Comparison of Primary School Boys and Girls on Number Conservation Ability

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Abstract

The purpose of this empirical study was to observe the ability of primary school boys and girls to test on the Piaget's task of number conservation. The current study was based on two major objectives: 1) To explore number conservation ability among primary school boys and girls; 2) To compare primary school boys and girls on number conservation ability. The population of this study comprised all public (boys & girls) and private (boys & girls) primary schools of Khyber Pakhtunkhwa. A total of 480 students of public and private primary schools' (boys and girls) were chosen as a sample of the study. Since it was an empirical study so, empirical research design was used. Observation sheets were used as a data collection tool. Data were analyzed through percentage and t-test. It was established that boys and girls of primary school of age group 3 to 5 were non- conservers of number. It was concluded that primary school boys and girls (3 to 5 years old) were found to be same on number conservation ability. However primary school girls (4 years old) performed better than boys at the same age level. It was also provided by the data that boys and girls of primary schools were number conservers at the same age level that is 6 years old, that is the number conservation age was found to be the same both for boys and girls. It was concluded that gender have no effect (6 to 8 years) on the number conservation ability of primary schools children. It is recommended that school going age is to be form age 6.

Keywords: Piaget, cognitive development, conservation of number, primary level.

Introduction

For a country to be developed morally, culturally, intellectually, politically, and socio-economically we need education as it is the basic key for any country to compete in the world (Awan, 2003). Logical/cognitive improvement is the learning of how intellect is able to take data/information from the nearby and what a person do with this

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data/information. It concerns how we preserve and able to get back our memories (Khan, 2008).

Education is the back bone for a country to become advanced scientifically and technologically. The knowledge/information about the customs and traditions of a society, state, country or world is passed on from one generation to the other, is possible only through education. Through education not a country can become prosperous socially, morally and economically, but it is also a source to learn how to become active and effective citizen. There is a strong and resilient link between education and socio-economic growth of a country. Through education we can help and guide learners to develop social awareness, charity, endurance, self-regard, self-satisfaction, and cultural spirit. To overcome on issues such as, unemployment, and economic decline education can do the job for us. Human resource development and skillful workers are fruits of education, which give us more products and can be a source for the economic development of a country (Ozturk, 2001).

The progress and development of the countries of the world is related to the type of education, given to their people. The civilization and discipline of a country is directly proportional to the educated societies if the societies are educated there will be improvement and development in the country. As compared to un-educated societies, an educated society can play a pivotal role in the social development of a nation. If we want to develop our country we need strong footings of education system. To achieve sustainable development in economics we need to invest much in education. Only education can play a role in securing progress socially and economically (Ozturk, 2001). Islam gives much importance to education as it is obligatory on each individual to obtain understanding from early age to the end. We can understand how much emphasis is given on education by the first revelation on the Prophet (S.A.W) was "Read in the name of Allah, Who created you". To recognize and determine our day to day societal problems we need proper education (Ahmad, 2017).

There are six tiers of education in Pakistan: Early Childhood Education (age group of 3 to 5), primary level education which comprised grades I-V, high school education (grades IX-X) also called secondary education, higher secondary school education or intermediate education comprising grades XI-XII, and tertiary education which is also called higher education (grade XIII and onwards) provided in colleges and universities (Rasool, 2007).

Primary education is considered to be the basic right of each individual. In Pakistan primary education encompasses Nursery/Prep education and class I-V. The skills of 3R's, (read, write, and arithmetic) are the major objectives of primary education. Each and every individual either boy or girl have to complete their primary education. From their early childhood boys and girls should be prepared to compete with the surrounding world (Rasool, 2007).

This is universally established fact that "Teachers are better than an educational system" (Pakistan, 1959). To develop the personality of learners for the nation building is the sole role of a teacher. So a teacher must be competent in the subject matter he teaches, as well as he must aware of the developmental aspects of each learner. Physical, social, emotional, moral and the cognitive development are the main areas of individual development. The role cognitive development cannot be ignored in students' learning process. This is why more emphasis is given on cognitive development of learner as compare to other aspects in educational field (Ahmad, Tabassum, & Farooq, 2017).

Piaget, for the first time proposed the four different stages of cognitive development in children (Mooney, 2000). Sensorimotor stage is the first phase of his theory, starts from birth and last up to 2 years. The child can understand and comprehend their world by using his senses. The second stage which is named as pre-operational phase starts from age 2 and last up to 6/7 years. Development of language and mental images are the main causes to know about the world. The third stage of cognitive development named as concrete operational stage, starts from age 6/7 and last up to 11 years. The main characteristic of this phase is the logical thinking of a child. Piaget put the children of age 11/12 up to 19 in formal operational stage. In this phase children can reason scientifically and hypothetically (Ahmad, Tabassum, & Farooq, 2017).

According to Piaget as the individual goes to next phase changes occur in perception of an individual. He concludes that an individual is always in-search of knowledge to develop him mentally (Lutz, 2004). The development of an individual occurs in four phases. The mental development is directly related to four factors (maturity, experience, equilibrium and social environment). Maturity is dependent upon learning and is an essential perception, which gives the idea about a child that at which stage he can perform which task, we can categorize it in a series as; development, babyhood, cradle, pre-adulthood and youth. An individual interacts with entities and acquires information about the comparisons, contrasting, discriminating, and transferring and hence he develops the perceptions. If the visual spatial shapes deceive him, then he tries to overcome this deficit by thinking more logically and systematically (Safdar, 2007).

Cognition is the ability of higher mental processes through which a child can understand his world, compute information get from his surroundings, makes conclusions on the basis of collected information and exchange his understanding to others. Just like a scientist children create their own knowledge (Rahman, 2011). According to Piaget the logical thinking is the characteristic of concrete operational stage, however they lake the hypothetical thinking and reasoning at this phase. Important processes during this stage are:

- **De-centering**: The ability of a child to think about the multiple aspects of any task assign to him to resolve it.
- **Reversibility**: This is the ability of a child that things can be reversed, which is 2 +3 = 3 +2.
- **Conservation**: Through this ability a child can make a sense that quantity of anything remains the same despite changes in their physical shape.
- **Seriation**: Ability to organize objects with respect to its magnitude.
- **Classification**: The capability of a child to arrange objects with respect to size/appearance in different categories (Seifert, 2009).

At concrete operational stage, individuals can carry out cognitive events involving common sense such as conservation; which is the basic characteristic of this period. Conservation means the ability of a youngster that worth/amount and physical changes both are unrelated (Ojose, 2008).

Conservation of Number

Piaget's number conservation ability task is more famous and widely exercised, in this testing two indistinguishable rows of objects that is, buttons or coins are shown to a person, and make inquiries to declare that either both of rows have the same quantity of items or not, and young children generally state agreed. After that any of the row is extend or packed in front of an individual and is then inquired if both rows are same or one row has more objects or not, those persons, whose age is below 6 to 7 years will reply both rows are different by justifying their answer as one has more than other row; while older children (up to 6 or 7 years) typically answer yes and justify their response appropriately (Salkind, 2008).

In a study conducted by (Agger, 2007), it was found that 3 and 5 years old children do not have the ability to conserve number. In another study conducted by (Price, 2004), he was found that (3:5 to 4:11 years) old pre-school English children when are asked alternative questions they may conserve the number. A study on a 4 years old child conducted by (Muller, 2005) showed that he (4 years child) does not have the number conservation ability. In another study conducted on 5 and 8 years old children by (Miller, 1976), concluded that 5 years old children are lacking number conservation ability while 8 years old children have this ability to conserve number. The studies conducted by (Neys, 2014) and (Seifert, 2009) showed that children of age 6 or 7 can conserve number.

By studying the above mentioned research studies there is a contradiction in the attainment age of number conservation ability. In Pakistan, little work on the number conservation ability has been done (Shabab, 1995), so the researcher studied this topic to see whether the Khyber Pakhtunkhwa (Pakistan) children achieve this ability at the age of 3 to 8 years.

Statement of the Problem

The study was aimed at comparison of primary school boys and girls on Piaget's number conservation task.

Objectives of the Study

Following were the objectives of the study:
1. To explore number conservation ability among primary school boys and girls.
2. To compare primary school boys and girls on number conservation ability.

Hypotheses of the Study

Following were the hypotheses:
- H_o1: Primary school boys and girls (age 3 to 8) are not number conservers
- H_o2: Boys and girls of age group 3 to 8 have no difference on number conservation task.

Significance of the Study

The study is equally significant for all primary level students (boys and girls) and teachers as well as for researchers and curriculum developers.

Methodology

Population

The population of the study was all the 4,191,748 (including public and private) primary school children of Khyber Pakhtunkhwa (Pakhtoonkhwa, Annual Statistical Report of Govt: Schools, 2014).

Sample

By using convenient sampling method, (researcher uses convenience sampling not just because it is easy to use, but because it also has other research advantages) (Teddlie, 2007), eight schools were selected (that is rural, urban, public and private) schools' students may include in this task. Sixty students were randomly selected from each school. The student's numbers (roll number 1-40, or according to the strength of the students) were written on separate slips of paper, and placed it in a plastic box. The box was shacked and drew out a slip of paper and continued the process until 10 slips (for each class/ age group 3 to 8 at each school) of paper had been picked (Ary, 2010). A total sample of 480 boys and girls were tested on number conservation task. According to (Gay, 2009) if the population size is in thousands or in millions, then a sample size of 400 will be adequate. The names of selected schools are:

Sampled Schools (Urban Government) in District Swabi
- Government Primary School Mathani Changan Tordher
- Government Girls Primary School Saifur Banda Tordher

Sampled Schools (Urban Private) in District Swabi
- The Iqra Public School and College Tordher (for Boys)
- The Iqra Public School and College Tordher (for Gilrs)

Sampled Schools (Rural Government) in District Swabi
- Government Primary School No.1 Jalsai
- Government Girls Primary School No. 4 Jalsai

Sampled Schools (Urban Private) in District Swabi
- Star Public School Jalsai (for Boys)
- Star Public School Jalsai (for Girls)

Delimitation of the Study
The study was delimited:
- To the primary children (boys and girls) of age group 3 to 8
- To one district (Swabi) of Khyber Pakhtunkhwa only

Research Instrument
Red colored plastic buttons (twenty in numbers) were used for the number conservation   task (Ahmad A. , 2017)

Research Design
According to the nature of the study the following empirical research design was used.
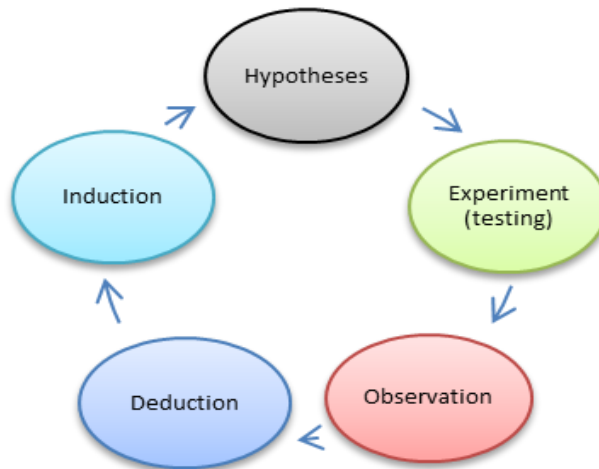
Figure 1. *Research design*

Since this study was conducted to test the number conservation task on primary school boys and girls in Khyber Pakhtunkhwa (Pakistan) context, so the study was based on the following questions:

- **Piaget claims:** Children underneath 6 to 7 years do not have the ability of conservation of number (Berk, 2005); (Crawford, 2008); (Muller, 2005); (Neys, 2014).
- **Research question No: 1.** Do Pakistani children keep the same characteristic?
- **Piaget claims**: Children older than 6 to 7 years are conservers of number (Arnold, 2006); (Haroon, 2005); (Richardson, 2006).
- **Research question No: 2**. Are Pakistani children also number conservers, who are older than 6 to 7 years?

Procedure of the Study

The tasks which were based on Piaget's task of conservation of number were conducted in the following way:

Task 1

The subject children were presented two rows of equal length containing the same number of buttons (placed on a table, as shown below). The subject children were asked. Whether the two rows are identical? (Ahmad, Tabassum, & Farooq, 2017). If the answer is 'Yes' or 'No', then why/how much? (Ahmad, Tabassum, & Farooq, 2017).

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Task 2

One of the rows was spread apart so that one is longer than the other (as shown below) and the subject children were asked. Now, whether the two rows are identical? (Ahmad, Tabassum, & Farooq, 2017). If the answer is 'Yes' or 'No', then why/how much now (Ahmad, Tabassum, & Farooq, 2017).

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The activity was conducted in a quiet room and the subject children were called upon one by one.

Scoring Data

The responses gain from the sample students were noted on the following observation sheet (sample observation sheet is shown below). There were two tasks which have two major questions and each question have three options as yes, no and why/how much. Subject children when presented the rows and were asked if both rows

are identical if child answer is yes one mark was assigned (otherwise marked as 0), then child was asked why/how much and he/she reply that both rows are same in length or same number of items one more mark was added to their score (otherwise marked as 0). In second task when one row is spread apart and child was asked if both rows are same, if answer is yes one mark was awarded (otherwise marked as 0), then asked why/ how much and if child answer that length is different but amount is same was awarded one mark (otherwise marked as 0). Hence a child when scored 4 were declared as passed on number conservation task (otherwise failed). The number of children in each category, that is, at each age level was converted into percentages and the results were presented in the form of tables (Ahmad, Tabassum, & Farooq, 2017). Following observation sheet was used for scoring the data. (Sample observation sheet)

Table 1

Sample observation sheet

S. No	Name	Age in Months	Question: 1			Question: 2			Score
			Yes	No	Why/How much	Yes	No	Why/How ow much	
1	ABC	72	1	-	1	1	-	1	4 (Conserver)
2	DEF	60	1	-	1	1	-	0	3 (Non-conserver)
3	GHI	50	1	-	1	-	0	0	2 (Non-conserver)
4	JKL	48	1	-	0	-	0	0	1 (Non-conserver)
5	MNO	40	-	0	0	-	0	0	0 (Non-conserver)

Collection of Data

The observation sheets (data collection tool) were used in order to collect data from the sample students.

Analysis of Data

The data collected on observation sheets were analyzed by using statistical tools such as percentage and t-test. To determine the age of attainment of number conservancy of boys and girls 50 percent criteria was used (Ahmad, Tabassum, & Farooq, 2017).

Results

In table 1 the percentage values (0, 0), (0, 15), and (27.5, 30) of 3 to 5 years old boys and girls clearly indicates that these values are less than 50%, which indicates that boys and girls of this age were not able to conserve number. Similarly the percentage values (55, 57.5), (75, 77.5), and (82.5, 87.5) clearly shows the ability of number conservation of 6 to 8 years old boys and girls. It is also shown in the table that the ratio of number conservers increased with growing age of the children.

In table 2 the t values (0, 0.223, 0.245 0.260 and 0.621) of 3 to 8 years old boys and girls of primary schools clearly indicates that they are non-significant at α = 0.05. So the hypothesis that: Boys and girls of age group 3 to 8 have no difference on number conservation task was retained (accepted). However the t-value (2.631) of 4 years boys and girls shows significance of difference at α = 0.05.

$H_0$1: Primary school boys and girls (age 3 to 8) are not number conservers.

Table 1

Frequency and percentage of 3 to 8 years old primary school boys and girls

| Group	N	Age	Conservers	Percentage	Status (Criteria = 50%)
Boys	40	3 years	0	0	Non-Conservers
Girls	40		0	0	
Boys	40	4 years	0	0	Non-Conservers
Girls	40		6	15	
Boys	40	5 years	11	27.5	Non-Conservers
Girls	40		12	30	
Boys	40	6 years	22	55	Conservers
Girls	40		23	57.5	
Boys	40	7 years	30	75	Conservers
Girls	40		31	77.5	
Boys	40	8 years	33	82.5	Conservers
Girls	40		35	87.5	

$H_0$2: Boys and girls of age group 3 to 8 have no difference on number conservation task.

Table 2

Frequency and t-values of 3 to 8 years old primary school boys and girls

Group	N	Age	Conservers	df	t- value	d	Effect size Strength
Boys	80	3 years	0	78	0*	----	----
Girls			0				
Boys	80	4 years	0	78	2.631**	0.83	Large
Girls			6				
Boys	80	5 years	11	78	0.245*	----	----
Girls			12				
Boys	80	6 years	22	78	0.223*	----	----
Girls			23				
Boys	80	7 years	30	78	0.260*	----	----
Girls			31				
Boys	80	8 years	33	78	0.621*	----	----
Girls			35				

*Non-Significant, **Significant, Table Value = 2.000
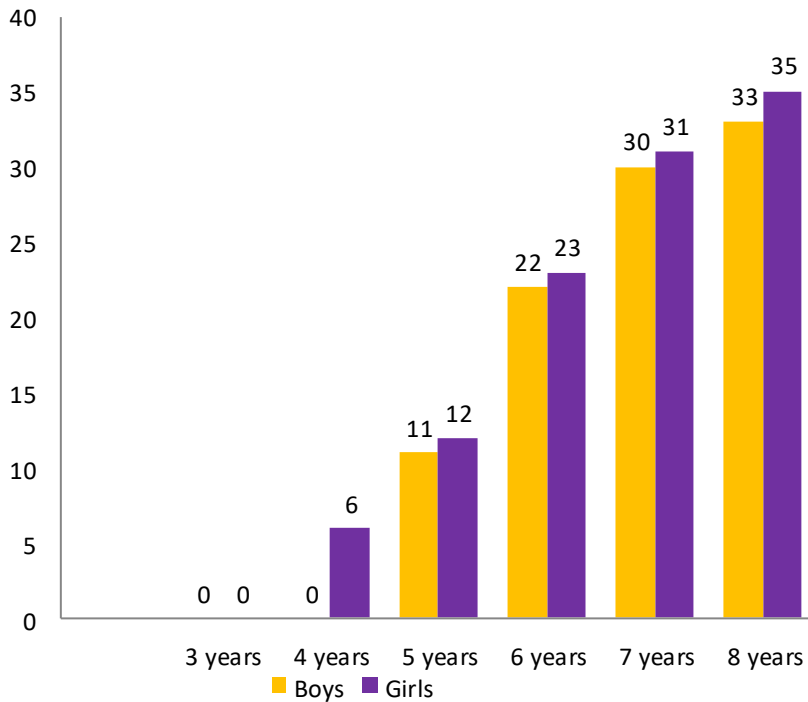
Figure 2. *Frequency of 3 to 8 years old number conservers belong to primary schools' boys and girls.*

Discussion

The purpose of current study was to measure and compare the performance of boys and girls of primary school (3 to 8 years) on Piaget's number conservation task. The study reveals that 3 to 5 years old boys and girls were failed on Piaget's number conservation task. This result is supported by the studies of (Agger, 2007), and (Muller, 2005) they concluded in their studies that children of age group 3 to 5 do not have number conservation ability. The studies of (Neys, 2014) and (Miller, 1976) are also in the support of these findings. Hence the Piaget's claim that children underneath 6 to 7 years do not have the ability of conservation of number is proved. The only research which is in contradiction to these findings is the study conducted by (Price, 2004), he was found that (3 years: 5 months to 4 years: 11 months) old pre-school English children when are asked alternative questions they may conserve the number (Ahmad, Tabassum, & Farooq, 2017).

Boys and girls (6 to 8 years) of primary school were passed on Piaget's number conservation task. The supporting researches to these findings were conducted by (Seifert, 2009); and (Neys, 2014). They concluded in their researches that children of age 6 or 7 can conserve number. Hence the second claim of Piaget's that children older than 6 to 7 years are conservers of number are proved (Ahmad, Tabassum, & Farooq, 2017).

It was provided by the data that boys and girls of primary schools were number conservers at the same age level that is 6 year old. It means that gender have no effect (6 to 8 years) on the number conservation ability of primary schools children. However primary school girls performed better than boys at the same age level (4 years old) (Ahmad, Tabassum, & Farooq, 2017).

Conclusion

The major conclusions drawn were as under:

Boys and girls (3 to 5 years) of primary schools were found unable to pass the number conservation task. Hence they were declared as non-conservers of number. It shows that there was no difference of 3 to 5 years old boys and girls of primary schools on Piaget's number conservation task. However primary school girls (4 years old) performed better than boys at the same age level.

It was provided by the data that boys and girls of primary schools were number conservers at the same age level that is 6 years old, that is the number conservation age was found to be the same both for boys and girls. It means that gender have no effect (6 to 8 years) on the number conservation ability of primary schools children. It was recognized that 6 to 8 years old primary school boys and girls were passed the Piaget's number conservation task and were declared as number conservers. It also shows that there was no difference in the performance of boys and girls on Piaget's number conservation task.

Recommendations

The recommendations made were as under:

Since boys and girls (3 to 5 years) of primary schools were found unable to pass the number conservation task; while 6 to 8 years old primary school boys and girls were passed the Piaget's number conservation task and were declared as number conservers, so the researcher recommends school going age is to be form age 6, Federal and provincial educational agencies may look into the matter. The data that primary school girls (age group 4) was found to be better than boys so further research may be conducted to find out the reasons behind this. Same kind of research may be carried out for street children (out of school children). It is further suggested for future researchers that this type of research be conducted for other Piaget's conservation tasks such as conservation of length, liquid, volume and weight.

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