills can be classified into the following:

1. First, distinguish truth from the claim.
2. Distinguish objective evidence from randomness.
3. The ability to determine the reliability of the news and opinion
4. Verify the authenticity of the news source.
5. Distinguish ambiguous allegations and evidence from objectivity.
6. The ability to identify the bias of others
7. The ability to distinguish logical fallacies
8. Determine the strength of proof or evidence.
9. The ability to recognize discrepancies between the information

In the current study, the critical thinking skills were based on the California Test Model (2000) translated into the Jordanian environment by Mari and Nawfal (2007). It includes five basic skills designed to provide the subject with some situations and problems that require the use of some mental skills that form critical thinking, and they are as follows:

1. Analysis: It is the ability to divide complex information into small parts with specifying their names and types, to know relationships in sentences, concepts, explanations, or any other form of expression of beliefs, experiences, causes, or information.
2. Induction: It is the ability to make expectations based on rules and laws and a group of observations in issuing

a judgment by referring to the similarity of situations or determining some of the consequences of introductions or previous information.
3. Deduction: It is the ability to derive or draw conclusions according to data, statements, evidence, beliefs, opinions, or explanations, and the individual can determine the correctness or error of the deduction in light of the facts given.
4. Deduction: It is the ability to implement or practice processes that depend on generating arguments and assumptions, searching for evidence, reaching conclusions, and identifying correlations and causal relationships.
5. Evaluation (evaluating arguments): It is the ability to assess the reliability of statements, make judgments on the issues mentioned in the text and clarify strengths or weaknesses in light of the available evidence.

Criteria for critical thinking

Jarwan (2007) believes that the criteria for critical thinking are as follows:

1. Clarity: It is one of the essential criteria for critical thinking. If the statement is vague and unclear, the individual will not know the true meaning behind it, and therefore he will not be able to reach what is required of a clear understanding to reach accurate solutions.
2. Clarity: It is one of the essential criteria for critical thinking. If the statement is vague and unclear, the individual will not know the true meaning behind it, and therefore he will not be able to reach what is required of a clear understanding to reach accurate solutions.
3. Health: This criterion refers to the necessity for the statement presented to be of a high degree of validity and reliability so that this phrase or information is based on official or scientific documents confirmed.
4. Accuracy means giving the subject its right to be treated and verified and accurately expressing it without adding or decreasing it.
5. Connectivity: It means how strong the link or relationship is between the question and the problem's topic at hand.
6. Depth: It means careful research in all parts of the problem at hand and not only delving into generalities.
6. Breadth: It means comparing the problem from all its different aspects.
7. Logic: It means that the inference to solve the problem must be logical.

Students with visual disabilities

The degree of care given by any community to individuals with disabilities - among them the blind - is an essential indicator by which to judge the extent of society's progress and civilization, by educating and qualifying them, and trying to integrate them into society, and paying attention to research and studies that take them as a focus. Disability is a term that refers to a person's inability to respond to or adapt to the environment as a result of behavioral, mental, or physical problems, which limits his ability to perform his natural role in society based on age and gender; disability is a form of disability and deficiencies, with which the owner feels the loss of one of his organs or the possibility of his potential.

The characteristics of students with visual disabilities

Linguistic characteristics

The visual impairment does not directly affect the acquisition of language for the blind, but it faces problems, including:

1. Replacement: It is replacing a sound with a sound like replacing the shin with sin or the kaf with the qaf.
2. Loudness: The loudness of the voice may not correspond to the nature of the event he is talking about.
3. Not to change the pitch of the voice so that the speech proceeds in a single tone and frequency.
4. Limitations in the use of facial and physical gestures and expressions accompanying speech
5. Verbalism: It is an overabundance of words at the expense of meaning, and this failure results in the accurate use of words or expressions related to a topic or a certain idea, so the visually impaired person intends to narrate a group of words or expressions so that he can communicate or clarify what he wants to say.
6. Deficiency is in expression resulting from the deficiency in the visual perception of some concepts, relationships, or events and the associated deficiency in recalling the verbal connotations that express them.

Social and emotional characteristics

Visual impairment may impose on the individual a specific type of deficiency resulting from the absence or lack of the sense of vision. This leads to the suffering of the visually impaired from multiple problems such as motor problems, and the problems resulting from excessive protection, dependence on others, and deficiencies in social relations. This affects the disabled socially and emotionally. Studies conducted on the link between visual impairment and other disabilities have shown that there are some disabilities associated with visual impairment, the most common of which are: emotional disorders and physical disabilities such as

disturbances in movement and speech, cases of epilepsy, mental retardation, and deafness.

Kinetic characteristics

Blind people face problems in being able to move safely from one place to another due to their lack of knowledge of the environment in which they are moving, and they exhibit stereotypical physical manifestations such as moving hands, turning around the place in which the disabled person is, pulling hair, etc.

Mental characteristics

1. There is no significant difference in intelligence between the blind and the normal child on verbal intelligence tests.
2. The blind has the power of attention and auditory memory.
3. They face difficulties in understanding abstract concepts (Al-Hadidi, 2009).

Measuring critical thinking

Many tests attempt to measure critical thinking for different ages, the most common of which are:

1. Glycerin Watson test: This test was prepared in 1964 and was designed for students of the ninth grade according to two forms; it is one of the most common equivalent tests. It consists of five sub-skills: knowledge of assumptions, argument evaluation, interpretation and deduction, and induction; each skill consists of an attitude towards it that shows the degree of his practice of thinking skills from a group of situations followed by several statements that require the individual to take the previous critic.
2. California test of critical thinking skills: This test was prepared by Fascists (1992) for students from the tenth grade through the university level. It consists of two pictures, each containing (34) multiple-choice paragraphs. This test measures the skills of analysis, evaluation, deductive reasoning, and inductive reasoning.
3. The Thinking Critical Weir-Ennis test, a multi-faceted essay test, was prepared in 1985. It is designed for the secondary and university levels and measures a large number of critical thinking dimensions. The test gives freedom to the subject to evaluate discussions and scrutiny and to evaluate individually.
4. The Cornell Test for Critical Thinking: This test was prepared in 1985 in two levels, the first starting from the fourth grade until the university level, the second covers the second stage until adulthood. The test is designed in group discussion situations on general issues. In the end, the individual is asked to judge the validity of some of the discussions' results and the extent of its reliability with reality. The test measures the following skills: deduction, induction, determine and identification, defining postulates, reliability of phrases, and meanings (Facione, 2006).

Intelligence and thinking skills of blind students

Intelligence among blind students can be identified through many indicators, including: Expressing a desire to know the relationships between causes and etiology, classifying various things and placing them into categories, carrying out inference and experimentation, and the desire to discover errors in what surrounds them of things, and their reading is characterized by the demand for science and mathematics books more than others, as well as the ability to organize relationships and skillfully use abstract numbers and symbols in addition to the power of deduction and classification; they like to do scientific, mathematical, and logical activities and thinking, like games that need thinking such as chess, logical puzzles, and arithmetic verbal stories, and like to measure things, classify, weigh, analyze them and can think of abstract concepts with words or pictures, and enjoy numbers, shapes, models, and relationships, and the learner also has a talent for solving problems, and an ability to deal with graphs.

Their mental abilities are sound, which requires developing their capabilities to make them social actors in society. On the other hand, the lack of the sense of sight will hardly make them tend to develop their other senses such as hearing, speaking, touching, and discovering the world through them, and trying to compensate for that deficiency that he suffers from, which makes them aware of things through their description of him. Thus, his perception of things has an objective framework; the Arabs previously said insight, not sight, which is a description that may indicate the abilities of visionary, as it was previously called. And it is one of the senses that the human mind is indispensable for, as the image provides the individual with information and knowledge of more than a thousand words, as well as its coverage and abbreviation, and the sense of sight is one of the senses essential for human learning. Since the blind do not differ from the sighted except in the aspects related to visual loss, the differences between them and their other peers are individual differences in the development of mental, psychological, and physical abilities (Amer and Muhammad, 2008).

The researcher believes that the level of critical thinking among the blind depends on the level of intelligence of the blind, the experiences he goes through, and the amount of support he receives from the family and

society.

Blind psychology assessment

As the experiences of blind people differ from those of blind people, the use of standardized psychometric tools to assess the psychological characteristics and needs of blind people has come under increasing criticism in the past few years. However, many factors push researchers to continue using standardized measurement tools, and the most important of these factors is the lack of adequate tools specifically designed to assess the blind.

However, real dangers may result from such practice, including:

1. First, the measurement specialists lack knowledge of visually impaired persons' developmental characteristics, leading to inaccurate deductions.
2. To adopt standards that have been applied to persons without disabilities.
3. Applying and correcting the tests in a modified way casts doubts on the real benefit intended from the tests.

It is appropriate to employ informal evaluation methods that are not based on tests, and these methods include observation, interview, and assessment lists. Some of the standardized psychological tests used in studying the blind are California Personality Test, Emotional Factors Test (for the blind), Minnesota Multifaceted Test (for the blind), Projective Auditory Test (for the blind), Sentence Completion Test, Lowenfeld Blind Anxiety Test, 1973)).

Previous studies

The previous studies related to the subject of the study will be reviewed according to their sequence from the oldest to the most recent; they will be divided into two parts:

The study of Ashour and Al-Najjar (2017) aimed to investigate the level of critical thinking and the level of self-efficacy among graduate students in the Faculties of Education in Palestinian universities, as well as to reveal the differences in the level of critical thinking according to the variables (gender, specialization, and university) and the possibility of predicting the level of self-efficacy through the critical level of thinking. The study sample consisted of the master's students in the Faculties of Education and their number (90) male and female students. The researchers used the critical thinking scale and the self-efficacy scale. The results showed that critical thinking among the research sample members is below the educationally acceptable level. On the other hand, the level of research self-efficacy among the research sample members is appropriate; the results showed no differences in the level of critical thinking according to the variables of gender and specialization. The results also indicated an unpredictability of research self-efficacy through critical thinking. The study recommended work to raise the level of research self-efficacy of graduate students to gain mastery, training faculty members in colleges of education to teach critical thinking skills and paying attention to university education in deduction, evaluation and analysis in particular, and thinking skills in general.

Kamel and Issa (2011)'s study aimed to determine the effect of using the Learning Dimensions Model on developing reading the map and critical thinking among fifth-grade students with learning difficulties. The study sample consisted of 54 students of the fifth grade of primary school from Prince Sultan Educational Complex, Bilal bin Rabah School, and Jaafar bin Abi Talib School in Riyadh. The map reading skill test, the critical thinking skills test and the Raven Intelligence Sequential Matrix Test were applied to achieve the study's goal; the teacher's guide and the student handbook were used in the two study units prepared according to the learning dimensions model. The study found significant differences between the experimental group's mean scores using the learning dimensions model. The study also found that there are statistically differences between the average scores of the experimental group that was studied using the model of learning dimensions and the control group that was studied in the usual way in testing the skill of reading the dimensional map in the direction of the experimental group. There were also statistically significant differences in the mean scores of the experimental group in the pre-measurement and the post-test in testing the skill of reading the map in the direction of post-measurement; the mean scores of the experimental group were studied using the learning dimension model. The control group found statistically significant differences that were studied in the usual way in testing critical thinking skills in the direction of the experimental group. Also, significant differences were found between the mean scores of the experimental group in the pre-measurement and the post-measurement in the test of critical thinking skills in the statistical direction of the post-measurement.

Kamashad (2011)'s study aimed to reveal the creative thinking capabilities of blind students in Kuwait in light of age, gender, and degree of visual impairment. For this purpose, the researcher prepared a test of creative thinking abilities for the blind, and the test consisted of four parts, each part measuring one of the four creative thinking abilities (sensitivity to problems, originality, flexibility, fluency). It was applied to 81 male and female blind students divided into three different age groups. The results of the study highlighted the existence of statistically significant differences between blind students

with the ability to think creatively due to age in favor of the two older groups; while the results showed that there were no statistically significant differences between totally blind students as a whole and partially blind students as a whole with the abilities of creative thinking. Also, there were statistically significant differences in fluency that could be attributed to the interaction between the student's gender and the degree of his visual impairment in favor of the blind female. In light of these results, this study concluded with the recommendation of the necessity of enriching and enhancing activities and various training programs, intending to develop the creative thinking abilities of blind students in the State of Kuwait.

Ashour (2019)'s study aimed to find out the effectiveness of an educational program in mathematics based on intellectual intelligence in improving critical thinking among blind students in the tenth-grade students in Amman. The study sample consisted of 24 male and female students chosen by the intentional method. They were divided into two groups: one is an experimental group consisting of 12 male and female students, and the other is a control group consisting of 12 male and female students from the tenth grade of the Royal Academy of the Blind in 2018 / 2019. An educational program based on intellectual intelligence was built to achieve the study goal, and the critical thinking test prepared by Watson and Glaser was used and applied to the experimental group. It resulted in a statistically significant difference between the experimental and control groups' scores, which indicates that teaching mathematics using a program based on intellectual intelligence had an impact in improving critical thinking among blind students. There is no statistically significant difference attributed to the gender of the student. There is no statistically significant difference between the answers of the experimental and control groups due to the interaction of the program based on intellectual intelligence with the gender of the blind students.

The study of Issa and Ali (2019) aimed to identify the cognitive thinking skills of blind students and those with learning difficulties in light of a number of variables represented in the classroom and the type of disability. The study sample consisted of 120 students, including 49 students with visual impairment in Riyadh and 71 students with learning difficulties enrolled in learning difficulties programs at Al-Muthanna Bin Haritha School, King Saud Elementary Complex and King Abdulaziz City for Science and Technology School in Riyadh during the school year 1435-1436 AH. To achieve the aim of the study, the researchers used the scale of cognitive thinking skills; the scale was applied by teachers in institutes and programs of visual impairment and teachers of learning difficulties on the study sample students. To answer the study questions, arithmetic averages and standard deviations were calculated, and a "T" test was calculated to indicate the differences between the averages. The results showed that the average scores of the blind students on the scale of cognitive thinking skills are high compared to the average scores of students with learning difficulties in all classes and those students from fourth to sixth grade who are blind and those with learning difficulties possess a high level in cognitive thinking skills. It also indicated statistically significant differences at the level of 0.01 between the average scores of blind students and those with learning difficulties on the scale of cognitive thinking skills due to the school grade variable in favor of grades from fourth to sixth grade. In addition, it indicated statistically significant differences at the level of 0.01 between the average scores of blind students and those with learning difficulties on the cognitive thinking skills scale due to the variable of the type of difficulty in favor of the blind students.

METHODOLOGY

Study population

The study population consisted of (100) blind students enrolled in schools for the blind in Jordan.

The pilot study sample

A sample of 30 blind students was taken in Abdullah bin Maktoum's study, and the scale was applied to the students after converting it to Braille, in cooperation with the teachers in the school, to find indications of validity and reliability, and to take notes on the scale.

The final sample

The sample was chosen by the intentional method. The final sample consisted of 66 blind people enrolled in special schools for the blind from all governorates in Jordan (Table 1).

Study tool

The California Critical Thinking Scale, in its original modified form, in the Jordanian environment.

The California Test of Critical Thinking Skills model (2000) was used in its modified version of the Jordanian environment (Mari and Nawfal, 2007). This is to measure the degrees of critical thinking of the study sample.

This test consists of 34 items divided into five sub-skills of critical thinking skills, namely:

1. Analysis skill: The number of its paragraphs is (6), which are (3, 5, 6, 11, 13, 18).
2. Induction skill: the number of its paragraphs is (6), which are (22, 24, 31, 32,33, 34).
3. The skill of deduction: The number of its paragraphs is (4), which are (8, 14, 15, 23).
4. Inference skill: The number of its paragraphs is (12), which are (1, 4, 9, 10, 12, 20, 21, 26, 27, 28, 29, 30).
5. Evaluation skill: the number of its paragraphs is (6), which are (2, 7, 16, 17, 19, 25).

Table 1. Distribution of study individuals according to the study variables.

Parameter	Categories	Number
Gender	Males	35
	Females	31
	Total	66
The class level	Tenth	21
	First secondary	11
	Second secondary	34
Total		66

Connotations of validity and reliability of the modified California scale on the Jordanian environment

The tool validity

Content validity: The California Test of Critical Thinking indicates validity in the Jordanian environment. Mari and Nawfal (2007) offered the test to five faculty arbitrators. In the University College of Educational Sciences and Al-Isra Private University, and in light of the results of the arbitration, the initial image of the translated scale into the Arabic language was reviewed, and some amendments were made to some paragraphs in terms of accuracy of translation from English into the Arabic language. Also, some amendments were made to the language of some paragraphs that are ambiguous. Thus, the test preserved its number of (34) items, distributed over the five critical thinking skills.

Reliability of the scale in its original modified form on the Jordanian environment

Reliability coefficients were available for this test in the Jordanian environment. For example, in the study of Mari and Nawfal (2007), the overall reliability coefficient was 0.86; for each of the five skills of analysis, extrapolation, deduction, inference, and evaluation, it was 0.84, 0.83, 0.73, 0.88, 0.81), respectively.

California advanced blind scale

Scale development

The scale was developed through the following steps:

1. The scale was displayed in its modified Jordanian form to a group of blind teachers and administrators. Then, it was sent through (WhatsApp) where the readable material was converted into audible through a special application for the blind, and they were required to read the paragraphs judge their suitability for the blind, and make appropriate proposals in preparation for developing the scale.
2. The scale was displayed in its modified Jordanian form to a group of sighted teachers who teach the blind at Abdullah Bin Maktoum School for the Blind, where the scale was sent through (WhatsApp), where the material was converted into audible through a particular application for the blind. They are required to read the paragraphs, judge their suitability for the blind, and make appropriate proposals.
2. The researcher reviewed the scale several times to preserve the appropriate paragraphs for the blind and replace the inappropriate items in proportion to their characteristics.
3. Paragraphs containing the drawing and illustrations were deleted.
4. Some paragraphs containing graphics were replaced with descriptions of the attached graphics.
5. Some terms were deleted and replaced with familiar terms for the blind, such as poor, weak. They were replaced by the word (weak). In Paragraph No. (19,24,25,30), the scale in its original form translated into Arabic.
6. Some items were deleted (28,29,30) in the scale in its original form so that the number of paragraphs became 30 paragraphs.
7. Delete some expressions that require the sense of sight and replace them with terms that require other senses, such as hearing, for example (while I was watching TV). It was replaced by (while I was listening to the news) in Paragraph 4 of the scale with its original form translated into Arabic.
8. The researcher considered the blind and their teachers' suggestions and made appropriate adjustments to the scale.
9. The initial image of the scale was obtained so that the scale in its initial form consists of (30) items that measure the following sub-skills:
10. Analysis skill: the number of its paragraphs is 5, which are 3, 5,9,11, 16.
11. Evaluation skill: the number of its paragraphs is 6, which are 2, 6, 14, 17, 23, and 15.
13. Inference skill: The number of its paragraphs is 8, which are 1, 4, 8,10, 18,19,24,25.
14. The skill of deduction: the number of its paragraphs is 4, which are 7, 12, 13, 21.
15. Induction skill: the number of its paragraphs is 6, namely 20,22,26,27,28,29.
16. Then, the researcher presented the scale's initial image to a group of arbitrators and specialists in Jordanian universities, where the arbitrators made some of the proposed amendments.
17. The scale was converted into a speaking scale through an application called (Voice Over) available on Apple devices and Android devices (Talkback), cooperating with Abdullah Bin Maktoum School for the Blind.

Validity of the California advanced blind scale

First: To verify the validity of the content in the current study, the researcher presented the test to 10 arbitrators who specialize in the fields of special education, educational psychology, psychological and educational counseling, and the Arabic language of the

Table 2. Reliability coefficients for the Critical Thinking Scale by the Cronbach Alpha and split-half method.

Number	Sub dimensions	Cronbach Alpha	Split-half method
1	Analysis	0.78	0.80
2	Evaluation	0.80	0.81
3	Inference	0.77	0.74
4	Deduction	0.81	0.77
5	Induction	0.74	0.72
Overall		0.84	0.82

teaching members at Jordanian universities and the Ministry of Education. The judges were asked to give their opinions and observations about the suitability of the test questions, the integrity of the drafting of its items, and the clarity of its meaning from a linguistic point of view. Then, the amendments, notes, and proposals were taken into consideration, and to keep the paragraphs that obtained an agreement rate (80%) or more by the arbitrators on the required amendment, whether negative or positive.

Reliability of the developed California Blind Scale

Two methods were studied to calculate the reliability, the first using the Cronbach alpha equation and the second using the split-half method. The reliability was calculated through a survey sample of 30 blind secondary school students, and reliability was calculated for the three sub-dimensions that make up the scale and for the scale as a whole. These results are presented in Table 2.

It is clear from Table 2 that the reliability coefficient for the scale as a whole calculated using the Cronbach Alpha equation reached 0.84; it is also clear from the table that the reliability coefficients for the sub-dimensions of the scale ranged between 0.81-0.74. The reliability coefficient was the highest for the dimension of deduction and the lowest for induction. Therefore, the reliability coefficients calculated using the Cronbach-alpha equation for the scale are considered acceptable and satisfy the study's purposes.

Second, reliability is calculated by the split-half method. It is evident from Table 2 that the reliability coefficient for the scale as a whole calculated by the split-half method reached 0.82; it is also clear from the table that the reliability coefficients for the sub-dimensions of the scale ranged between 0.81-0.72, where the reliability coefficient was the highest for the evaluation dimension and the lowest reliability coefficient for the induction dimension. Therefore, the reliability coefficients for the scale calculated by the semester method are also acceptable and fulfill the study objectives.

Scale correction

The California Blind Test consists of 29 multiple-choice items, and each item has four alternatives; some paragraphs have five options, with one mark for each correct answer and zero scores for the wrong answer. Thus, the total score of the test ranged from 0-29 degrees, and hence the maximum score for the five skills composing the test is as follows:

1. The skill of analysis: the number of its paragraphs is 5, which are 3, 5,9,11, 16.
2. Evaluation skill: the number of its items is 6, which are 2, 6, 14, 17, 23, and 15.
3. Inference skill: the number of its paragraphs is 8, which are 1, 4, 8,10, 18,19,24,25.
4. The deduction skill: the number of its paragraphs is 4, which are 7, 12, 13, 21.
8. Induction skill: the number of its paragraphs is 6, namely 20,22,26,27,28,29.

Study procedures

The study objectives were achieved according to the following procedures:

1. The researcher got the approval of the scale's owner (Dr. Ahmed Nofal) to develop and apply the scale to a sample of blind people.
2. The scale was presented to a group of teachers from Abdullah bin Maktoum School to judge the scale's paragraphs regarding their suitability for blind students and take their notes.
The researcher considered all the observations and developed the scale to suit the characteristics of the blind.
3. The researcher prepared the scale and extracted the indications of its validity and reliability.
4. The researcher obtained
5. Official approval from the Jordanian Ministry of Education (A book to facilitate the researcher's mission).
6. The researcher determined the study population in Jordan.
7. After converting the scale into Braille, it was applied to an exploratory sample of (30) blind students to reach validity, reliability, and taking notes.
8. The researcher applied the scale to the final study sample (100) blind students in Jordanian schools.

Data collection

Conduct appropriate statistical treatments to answer the study questions.

Statistical processors

The arithmetic averages and standard deviations of the blind students 'scores were calculated on the critical thinking test sub-skills. For the overall score of the California test, a criterion of 80% has been determined to be taken as an acceptable educational level for the level of possession of critical thinking skills on the California test for that critical thinking variable based on the study of Ashour and Al-Najjar (2017) and Mari and Nawfal (2007), which set the acceptable educational critical level of thinking skills at (80%). And to answer the second question, the arithmetic means and

Table 3. Arithmetic means and standard deviations of blind students' scores on critical thinking skills in the California test.

Number	Skill	Number of paragraphs	Arithmetic average	Standard deviation	Rank	
1	Analysis	5	0.273	0.178	4	
2	Evaluation	6	0.328	0.178	2	Educationally acceptable arithmetic mean 80%
3	Inference	8	0.326	0.168	3	
4	Deduction	4	0.261	0.221	5	
5	Induction	6	0.351	0.219	1	
Overall		29	0.313	0.079		

standard deviations of the blind students 'scores were calculated on the California Critical Thinking Test according to the gender variable. The t-test was also calculated to judge the significance of the differences in critical thinking skills between male and female students.

According to the grade variable, the arithmetic means and standard deviations of the blind students 'scores were calculated on the California Critical Thinking Test. According to the grade variable, a One-Way ANOVA was also performed to judge the significance of differences in critical thinking skills.

RESULTS

The following is a detailed presentation of the results of the statistical treatments of this study:

The first question: What is the level of critical thinking skills among blind students?

The arithmetic means and standard deviations of the blind students 'scores on the critical thinking skills of the California test and the overall score of the test were calculated, and the following is a presentation of these results.

It is evident from Table 3 that the arithmetic average of the blind students' responses to the California Critical Thinking Test reached 0.313 with a standard deviation of 0.079, which is less than the educationally acceptable standard (80%). As for the five critical thinking skills that were included in the scale, their arithmetic averages ranged between 0.261-0.351. This also means that all skills were below the educationally acceptable level, where the highest arithmetic average was for the induction skill with a mean of 0.351 and a standard deviation of 0.219. Then the evaluation skill with arithmetic mean of 0.328 and a standard deviation of 0.178, the inference skill with arithmetic mean of 0.326 and a standard deviation of 0.168, the skill of analysis of 0.273, and finally the deduction skill with arithmetic mean of 0.261 and a standard deviation of 0.221.

The second question: Are there statistically significant differences in the level of critical thinking among blind students due to gender?

The arithmetic averages and standard deviations of the blind students' scores were calculated on the California Critical Thinking Test according to the gender variable. The t-test was calculated to judge the significance of the differences in critical thinking skills between males and females. The following is a presentation of these results.

Table 4 shows that there are no statistically significant differences in the level of critical thinking between male blind students and female blind students in each of the skills (analysis, evaluation, deduction, and induction), as well as the overall score of the California Critical Thinking Test, where the values of t were not significant at the level of significance ($\alpha = 0.05$). However, it is also clear from Table 4 that there are statistically significant differences between male blind students and female blind students in the inference skills. The value of t was 2.22, which is statistically significant at the level of significance ($\alpha = 0.05$), and these differences were in favor of blind students.

The third question: Are there statistically significant differences in the level of critical thinking among blind students due to the grade variable?

According to the grade variable, the arithmetic averages and standard deviations of the blind students 'scores were calculated on the California Critical Thinking Test. A One-Way ANOVA was also performed to judge the significance of differences in critical thinking skills according to the grade variable, and the following is a presentation of these results.

It is evident from Table 5 that there are apparent differences in the scores of the blind students on the sub-skills of the California test for critical thinking and the total score of the quiz according to the grade variable. To determine whether these differences are statistically significant, a One-Way ANOVA analysis was performed for the sub-skills and the test as a whole. The following is a presentation of these results.

It is evident from Table 6 that there are no statistically significant differences due to the class variable in the level of critical thinking in all critical thinking skills (analysis, evaluation, inference, deduction, and induction) as well as in the overall score of the California Critical Thinking Test. The p-values were not statistically significant at the significance level ($\alpha = 0.05$).

Table 4. T-test results to indicate the differences in critical thinking skills between male blind students and female blind students.

Field	Gender	Number	Arithmetic average	Standard deviation	(T) test	Degrees of freedom	Significance level
Analysis	Male	35	0.25	0.11	-1.32	64.00	0.191
	Female	31	0.30	0.23			
Evaluation	Male	35	0.34	0.17	0.71	64.00	0.483
	Female	31	0.31	0.19			
Inference	Male	35	0.37	0.19	2.22	64.00	0.030
	Female	31	0.28	0.13			
Deduction	Male	35	0.25	0.26	-0.44	64.00	0.661
	Female	31	0.27	0.18			
Induction	Male	35	0.35	0.20	-0.13	64.00	0.895
	Female	31	0.35	0.24			
Overall	Male	35	0.32	0.06	0.84	64.00	0.404
	Female	31	0.30	0.10			

DISCUSSION

What is the level of critical thinking skills among blind students?

The results related to the first question indicated that the arithmetic average of the blind students' responses to the California Critical Thinking Test was less than the educationally acceptable standard of 80%. For the five critical thinking skills included in the scale, all skills' arithmetic averages were below the educationally adequate level. The highest arithmetic average was for the induction skill, then the evaluation skill, the inference skill, the analysis skill and finally the deduction skill. The researcher uses the traditional methods of teaching and the keenness on the part of some teachers of the blind to communicate information to the blind students in all its realistic details without interest in giving examples or asking questions that provoke critical thinking such as questions that require searching for the source of the information and questions that need exploring the truth. The teacher is satisfied to present the information in the language of the blind without resorting to critical thinking skills so as not to distract the blind. The result also found that the highest average arithmetic was in the skill of induction, which is a skill that requires that prediction be based on rules and laws and the issuance of judgments by referring back to the similarity of the situations. The researcher believes that this result is logical. The blind depend, in their review, on previously known rules and laws; they rely on similar situations to pass judgment, as they lack the sense of sight; the delivery of new information to them depends on the information known to them to simulate through it. This result is consistent with Kamashad (2011)'s study which recommended the necessity of providing enriching programs and various training to develop innovative thinking skills for blind students in the State of Kuwait.

Are there statistically significant differences in the level of critical thinking among blind students due to the gender variable?

The results indicated no statistically significant differences in the level of critical thinking between male blind students and female blind students in each of the skills (analysis, evaluation, deduction, and induction); these differences were in favor of blind students. The researcher attributes this result to the fact that all blind students, whether male or female, are exposed to the same type of education that focuses on the senses of hearing, touch, smell, and taste. Therefore, the level of skills related to the critical thinking process depends on the inputs through the senses and the way they are processed, through mental activities; the treatment method depends on the accuracy of the input and the fact that the blind lack the sense of sight, and some information requires the presence of the sense of sight to complete the real picture for them. The results indicated a decline in these skills, and it showed differences in the inference skills, and the differences were in favor of blind students. The researcher attributes this result to the fact that blind males may have more opportunities than

Table 5. Arithmetic means and standard deviations of the blind students' scores on critical thinking skills in the California test according to the grade variable.

Field	Class	Number	Arithmetic average	Standard deviation
Analysis	Tenth	21	0.27	0.17
	First secondary	11	0.24	0.15
	Second secondary	34	0.29	0.19
	Overall	66	0.27	0.18
Evaluation	Tenth	21	0.35	0.17
	First secondary	11	0.41	0.17
	Second secondary	34	0.29	0.18
	Overall	66	0.33	0.18
Inference	Tenth	21	0.30	0.17
	First secondary	11	0.34	0.18
	Second secondary	34	0.33	0.17
	Overall	66	0.33	0.17
Deduction	Tenth	21	0.21	0.21
	First secondary	11	0.23	0.24
	Second secondary	34	0.30	0.22
	Overall	66	0.26	0.22
Induction	Tenth	21	0.34	0.17
	First secondary	11	0.27	0.19
	Second secondary	34	0.38	0.25
	Overall	66	0.35	0.22
Overall	Tenth	21	0.30	0.08
	First secondary	11	0.31	0.04
	Second secondary	34	0.32	0.09
	Overall	66	0.31	0.08

indicated no statistically significant differences based on the gender variable.

Are there statistically significant differences in the level of critical thinking among blind students due to the class variable?

The results indicated no statistically significant differences attributed to the class variable in the level of critical thinking in all critical thinking skills (analysis, evaluation, inference, deduction, and induction). Likewise, in the overall score of the California Critical Thinking Test, where q values were not statistically significant, the researcher attributes this result to the fact that blind students in all grades receive their education depending on the remaining senses. The teachers also focus on communicating information to the blind students through Braille, and most often, their educational and behavioral goals do not include developing thinking skills in general and critical thinking in particular. The researcher recommends through this study the necessity of including blind curricula and activating thinking skills, especially since blind students are enrolled in higher studies, and some of them are qualified to take on influential roles in society; and the teachers of blind students should be enrolled in training courses to activate the critical thinking skills of the blind. This finding agrees with Kamashad (2011)'s study which indicated no differences between the group as a whole.

Recommendations

Educational recommendations

1. Provide training courses for teachers to develop critical thinking skills among blind students in Jordanian schools.
2. Enrich the blind textbooks with thinking skills in general and critical thinking in particular.

Table 6. Results of the One-Way ANOVA analysis of differences in critical thinking skills between Male blind and female blind students.

Field	The source of the contrast	Sum of squares	Degrees of freedom	Average of squares	P	Significance level
Analysis	Class	0.02	2	0.01	0.37	0.696
	Error	2.03	63	0.03		
	Overall	2.05	65			
Evaluation	Class	0.13	2	0.07	2.18	0.122
	Error	1.92	63	0.03		
	Overall	2.05	65			
Inference	Class	0.02	2	0.01	0.27	0.766
	Error	1.82	63	0.03		
	Overall	1.84	65			
Deduction	Class	0.11	2	0.06	1.17	0.316
	Error	3.06	63	0.05		
	Overall	3.18	65			
Induction	Class	0.10	2	0.05	1.07	0.348
	Error	3.02	63	0.05		
	Overall	3.12	65			
Overall	Class	0.01	2	0.00	0.47	0.630
	Error	0.40	63	0.01		
	Overall	0.41	65			

Research recommendations

1. Conduct studies related to the critical thinking skills of blind pre-school children.
2. Conduct studies on building training programs to develop critical thinking skills at different ages.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

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