THE DEVELOPMENT OF CHILDREN'S UNDERSTANDING OF EARTH SHAPE

Raghdaa' Abbas Abid
Prof. Safaa Tariq Habeeb, Ph.D

ABSTRACT

The present study aims at identifying the understanding of children of the earth shape according to the variables of age and sex. The researchers construct a test of six questions to measure the children's understanding of the earth shape. After ascertaining the test validity and reliability, it has been applied to a sample of 481 male and female child at the ages of 6,8,10 who are selected randomly using the stratum randomized method. The results show that the children of the sample aged 6,8,10 years understand the shape of the earth and this understanding follows a developmental continuous way according to their age.Such development occurs for all children, regardless of their age.

SECTION ONE: WHAT'S THE STUDY ABOUT

The problem of the study:

Many studies have shown the problems and difficulties that face children when understanding and unifying information(Kikas,2005).One reason behind these difficulties emerges from the beliefs or the initial knowledge that impedes scientific understanding (Kikas,2005:34). In addition to the naive theories or notions that children formulate according to their sensory observations, such as their belief that the earth looks like a flat circular which has an edge allowing anyone who is close to it falls down if walks forward (Nobes 2012:2). Thus, scientists have agreed upon the difficulties children face while understanding the modern scientific patterns about the circular nature of earth which shows that some children are able to acquire this knowledge and understanding till the end of their primary stage (Vosniadou,1994:67).

The importance of the study:

The children's understanding for the differences between two principle types the first is the occurrence which represents natural phenomena, the second is the natural existence, which includes the earth- is of great importance (Kikas,1983:357).Thus, the development of children's understanding for the earth as a natural existence is a very critical experience of sensory knowledge (Nobes,2012:2) .Accordingly, any research concerned with the understanding of children is in turn of great value because it leadsto the optimal understanding of the children's scientific notions.

The importance of this study also lies in construction it's test which measures children's understanding of the earth shape. The test can also be applied to other samples beyond childhood, teenage, and adulthood to ascertain the same understanding.

The study objectives:

The study aims at identifying the children's understanding of the earth shape according to the variables of age (6,8,10), and sex (male, female).

Study limits:

The study is limited to the age of(6,8,10)years, who are regular pupils at the morning public primary schools in Baghdad for the academic year2017_2018.

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Terms used in the study:

First: Development:

Piaget defines development as the ascension of balance from the weak state towards the stronger one (1986:7). In the present study, development is defined as the progress changes which occur while children trying to understand earth shape.

Second: Understanding:

Understanding is defined by Siegal & Surian (2004:534) as the children's knowledge of the specific astronominal notions and their abilities to identify the differences between the real world and the surrounding one.

Third: Children:

Children Rights Convention (1984:1st item) defines a child as any person who has not reached the age of 18 years and puberty yet according to the governed law (Alhammami,2006:2)

Fourth: The earth shape:

Alrubaie (2014:92) defines the earth shape as it look likes a blown which deceases towards the two poles causing it to take its real shape which is oval or elliptical. This indicates that the earth horizontal diameter is longer than its vertical one; it's then incomplete circular.

SECTION TWO: THEORETICAL BACKGROUND:

Introduction:

Children transfer different stimuli and experiences to comprehensible and symbolized meanings in a regulated way to be part of the constructed knowledge. Representing information occurs as:

1. Representing information as it is comprehended and recognized, i.e., as it is acquired by the sight sense.

2. Representing information according to their meanings, whether information is visual or audio or anything else. This may take the form of:
   a. Representing information according to their patterns of net connection which occurs through a net connection of information in terms of its principal notions and the relation specified by these notions.
   b. Representing information according to the patterns of mental diagrams.It is by this way, the regulations of information meanings occur abstractly (Aletoom, 2012: 185_89).

Understanding Earth Shape:

The opinion that confirms the circular earth shape contrasts with some anthology beliefs: one of which confirms that the earth shape is flat. For this reason, those who confirms the flat shape of the earth were attacking those who claim its circular shape, because they think that people who are on the other side, are going to fall down (Kuhn,1957:108).

Because children don't have the ability to observe and elicit facts, they face difficulties in understanding the circular shape of earth. During their transforming in understanding, from the flat shape into the circular, they are going to form many incomplete concepts about the earth shape (Vosiniadou & Brewer 1989:7).
The children's understanding of the world around them is composed by their daily experiences to some impact of cultural assumptions (Duit & Treagust, 1998:5). Due to such kind of learning, many misconceptions will be formed which resist to be changed unfortunately. Accordingly, the results of such unchangeable misconceptions are the intersection of understanding scientific concepts (Shuell,1987:247).

Mental Patterns Theory:

Mental Patterns are considered as highly relevant to the development of concepts and thinking about the nature world in specific. Mental patterns are similar representations which save the structure of the represented object. They are constructed according to a

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specific subject. These mental patterns are saved in the long term memory and restricted the general and specific theories (Vosiniadou, 2002:1_3).

Vosiniadou and her team has posted that naive knowledge of children concerning earth is just like a theory which is relevant and consistent. Such theory represents a specific mental pattern that stands for many mental representations for a certain motor setting composed to answer specific questions. Children ought to hold only one pattern at the moment. This pattern should then have an illustration capacity (Vosiniadou, Skopeliti & Ikospentaki, 2003:219).

Vosiniadou claims that children's formulation of mental patterns depends on their individual observation and cultural influences which in turn are subordinate to the restrictions of the realized structures. Accordingly, children have to formulate one relevant pattern concerning one topic, and the consistency of children answers to a series of questions is a good reflection of the relevance of children's understanding (Straatememeier, Van Der Maas & Jansen, 2008:278) Vosiniadou and her team claims that 80_85% of children construct initial, compound ,and scientific mental patterns about earth shape as follows:

1.Initial mental patterns: represented earth shape as tablet.
2.Compound earth shape: represented earth shape as boracic or rotatory with out head.
3.Scientific mental patterns: represented earth shape as spheral (Vosiniadou & Brewer,1989:8).

Fragmented Knowledge Theory:

This theory was specifically used by natural sciences to explain 'pre notions phenomenon' which is named mistakenly as' false notions' (Smith, Disessa & Roschelle, 1993:115). It aims at developing the modern theory of knowledge and understanding, and it has the capacity of comprehending the phenomenon of long term learning' fragmented learning'. Fragmented knowledge derived its name from such learning in addition to comprehending the phenomenon of long term learning 'conception change or theory change'. It

links between theoretical part and information related to conscious performance (Disessa, 2018:61). Performance is not considered as a direct expression of previous cognitive structures, but it is a process that depends highly on context and adjustment happens within context. Performance within context(environmental and cognitive) is the product of cognitive related sources in one's environment in a given situation (Hammer,Elby,Scherr,Redish,2005:94).

One's acquisition to fragmented experience in a field, and then regulation the initial knowledge in a group working scientifically represents the most important mechanism in fragmented knowledge. It helps to explain natural phenomena around us(Disessa,1993:122_133).

Smith(1995:44) points the importance of understanding pieces because individuals usually use general methods which they had learned naturally from time to time. Best people's understanding is when someone has rich understanding of all detailed and general knowledge. Holyer (1991:51) asserts the importance of understanding pieces or parts to maintain a general understanding, also the understanding of the minor parts results in the understanding of it as all.

SECTION THREE: PREVIOUS STUDIES

Some studies concerned with children's understanding of earth shape are going tp be surveyed as follows:

Nussbaum & Novack (1976):

The two researchers posted the possibility of children's learning and understanding of a concept if suitable teaching is available. The study sample consists of 60 pupils at the 2nd class of primary stage in Etaka of New York. Classes are divided into two groups, the first group being interviewed before receiving the audio lessons about earth, while the second group is being interviewed after the audio lessons. Some of the interview questions include, how do you know that the

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earth is circular? why don't we see the earth as a ball? Children's responses of such questions range into three levels of understanding, the first reflects the children's understanding concentrated towards the ego or the self which indicates the non scientific understanding of earth shape. The third level is the level of scientific realization and comprehension and in between lies the second level which represents the child's moderate answers between the opinion about the self and the scientific one. Results have shown the mental development that occurs reaching the scientific understanding of earth.

Vosiniadou & Brewer Study (1989):

The purpose of this study is depicting the nature of children's initial conceptual knowledge about earth shape and how such knowledge changes when being presented the scientific model during the years of primary stage. The study sample consists of 60 male and female child,20 of them in the 1st class aged 7years, the second 20 in their 3rd class aged 9,while the last 20 pupils are at their 5th class aged 11.Results have shown that there is a sharp contrast concerning the same child who once said that the earth is circular and this answer is in harmony with the notion of the rotational shape of earth. As for the question of earth edge, the child would answer that there's an edge because he believes in the possibility of falling down. This indicates that children get the information of the spherical shape but they are unable to understand it. Results have also shown that the scientific understanding of earth shape may take a developmental path with age progress. Two of 20 pupils at the first class, eight of 20 at the third class, and ten of 20 at the fifth class, have formulated the scientific concept of the circular shape of earth.

Straatemeier, Van Der Maas &Jansen Study (2008):

The researchers have used a new methodological and statistical procedure about children's knowledge and understanding of the earth shape. Their aim is revealing whether the children's simple knowledge of earth was related or fragmented before acquiring the scientific

understanding. The study sample consists of 328 child aged 4_11 years old. Results have shown that there's a developmental pathway of their understanding of the scientific model because the children's scientific answers are in increase with their ages.80% of children draw earth as flat aged 4_5, while 50% of them aged 5_6 draw the same drawing. In addition, there's a positive relation between their amount of knowledge and understanding and their consistent answers. The corelation coefficient between the scientific understanding and the answers' consistency of the study sample is (0.86).

In addition, no mental non scientific patterns have been revealed (initial or compound).These results are in harmony with the gradual increase in children's knowledge and understand of earth shape which really supported the fragmented knowledge .

The two researchers of the present study have made use of these previous studies when constructing their test.

SECTION FOUR: RESEARCH METHODOLOGY & PROCEDURES

First: Research Methodology

The two researchers have adopted the descriptive methodology because this research aims at measuring the development of children's understanding of earth shape. To truly achieve the study aim, the methodology of developmental studies which measure the occurring changes because of the passage of time (Odaa & Malkawi, 1992:112_7). The researchers have depended on the cross sectional studies which include so many cases of different ages in a relatively short time (Alobaidi,209:57).Also interviews are conducted as they are one important tool for gathering data. Interviews are characterized by revealing the questions' ambiguity directly by the interviewer (Abou zeena,et al,.2007:41).The researchers conducted individual interview because it's difficult for children to answer the questionnaire of this study.

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Second: Research Procedures

1. The Study Population:

The statistical population of this study includes pupils at the ages of 6,8,10 years old at the 1st,2nd,3rd classes of the primary schools at Baghdad for the academic year 2017/2018 .They are 803283 male and female pupils, distributing as 298070 at the age of six : 155593 male and 142477 female . 248437 pupils at the age of eight: 128779 male and 119658 female. While 256776 pupils at the age of ten: 133577 male and 123199 female.

2. study Sample:

The sample of this study is selected according to the stratum randomized methodology by the ratio of 0.06 of the total number of the population. Thus, the study sample is 481pupils who are distributing as 250male and 231female. 178 of them are at age of six: 93 male and 85 female,149 of them are at the age of eight : 77 male and 72 female, and 154 of them are at the age of ten,80 male and 74 female. Pupils who are not living with their parents in the same house and those who failed the previous year are excluded.

3.The Study Tool:

To achieve the study aims of measuring children's understanding of earth shape, the two researchers have surveyed many previous related studies, as mentioned earlier. They have constructed a test of six questions to measure the children's understanding of earth shape. Two alternatives are being put in front of each question, the correct answer is allotted 1mark while the incorrect is allotted 0.Accordingly,the highest total mark is six, while the lowest is zero. See Appendix A.

Content Validity of the Test:

The procedures of describing test content includes the systematic experimentation to decide whether or not the sample is representative of what is going to be measured. Content validity of a test is constructed at first by choosing appropriate vocabulary. If the test is

educational, experts in education should be consulted (Anastasia & Areana,2015:150_54)The test of children's understanding of earth shape has been exposed to a jury members, twelve, who have ascertained its content validity (Appendix 2). According to the opinions of the jury members, all the test six questions are accepted (Appendix 3).

Statistical Analysis of the Test:

1. Calculating test difficulty coefficient: It is calculated by using the formula of item difficulty and it ranges from 0.42 to 0.60 which is accepted according to Detrik who considers such value to be applicable. Alssdi (2008:121) indicates that if the value is between 0.30_0.90 , it has a fair difficult.
2. Calculating test recognition coefficient: It is calculated by using a formula and the value ranges between 0.43 and 0.77.According to (Eble, 1972:406), questions are considered good if their recognition item value is 0.30 or above.

Psychometric characteristics of the Test:

First: Validity

Content Validity and construct validity have been ascertained as mentioned earlier.

Second: Reliability

To calculate reliability, the test is applied to a sample of 100 pupils who are chosen randomly. Kuder Richardson 20 Formula is applied to obtain the reliability coefficient 0.738.Such value is considered acceptable and reliable because it is above 0.70 according to Parker etal., (1999:122).

Test Application:

The two researchers have applied the test to the study sample which is 481 male and female pupils using
individual interview.

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Statistical Means:

1. T_Test of one Sample to identify children's understanding of earth shape.
2. Kuder Richardson 20 to calculate test reliability.

SECTION FIVE : RESULTS EXPLANATION AND DISCUSSION

1. To identify children's understanding of earth shape according to age variable, 6,8,10, the mean and the standard deviation of the individual's scorers are calculated using t.test of one sample. The calculated mean is compared to the theoretical mean. It is revealed that the tabulated T. value is 1.960 at 0.05 level of significance with 177,148,153 degrees of freedom. It indicates that children at the age of 6 years are of fair understanding to earth shape, while children at the age of 8 enjoy a higher understanding of earth shape, and those who are at the age of 10 years also enjoy higher understanding of earth shape.

2. To identify children's understanding of earth shape according to the variable of sex, the mean and the standard deviation of thr individual's scorers are calculated using t.test of one sample. The calculated mean is compared to the theoretical mean. It is revealed that the tabulated T. value is 2.000 at0.05 level of significance with 73,79, 71,76,84 degrees of freedom. It indicates that males at the age of six enjoy a higher level of fair understanding of earth shape than that of females. Both sexes at the age of eight enjoy a higher level of fair understanding. While both sexes at the age of ten enjoy high level of understanding earth shape.

Results have shown that study sample individuals understand earth shape and their understanding is increasing when they grow older regardless of their sex.Such results confirm Vosiniadou &Brewer 'study(1989) & Straatemeie, et al., (2008). Children's understanding develops when they grow older and such understanding take the form of a progressive continuous pathway. The cognitive cultural effect has its important role on children's understanding of earth shape because children are exposed to the net working. Children have seen many photos and videos about earth in space and this helps them to acquire sensory knowledge that earth is flat or plane.

The researchers suggest that further studies could be conducted about children and teenagers' understanding of natural phenomena related to earthsuch as day and night succession, the four seasons, and earth gravity.

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APPENDIX 1

The Initial Form of the Earth Shape Test:

1. What does the earth look like?
   circular/flat
2. Does the earth looks like....the ball/tabular.
3. Why do we see the earth flat when we walk on it?Because it's very big/very small.
4. Does the earth have an edge on which we may possibly fall down? There's an edge/there's not an edge.

5. On which part of land of the surface of the earth do people live? Everywhere on the land/above the land only.

6. Where is the sky according to the earth? Above only/everywhere around the earth.

APPENDIX 2:

The Jury Members according to their Titles and place of work:

1. prof. Khalili Ibrahim Rasul, ph.d/College of Arts, Baghdad University.
2. prof. Khawla Abdulwahab ph.d /College of Women, Baghdad University.
3. prof. Zaraa Jafar Mousa, ph.d./College of Education, Dayalla University.
4. prof. Mohammed Anwar Mahmoud, ph.d./College of Education, Ibn rushd, Baghdad University.
5. prof. Nabeel Abdulkhfoor, ph.d./College of Education, Almustanseria University.
6. Assist. prof. Usamaa Hameed, ph.d./Open Education College,Minister of Education.
7. Assist. prof. Istabraq Majeed Ali L., ph.d./Institute of Fine Arts for Women, Ministry of Education.
8. Assist. prof. Intesar Hashem Mahdi, ph.d./College of Education,Ibn rushd, Baghdad University.
9. Assist. prof. Thai'r Abdulkareem,ph.d. /College of Education, Ibn alhaithem, Baghdad University.

10. Inst.Sawsan Kamal Ahmed, ph.d. /College of Education,Ibn rushd,Baghdad University.
11. teacher, Hameda Lateef Abbas, Alshaheed primary school.
12. teacher, Reem Ahmed Thabet, Alshaheed primary school.

APPENDIX 3

The Final Form of the Earth Shape Test:

1. What's the shape of the earth? Round/ flat.
2. Does the earth looks like.....?? Ball/ tabular.
3. Why do we the earth flat when we walk on while it's like a ball? Because it's very big/ very small.
4. Does the earth have an edge on which we may fall down? There's an edge/there's not an edge.
5. On which part of land of earth surface do people live? On the land of earth surface/on the above land only.
6. Where is the sky from the earth? Above only/ everywhere round the earth.

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