International Journal of Psychosocial Rehabilitation, Vol.24, Issue 01, 2020
ISSN: 1475-7192

The development of probabilistic thinking among children aged (6-11) years

[1] Dr. Mushtaq Khalid Jabbar

Abstract:

The aim of the present research is to identify probabilistic thinking among children ages (6, 7, 8, 9, 10, 11) years, and the significance of statistical differences in probabilistic thinking according to age and gender variables (males and females). The researcher prepared a tool to measure the probabilistic thinking in children after reviewing the previous literature and studies. The tool consisted of (9) paragraphs. On a group of experts, he extracted its psychometric properties, and the research concluded with the following results: T (6) to (11 years) have the ability to probabilistic thinking, the results showed the impact of the age variable in the ability to think about the potential for the benefit of old elder, and the results show the impact of the gender variable in the ability to probabilistic thinking.

keywords: *development, probabilistic thinking, children*

Introduction

Probabilistic thinking is one of the different types of thinking. The learner encounters many situations that call for thinking about their inevitable and theoretical probability of occurring and investigating other possibilities for a particular situation. These attitudes begin from the early years of the child's life. He tries to find a solution to his own ways of thinking. For example, the probability of rain is 50% Does this mean that the rain will fall on half of the area where the weather is forecast, or that light showers of rain will fall and cover the entire area? Such questions call for the need to teach probabilistic thinking to children from a young age according to different directions of teaching thinking, some of which see the need to teach thinking within the curriculum of study, while another direction sees teaching thinking in different curricula, and regardless of how to teach thinking to children must first determine the appropriate ages to teach Each type of thinking is different, including probabilistic thinking, and by looking at the literature related to probabilistic thinking, the researcher found a difference in determining the ages in which the ability to think of probabilistic thinking, Fischbein believes that the link can be observed In children between the ages of 3 and 4, it is established at the age of 6. This means that children in kinesthetic, pre-operative, and physical processes cannot acquire probabilistic thinking skills (Brain, 2001: 218).

As a result, there is a difference in viewpoints in determining the age at which the ability to think probabilistic appears, which led the researcher to ask some questions such as: Does probabilistic thinking follow an evolutionary path through different ages in children? This is what the current search will try to answer.

research importance

The importance of the current research is summarized in the following points: -

1. The importance of childhood, which is the basis that contributes to the formation of children's personalities and the basis on which their productivity and future performance in various aspects of life.

[1] *College of basic education / university of sumer/ Thi-Qar , Iraq. moshtaqkhaled@gmail.com*

2. The importance of thinking in general and the subject of probabilities in particular, as one of the different types of thinking. The subject of probabilities is related to various practical topics, such as natural sciences, mathematics, especially numbers, engineering, clusters, and data analysis.

3. The importance of knowing the ability of children to think probabilistic at different ages; it provides for workers in the field of education and information that contribute to the preparation of curricula that are compatible with their cognitive abilities.

4. The current research is a modest contribution to reveal the ability of children to conduct probabilistic thinking, in an effort to enrich the educational and psychological library and to enable researchers later to develop and study the study of probabilistic thinking variable, especially as this research after the first Iraqi research - to the knowledge of the researcher The study of this variable evolutionary in children, which calls us to the need to pay attention to this research area and conduct more research in it, both theoretical and applied.

objectives of research

The current search targets you know:

1. The ability of children to think probabilistic depending on the age variable (6, 7, 8, 9, 10, 11) years.

2. Significance of differences The ability of children to think probabilistically according to the variables age (6, 7, 8, 9, 10, 11) years, and gender (males, females).

search limits

The current research is determined by all the children in the public primary schools within the Directorate of Education Baghdad Rusafa first, ages (6, 7, 8, 9, 10, 11) years for the academic year (2017 - 2018).

Define terms

Development

Riegel 1975: Progress presents dialectics in four interdependent dimensions (internal biological processes, individual psychology, socio-cultural aspect, and physicalexternal environment). No synchronization of events on these dimensions is required (Riegel, 1975,: 21). .

Procedural definition: The change in the scores of children on probability thinking with age, expressed in the arithmetic averages for each age of the target ages in the current research.

Thinking

Al-Qaisi (2010): A term that refers in its general sense to any mental or mental activity that differs from sensory perception or goes beyond the two to abstract ideas. .

Probability

Abed (2011): The probability of an event, measured as a number between zero and one, where zero indicates the impossibility of an event and one to confirm (Abed, 2011: 562).

Probabilistic Thinking

The definition of Ahmed (2007): The set of mental processes carried out by the individual in response to situations containing the areas of probabilistic thinking (Ahmed, 2007: 11).

The researcher defines theoretical thinking in the current research as: a mental process is done to solve problems related to the possibility of an event or the impossibility of occurrence or confirmation of occurrence. The researcher identifies him procedurally to the degree to which the subjects obtained in the current research on the test prepared for this purpose.

Theoretical background

Piaget and Inhelder's point of view, which emphasizes that the ability of probabilistic thinking is evident in the stage of abstract operations (15-11 years), where Piaget believes that potential thinking evolves from the evolving evolution of Identical to building logical processes. As an example of the way that connects the Piaget's perceptions probabilistic and development of logical operations, the observation of children while comparing them to the prospects by placing two sets of white cards and put on some of a signal and asked them to indicate which groups best to get a card with a signal arises to have a comparison between the four numbers in The most difficult conditions will shift, to a comparison of ratios. He believed that this capacity was only expanded within the phases of his abstract operations (Brain, 2001: 218).

Piaget looked at the possibilities in terms of the physical features of the idea of luck. And studied in three axes: are random mixing, games that sold fool, and random clouds. To study this, he put a set of balls in a box divided into two sections and each section has balls of a certain color, and found that the children in the first stage between the work (4-7) years are mistaken in understanding the principle of nonspatial opposite in random mixing, they do not realize that the balls in The box is not returned to its original position after mixing. The second stage begins with the end of the seventh year, where intuition shows the possibility (luck or opportunity) and the child begins to accept the idea of mixing the balls, but without understanding the idea of the possibility of return. The third stage begins at the age of (11 - 12) years, in which the child understands the process of random mixing, which is not reversible process does not return the balls to their original place before mixing. . In games where luck and probability are involved, children in the first stage provide responses that are easily susceptible and do not believe that there is any kind of trick through the games of luck. In the second stage, they refuse to accept the idea that the results of luck games always give the same result and the second time the result must be contrary to the first time because they have a comprehensive sense of probability. First. They have a comprehensive sense of probability. In the third stage there is more than one intuition or a comprehensive sense of probability and there is a beginning of quantitative assessment and evaluation (Ahmad, 2007: 21-22).

Fischbein's point of view: Fischbein disagrees with his belief that the notion of probability does not appear until the child reaches the stage of abstract thinking.In contrast, Fischbein says that one must distinguish between the initial intuition of probability and the concept of abstract probability, and explained that intuition in probability appears at the age of An early life of a child stresses object in preoperations, it begins day-to-day from children's experiences. Vishn emphasizes the need to distinguish between the concept of explicit probability and the calculation of probability in space, the intuition of probability as a personal matter, and the comparison of the probability of elements of space in kind (Brain, 2001: 218-220).

previous studies

Williams & Amir (1995) The study aimed to reveal what the child understands about the possibilities when they start secondary school and show how spontaneous discovery affects their probabilistic thinking in the school environment. The results of the study showed that the understanding of children aged (11-12) years For probability attributed to intuition and influences beliefs.

The Jones et al. Study (Jones etal., 1995) The study aimed to prepare a “framework for assessing the thinking of children in probabilities”. In this study, a general framework for evaluating the probabilistic thinking of children in grades 1 and 3 was developed, announced and revised. This framework was established based on some published literature and on the observation of children over two years of age. This framework consists of four main structures, namely, space, probability, probability, and probability. The results showed that this framework gives a unified and consistent picture of children's thinking in the possibilities, but there is stagnation and stagnation in the levels of thinking, which showed a contradiction in the levels of probabilistic thinking.

Beck et et al. (2006) The study aimed to verify that children were able to understand probabilities in their correct answers to questions about the possible outcomes of an experiment provided that the results were the opposite of the actual experiment. A mouse can slide from a slide and ask the children what slide the mouse can choose and use the questions "What if I take the other sleigh the second time? (Expecting the future) Can he go anywhere else?" (This needs to think of an adverse outcome as an optional probability and was relatively difficult.) The results of the study showed that the children had difficulty in identifying the two possible possibilities of the results compared with the determination of one expected result similar to the reality of the experiment.

Ahmed's study (2007) The study aimed to identify the progress in the ability to think probability by the progress of students in the study from the basic stage to the secondary stage and to know the impact of the course of study and gender in the ability of probability thinking. The results showed the superiority of scientific students over literary students in probabilistic thinking as well as the superiority of females over males in probabilistic thinking.

Research Methodology and Procedures: The research procedures include the methodological steps adopted by the researcher to achieve the objectives of the research from the identification of the community, and the selection of sample sample, and procedures for the preparation and application of the research tool as follows:

First: Research Methodology: The researcher relied on the cross-sectional studies that fall within the evolutionary studies of the descriptive approach. The data in this type of studies are collected from a sample drawn from the community, represented in different age segments. Through Time (Al-Batsh, Abu Zeina, 2007: 225).

Second: Research Procedures:

Research community: The current research community consisted of children in the public elementary schools within the Directorate of Education Baghdad Rusafa first number (16,884) (83658) males and (85183) females, distributed by the love of primary school grades.

Research sample: For the purpose of withdrawing the research sample, the researcher followed some procedures represented by withdrawing a number of male and female schools randomly and then withdrawing one division randomly from each school and for each stage of study (first - sixth) primary, and withdraw the sample of children by reference to lists of names and marking the sequence that occurred Within the individual figures, the researcher excluded the children who failed in the previous school year, and excluded children who do not live with their children and their mothers in one house, and finally refer to the pupils cards to obtain data that inform the researcher to verify the equivalence of the sample, and the current research sample consisted of (180) Verda Mo Eye on (6) Reconstruction of (30) individuals for each age and by 15 males and 15 females.

Research tool: To achieve the objectives of the research required the preparation of a tool to measure the ability of children to think probabilistic, and through the researcher to see a number of literature and previous studies as well as the curricula of primary school, the researcher prepared a probabilistic thinking test for children consists of (9) tasks distributed evenly on (3) Models of probability: probability of occurrence, probability of impossibility, probability of occurrence, and each test task has three alternatives to answer. The following example illustrates this:

● Ahmed bought a chicken chick (chick) and took care of him and feed him, and Ahmed began thinking that this chickot live with him forever, and then ask the respondent researcher (will the chick live with Ahmed forever) Alternatives a- possible to live forever, b- Sure to live forever, c - impossible to live forever.

● Correction of the test: When the test correction is given one score for the correct answer and zero for the wrong answer, and the highest score for the test (9) and the lowest score (zero) and theoretical average (4,5) score.

Logical analysis of the tool: To verify the conformity of the tool with the property prepared for measurement, the researcher presented the test tasks in classical Arabic and accent the bicycle to a number of professors with expertise and specialization in educational and psychological sciences, to verify their suitability, and experts approved by (100%), taking some Notes regarding the amendment of the wording of certain tasks in the Iraqi dialect bike.

Calculation of discrimination and difficulty coefficients: The researcher calculated the discriminatory power of test tasks and their difficulty coefficients. The results are shown in Table (1).

Table 1 Discriminatory power coefficients and difficulty for probabilistic thinking tasks

mission	The number of correct answers in the upper group	The number of correct answers in the lower group	Discrimination	Difficulty
1	49	9	0,82	0,59
2	49	11	0,78	0,61

3	49	9	0,82	0,59
4	49	10	0,80	0,60
5	49	11	0,78	0,61
6	49	12	0,76	0,62
7	49	12	0,76	0,62
8	49	10	0,80	0,60
9	49	10	0,80	0,60

The above table shows that all tasks have a serious discriminatory power. (Ebel, 1972) considers that the test paragraphs are good and can be retained if their discriminatory power is more than 0.30 (Ebel, 1972: 392). As for the difficulty of the tasks, it was found to be acceptable. (Karma, 1994) believes that the test is good and suitable for application if the difficulty of its paragraphs ranges between (0.20 - 0.80) (Karma, 1994: 101).

Parameters Validity Indicators (Test Tasks): To verify the validity of probability thinking tasks, the researcher relied on the total score of the test as an internal test, through which the validity of the paragraphs of the scale can be extracted, and the arbitrary correlation coefficient between the degree of each paragraph and the total score of the respondent was used. After obtaining the results and balancing the correlation coefficients calculated by the tabular division of the correlation coefficient, it was found that all the coefficients are statistically significant at the level of significance (0.05) and Table (2) shows that.

Table 2 Coefficients of probability thinking tasks

sequence of item	Correlation coefficient
1	0,656
2	0,667
3	0,822
4	0,845
5	0,916
6	0,879
7	0,562
8	0,764
9	0,678

The stability of the test: The researcher relied on the method (Alfa Kronbach) to calculate the stability after applied to a sample of children, and the coefficient of stability of the test (0.91), and this factor is good as it indicates (Issawi, 1985) that the coefficient of stability, which ranges between (0 , 70 - 0.90) is a good indicator of the constant test (Issawi, 1985: 58).

Statistical treatments: Statistical treatments for the data in this research were carried out using SPSS.

View and interpret results

In order to verify the first goal, which provides the definition of the ability of children to think probabilistic according to the age variable (6, 7, 8, 9, 10, 11) years, the arithmetic mean and standard deviations in children by age were calculated on the probability thinking test, and the researcher used the test T-test for one sample to identify the significance of statistical differences between the averages achieved and the theoretical averages of the size. The results are shown in Table (3).

Table 3

Computational circles and standard deviations of children's scores on probabilistic thinking test and T-test results

age	MSA	standard deviation	Theoretical mean	Calculated t value	T-value crosstab	Degree of free	Significance at 0.05
6	4.8	0,78881	4.5	2,083	2.045	29	Function
7	5.1	0,71818		4,576			Function
8	6.3	0,65695		15,012			Function
9	7.25	0,91047		16,546			Function
10	8.1	0,85224		23,136			Function
11	8.95	0,22361		109,068			Function

It is noted from Table (3) that there are statistically significant differences at the level of (0.05) and the degree of freedom (29) in favor of the averages of children calculated as their averages are greater than the theoretical average of the test, which means that children have the ability to think probabilistic and graphical (1) Explain it.

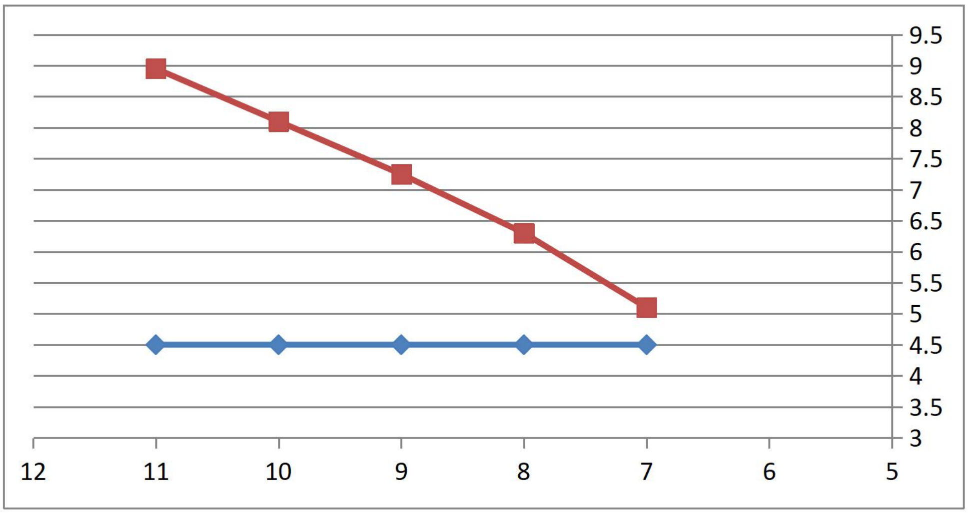

Figure 1 The mean scores of children on probabilistic thinking test depending on the age variable

To investigate the second objective, which states that the significance of the differences is known as the ability of children to think probabilistically according to the variables of age (6, 7, 8, 9, 10, 11) years, and gender (male and female), the researcher used the analysis of binary variance (tow way The results are shown in Table (4).

Table 4 Results of binary variance analysis of probabilistic thinking by age and gender

Source of Contrast	Total squares	Degree of free	Average squares	Value f		Statistical significance
				calculate	table	
Age	785	5	157	359,349	2,2141	function
Gender	0.0089	1	0.0089	0,020	3,8415	Not function

Age and gender	1.1331	5	0,2662	0.609	2,2141	Not Function
The error	73.410	168	0,4369			
Total	859.7499	179				

1. Age effect: It is clear from table (4) that there is a statistically significant difference according to the age variable, where the calculated preventive value (359,349) was greater than the tabular value (2,2141) at the level of (0.05) and two degrees of freedom (To identify the direction of the difference, the researcher used the postShivieh method of multiple comparisons, and Table 5 illustrates this.

age	6	7	8	9	10	11
6		-0.3	-1.5	-2.45	-3.3	-4.15
7			-1.2	-2.15	-3	-3.85
8				-0.95	-1.8	-2.65
9					-0.85	-1.7
10						-0.85
11						
2.215					Value sh calculate	

It is clear from Table 5 that it is between each of the ages (6, 7, 8) years with ages (9, 10, 11) years, which shows that older children are more sophisticated in their ability to think positively.

2. Gender Impact: Table (4) shows that there is no statistically significant difference according to the gender variable (males and females) in probabilistic thinking at the level of (0.05) and two degrees of freedom (1, 168), where the value Calculated FY (0,020), and smaller than the tabular value (3,8415).

3. Interaction between age and gender: The results of the analysis of variance in table (4) showed that there is no effect of interaction between the variables of age and gender, where the preventive value calculated (0.660) is smaller than the table value (2,2141) at the level of significance (0). And 05) and two degrees of freedom (5, 168).

Interpretation and discussion of the results: The results indicated that children aged (6) to (11) years have the ability to think probabilistic, and the researcher believes that it is possible to show the ability of children to think probabilistic age less than (6) years, and this result is consistent with the above Mechanism of Fischbein, which believes that the probability link can be observed in children between the age of (4) years and established at the age of (6 years), while the results differed with the argument (Piaget) that the children in the sense of motor and pre-operative Physical processes can not acquire the skills of probabilistic thinking, the researcher believes that the difference between what he put forward (Biagi The researcher believes that scientific and technological development, the development of interest in preschool children, the development of curricula and teaching methods and strategies have contributed to the emergence of this result, as well as the opening of Iraq to the outside world after (2003). And the entry of various types of entertainment games and educational games, and computers and electronic devices such as smart devices and tablets and the availability of Internet networks in most Iraqi homes and the emergence of many broadcast channels on the Internet specifically on the application of YouTube, which deals with programs for children and for different ages, as well as the number The large number of satellite channels that offer a variety of programs for children, including those that offer programs of children with professional, educational and scientific levels, has contributed to the development of children's knowledge and expand their awareness. The researcher believes that the children were able to conduct probabilistic thinking based on their previous experience while growing up with their families, kindergartens and schools that contributed to the formation of many different concepts they have.

The results showed that there are differences in the ability of children to think positively according to the age variable, as shown in Figure (1) that there is an increase in the ability of children to think positively proportional to the ages of children, as the results indicated that the older children the higher their ability to think This finding is consistent with most of the evolutionary studies that have dealt with different thinking patterns in children as well as studies that develop children's concepts. This finding is consistent with Piaget's view of cognitive development. He sees that as a child grows older, cognitive abilities and cognitive processes of things increase, and the development of mental representations of experiences begins to take more control (Katami, 2008: 212).

The results showed that there is no effect of the gender variable (males and females) in the block on probabilistic thinking, and this result is consistent with the opinion of Nelson (Nelson, 1974), as he believes that mental processes are similar in gender in the development of concepts, thinking and classification Growth in the same context (Nelson, 1974: 582), the researcher attributes this result to the experiences and similar stimuli experienced by both males and females, whether at home or kindergarten and school. As for the interaction between age and gender, the results did not show a statistically significant effect.

Conclusions:

In the light of the research results, the researcher can conclude the following:

1. The ability of children to think about probability begins before the age of (6) years and takes root at the age of (6) years.

2. Prospective thinking takes a continuous evolutionary path in children, as the increase in children's grades can be observed as they age and in favor of older age.

Recommendations:

From the above mentioned results and conclusions the researcher recommends the following:

1. Developing educational curricula for children in the modern trends in education that aims to teach thinking thinking patterns through the curriculum of study or separately.

2. Enriching the environment of children in various institutions of upbringing with stimuli that contribute to building concepts offered by the curriculum.

3. Adopting the results of the tests of abilities and thinking tests in children in the development of curricula commensurate with their abilities and potential.

Proposals:

The researcher suggests further studies such as:

1. Study the development of probabilistic thinking and its relationship to logical thinking in children.

2. A comparative study in the development of probabilistic thinking among children in public and private education.

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