



## Brazilian children´s drawings of Human Pregnancy

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### Abstract

Biology is uniquely about living things which are able to reproduce their own kind, of which our species is but one. Human children become intrigues by reproduction particularly pregnancy and the growth of the baby before its birth and with copulation and other sexual manifestations in their societies. This study reviewed the literature on young children's development of ideas surrounding pregnancy and particularly growth and feeding of the baby before birth. Eleven Brazilian children between the ages of 6 years and 12 were asked to draw their understanding of the position of a baby before birth inside its mother. They were given a blank piece of paper. Their drawings were examined and a commentary written. The results show a varied understanding within this small sample form one cross age sample in a state primary school. Apart from 2 focused on reproduction in two invertebrates, one illustrating sperm at an egg, and two of situations associated with pregnancy the drawing indicated the position of a baby within the mother's abdomen. Suggestions for teacher training are suggested that practitioners, and parents, have a more comprehensive and less personal knowledge of human reproduction and how it fits into the overall biological unique phenomenon of New Life creation in all organisms. Whilst only a few results were obtained they revealed misunderstanding of where the fetus is positioned inside a human mother and several girls were concerned about the emotions of the expectant mother but showed the everyday knowledge the children had acquired in their lives. The conclusion of this short work is that biological literacy is inadequate in the child population but the more emotive aspects or hazards have some recognition.

**Keywords:** Humans Pregnancy, Drawings, Children's ideas, New life education.

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## 1. Introduction

Biology is the study of living things which uniquely can reproduce themselves this process two parents are involved from whom half their of their genetic make-up is passed on to their offspring through a sex cell in humans, made by each parent. [1-10]

Offspring will have the same number of chromosomes as their parents, 23 pairs of chromosomes in humans, and the genes are all in a code of DNA on the chromosomes. Children inherit a mixture of genes from each parent. What they inherit is not exactly the same as their parent's chromosomes because of an exchange of parts of chromosomes in the cell division when these cells are made. This process of mixing of genes which cause variety in the offspring is the essential part of asexual reproduction so the offspring, whatever the species, are not exact replicas of either parent but a mix of characteristics. With no genetic inheritance from two parents there are no variations and offspring look like the one parent, the mother. Sexual reproduction presents a problem in land living organisms. How do the separate sex cells meet? The answer is various ways of arranging this meeting have evolved. In seed bearing plants for example, like garden flowers, trees with flowers often called blossom, the two adult parents don't locomotion so other methods have evolved to take the male sex cell, called pollen, to the female. The carrying of these sex cells is, for example, by insects as pollen, or by wind. In animals the male sex cells are in a fluid Animal the sex cells have the same problem but the male sex cells are in fluid. [1-10]

Animals move. Hence the adults can move to each other. If they live in water they can meet in water, so that the male can put in some way this sex cells onto the female's eggs lain at the same time and the egg is fertilised and a baby develop as do for example, frogs. Food for the developing baby is provided in the mother's egg. As it is in plant seeds. However land living animal organism move around so have to move to meet each so that the male can put in some way this sex cells into the female's special place where her eggs are formed so the egg is fertilised and baby develop. In most groups of vertebrates the egg is then formed with food for the growing baby and is released form the body of the mother and is cared for, in birds often by siting on the egg to keep it warm. In Mammals (and some water living fish)

the male has a special organ the penis which can act as a tunnel when inserted into the female's egg receiving place (vagina) just below the anus in fur legged animals, under their tail. Humans now walk upright so it is under their body. The male cells can swim in their special fluid to the female sex cell or unfertilised egg and fertilise it, so the two chromosomes from their parents come together to make new cells for the baby with the number of chromosomes that kind of animal has. These eggs then develop inside the mother in the uterus which is an organ in her abdomen. The baby is pushed out by the strong uterine muscles when it is ready to live outside its mother, who still has to feed the growing baby. The meeting of the two sex cells is called fertilisation. [1-10]

This meeting of bodies and inserting the tunnel or penis is copulation. Where this fertilised egg develops in the special place for new life to develop which may be in an egg which is pushed out of the female body, it is laid, as in birds. In mammals the fertilised egg stays inside the mother and grows in an organs called a uterus and fed and given oxygen through an organ called the placenta which develops in the wall of the uterus and connects baby by a cord to the mother. Like a baby bird is attached to the yolk sac inside its egg until fully formed. When it is released from the mother's body. In humans this happens about 38 weeks since the two sex cells met. [1-10]

Developing humans, children, begin to show curiosity related to sexual reproduction which in many societies has become commercialised and a frequent topic shown in the media and discussed without any understanding that this is the new life process common amongst all living things. Whilst sexual intercourse intrigues children, aspects of human pregnancy, birth and babies of particular interest to 8-year old children -both genders. In a study of school children of this age in England (Tunnicliffe, 1994; 1997) [31, 18] their questions were analysed, differing in some instances between boys who wanted facts like weight, and girls who were more concerned with looking after babies. Parents and teachers whilst they should be prepared to allow the natural curiosity of a child over this topic and teach according to the legal requirements for such information in the country it is useful and provides confidence, rendering the topic less personal, for them when they understand the shred biology of new life across the living world. (Personal communications to Author 2. e.g. 1997,



2010) [11, 18]. Whilst curiosity about sexual intercourse belongs as a part to human development and the understanding of how babies are born intrigue children and they make up their own explanations, if the big picture of new life origins is part of the adult and children's understanding, it becomes a special issue. Researchers, for example Novaes, Lobo, (1997); Barbosa, (2002); Brenman, Prezoto (2013); Doidge and Lliliott, (2017); Figueiró, (2018) [1-5].

Noted curiosity about pregnancy and birth in their work. Furthermore, Martins, 2008; Bartoszeck et al., 2010; Nilson, 2013; Katz, (2017) [6-9] reported that this curiosity began to be noticeable as children start discovering their own body and what they observe daily in their environment.

In the past in a Western Society, Berstein, (1978) [10] found that many children were told a myth about the origins of babies. Such stories that, for example, a baby was born inside a cabbage or brought by a stork, or discovered under a Gooseberry bush. The sex is the essence of reproduction in organisms and the continuity of life, hence biological literacy amongst the adults could be the source of both sexual education and birth education (Tunnicliffe, 2010) [11]. In this area there is an intense concern from educational authorities from health and sociology due to higher percentage in some countries during adolescence e.g. in Brazil and the consequences of school drop out (Taborda et al., 2014) [12]. Sex education is concerned to discussions over sexual activity in human beings beyond reproductive functions but also about cultural beliefs and emotional feelings (Kinsey et al., 1953; Nathanielsz, 1999; Hite, 1976; Gareau, 2011) [13-16]. In contrast 'birth education' is biology of a new life, the big picture of organism reproduction, an essential concept in biological literacy (Tunnicliffe, 2010) [11].

Hence this component of biological knowledge about the development of kind of living either plant or animal during embryological phase, pregnancy and during birth. Practical exercises with seeds, wind action and the influence of insects, for instance bees may allow to build a bridge for understanding how babies are born during primary and early years of secondary school classes. Relationship education which is an important part of sex education usually, e.g. in England begins at the top class of primary school, 11 years, and into the secondary school education.

Most of the teachers from nursery school, primary school and early years of secondary school tell stories or show in the environment how babies, birds, and tadpoles of frogs and toads are born. Teachers highlight the importance for a child to have a pet, notice of what bees do when they visit flowers in the garden and talk about pollination and how fruits appear( which hold the seeds), as well how a child grows up to be an adult (Tunnicliffe, 2013) [17]. Very Young children, 4-5 years old are very interested to what is the meaning of pregnancy and ask parents and teachers a lot of questions (Tunnicliffe, 1997) [18]. Children acquire knowledge gradually and what to know why things happen, why bees visit flowers, why mother or a neighbour has a big belly? Her imagination produces lots of answers not always correct. Imagination may be defined as a mental representation which is most of the times evoked without the stimuli of sense organs. We may say that imagination is a mental capacity for representing situations of objects that are absent. She performs a creativity imagination, images as to how and where is the baby in the mothers 'belly' or stomach (Singer et al., 1984; Barros, 1985; Kolbe, 2014) [19-21]. If the child receives answers to her questioning when very young attending nursery and primary school is, progressively will form a basis for completing details later on. However, the practitioners often lack the understanding of the concepts of new life and birth Education and find (personal observations, authors 1 and 2) the reference to is as emotionally challenging, embarrassing confining their understanding to the more personal sex education.

One of the pioneer studies about the development of the human embryo and how babies are born was carried out in children 4-12 years old (Conn, 1947) [22]. He interviewed 100 American children using the "playing with dolls" to investigate their understanding. He concluded from his work that only when children were older (10-12 years old) did they believe that the baby was inside the mothers' 'stomach' and needed to go to the hospital for the baby to be removed from there. Later on Nagy (1953) [23]. discovered that children in United States of America thought they knew how they were born. He then divided the explanations given by children's (4 to 8 years old) about how babies are born into 4 levels:



- 1st there is no birth as life has no beginning;
- 2nd the mammals life starts and is not dependent of his mother;
- 3rd the child birth only happens in the mother;
- 4th for mammals 'birth it is necessary to have a father.

Levels 1st and 2nd happens before those children 8 years old, level 4th after 8 years old and 3rd level was which higher frequency. Nagy took in his further research the theory of development of Piaget, (1929) [24]. Piaget suggested already that children pass through various stages in their explanations and ideas about reproduction and the development of children's ideas from where babies come during birth. Piaget defined the stages of the development of his own children's ideas of from where babies came in an era before mass media and such emphasis in society on sexual behaviour.

According to Piaget children start their own understanding with "pre-artificial" stage where they miss the true concept of origin (babies always existed maybe some place else and parents found a way for them to arrive). The "artificial" refers to children's belief that babies are made from pieces in a puzzle grown or given by other powerful people and or medical doctor, Something like Lego<sup>(c)</sup> pieces or those of a jigsaw. Finally children amend their understanding and reach a third stage, "naturalistic". In this stage they recognize the role taken by the mother.

Similar research was carried out with Spanish children aged 5 to 7 years old done by Martínez-Losada et al. 2009) [25]. The children were interviewed and provided drawings. They made after observing 11 animals (real organisms), both vertebrates and invertebrates, including frogs and dogs whether they had viviparous or oviparous birth. Children from this sample ( $N = 315$ ) were better in identifying the kind of reproduction of examples with closer proximity to the human classification, such as: human being-dog-lion (Martínez-Losada et al., 2009) [25].

The Kreitler's work, (Kreitlers, 1966) [26] with children from Israel found that children believed that their mothers ate food which turned into babies inside their abdomen, often called belly or stomach. Research with children from primary school in USA, (12 years) said that the origin of

babies were due to divine reasons (Moore, Kendall, 1972). The thinking of children aged 5-16 years old about reproductive aspects who lived in USA and Sweden, revealed that Sweden children had a more realistic perception about the pregnancy period of 9 months. However, many children thought that the anus was the channel for birth whereas others thought the caesarean procedure was the normal process of birth (Goldman, Goldman, 1992). The technique of graphical representation (drawings) was used to capture the opinion of Italian children, 5-11 years old about what they think is pregnancy. The youngest children from this sample of 4-6 years olds were interviewed to explain their drawings (Amann-Gainotti, Sellapoll, 1992) [29]. Later the collected drawings were analysed following the criteria shown on the drawings:

- I. How was the baby was positioned inside the mothers' body: above or below the waist line, central position or not differentiated;
- II. Baby's position inside its mother was either standing, sitting or oblique position, or head-pointed downwards to the opening of the uterus;
- III. Dilated uterus;
- IV. Placenta present or similar;
- V. Umbilical cord present.

More recently Zoldosova and Prokop (2007) [30] investigated by means of drawings and interviews what children 6-10 years old from Slovakia thought about the birth of a human baby. More specifically they noted indications of pre-natal development shown in their drawings. When children drew that the umbilical cord is directly connected to the baby' mouth. They thought that the foetus breathed by means of 2 special tubes connected to the mother's lungs. It seems that the understanding of human pregnancy is more important for girls than for boys, possibly because considering that the pre-natal development is more related to the mother and girls begin to realise that they may become mothers (personal communication refer to English 11 year old girls, Author 2). Prokop, Fancovicová (2008) [32] applied a Likert questionnaire to undergraduates in their first year of Pedagogy (Education) to elicit the understanding of these trainee teachers about



human pregnancy. Questions covered fertilization, organ and system of organs development of the foetus, foetus breathing the importance of amniotic fluid, foetal nutrition, sense organs activity, foetus movement and mother's nutrition. Results showed that the understanding of Slovakian students about human pregnancy was poor about the fertilization process and the development of the foetus inside the uterus. Something similar was observed by Yip, (Yip, 2008) [33, 34]. Working with Hong Kong secondary students (17 years old) after Hong Kong was ceded back to China by the British, The students filled up a multiple choice questionnaire about aspect of human reproduction. In this study students of both sexes revealed a poor understanding about fertilization by spermatozoa and implantation of the fertilized egg on the uterus wall. International investigations using drawings pointed out that children 6 years old have a limited understanding about embryonic development and baby's birth (Caron, Ahlgrim, 2012; Berends et al., 1994) [36, 35]. Almost all the ideas children have may be expressed on their drawings. The first signs of creativity by young children aged 4 to 7 and others aged 7 to 11 is plenty and may be channelized to various biological issues (Katz, 2017) [9]. There is a concern how the male and female bodies are represented in primary school textbooks, when the male genitals are illustrated the inner and outer parts, but the female genitals only the inner parts given indicating the idea that sex is only for procreation and not for pleasure (Marques, Ribeiro, 2006) [37]. However, more recent studies indicate that sex education is dealt as a part of a subject of Biology and Geology in the Spanish school curriculum (García-Cabeza, Sánchez-Bello, 2013) [38, 39] whereas in England the Biology curricula cover issues of sex and fertility education and students experiences were compared from secondary schools pupils from 14 to 18 years old (Maslowski et al. (2022) [40].

## 2. Materials and Methods

Eleven drawings from children 6-10 years old were collected from a public school in Curitiba, Paraná State, Brazil after parents signed a parental consent sheet which was handled in accordance with school protocols, and the questions posed to the pupils was discussed with the headmasters and class teachers. Once the administration had been finalised and the first researcher was available to

discuss any issue with parents, the pupils were asked to draw in pencil on an A4 piece of blank paper without any guidance from their teachers or researches. For this task pupils were given 20 minutes to complete their drawings. Their drawings were therefore the result of choice (Hart, Golding-Meadow, 1984) [41].

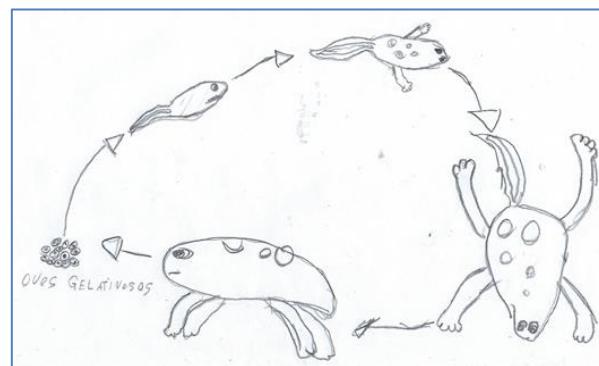
## 3. Research questions

- I. Draw what you think is a pregnant woman with a baby inside her tummy;
- II. Explain what you mean by your drawing?
- III. How does reproduction happen with other animals?

## 4. Results

A boy 10 years-old represents reproduction of a tadpole up to the adult shape of a toad starting from jelly eggs. Usually during childhood children have opportunities to interact with animals in the environment either in the backyard or ditch, in a pond in a park. Relatives are delighted to explain what happens in nature to young ones, Figure (1).

**Figure 1:** Drawing by 10 years old boy representing reproduction of a toad.



**Source:** Ten years old boy.

In the early years of primary school in many countryside during practical classes pupils may have the experience to observe through the microscope a drop of water collected from a pond. Many of them will relate the illustrations they have seen in books or to other media describing reproduction of the organism to what they see on the thin plate (Figure 2.).



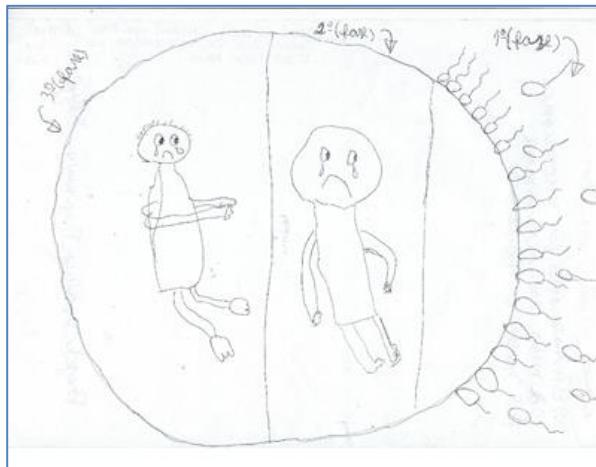
**Figure 2:** Drawing by a 10 years old boy representing the reproduction of protozoa.



Source: Ten years old boy.

Ten year old Children from this small sample had an idea what is the function of the spermatozoa in pregnancy it seems they do not have an idea that the spermatozoa must fertilize an egg which will initiate the changes needed which to develop an embryo (Figure 3). And imagine a whole baby inside the egg, but that could be a means of describing the DNA.

**Figure 3:** Drawing by ten years old boy representing spermatozoa and the cycle of pregnancy.



Source: Ten years old boy.

A 6 year old child depicts a pregnant woman just as with an enlarged ‘tummy’ (Figure 4). indicating observation.

**Figure 4:** Drawing by a 6 years old boy representing pregnancy stating that the mother is happy.



Source: Six years old boy.

Older pupils represent a pregnant woman with an enlarged ‘tummy’ there is a define breast area but there was no evidence that the child associated this with pregnancy also enlarged breast (Figure 5).

**Figure 5:** Drawing by a girl 12 years old representing a pregnant woman.



Source: Twelve years old girl.



An older primary school girl (12 years) represents the baby placed in a right position inside the mother's 'tummy' but no placenta but an umbilical cord drawn (Figure 6).

**Figure 6:** Drawing by a 12 years old girl representing a baby in her belly.



**Source:** Twelve years old girl.

A 9 year old girl represented a baby in breech position inside an organ with a wall and a cord attached to the wall, thickened and different form the rest of that side, hence a placenta (Figure 7). Heads in the few weeks of pregnancy.

**Figure 7:** Drawing by a 9 years old girl representing a baby inside the belly of a pregnant woman.



**Source:** Nine years old girl.

A more elaborated representation of pregnancy is shown in Figure 8 and Figure 9 by two girl's almost same age.

**Figure 8:** Drawing by a 10 years old girl representing pregnant woman with a baby.



**Source:** Ten years old girl.

**Figure 9:** Drawing by 8 years old girl representing pregnancy.

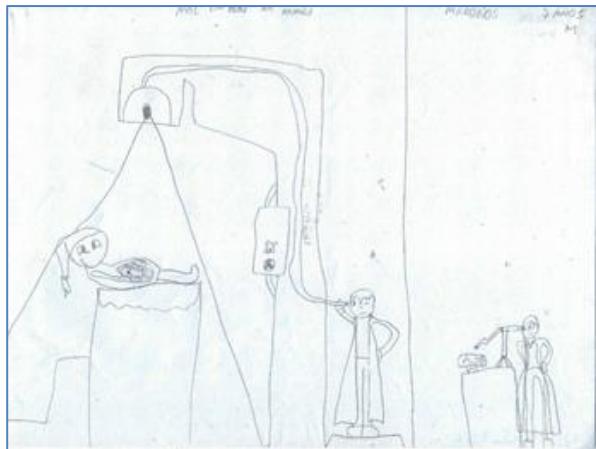


**Source:** Nine years old girl.



An eight year old girl drew in figure 9 a pregnant woman is side view but interview showed that she knew that with special equipment it is possible to view the baby inside the mother's tummy (shown by a boy of seven years in his drawing. Figure 10). Figure 8, drawn by a girl of 10 years show3d a baby in uteri not yet with head engaged for birth.

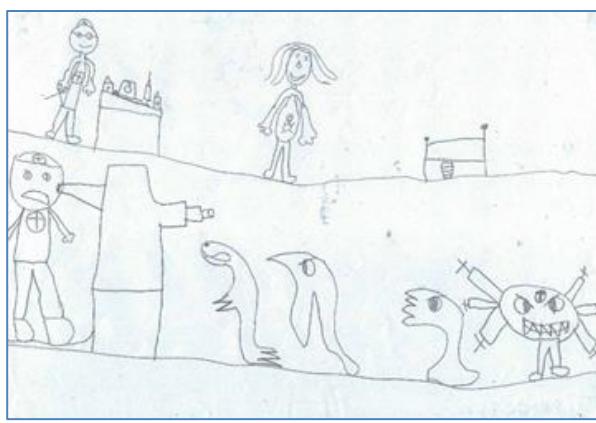
**Figure 10.** Drawing by a boy 7 years old representing equipment to view baby inside the mother's belly.



**Source:** Seven years old boy.

A ten year old boy showed microorganisms that may enter the mother's uterus and may be identified by a doctor preventing the delivery of a live baby (Figure 11).

**Figure 11:** Drawing by a 10 years old boy representing microorganism that might interfere in a pregnancy.



**Source:** Nine years old boy.

A ten year old girl represented a pregnant woman, interesting colouring the body area form upper chest to below pelvic region with an uncoloured heart icon in the protruding abdomen, does this indicate a baby?

When asked to explain their drawings, the girl from Fig. 8 said: the baby is inside the mother's 'tummy', she doesn't know how the baby feeds itself, if the mother wants to know what the baby sex is, and she must go to a doctor. Whereas the girl who drew Fig. 12 said: the baby feeds itself when the mother eats something, the same food goes to the baby. The other pupils declined to explain their drawings but gave no reason...

**Figure 12:** Drawing by 10 years old girl representing her view of pregnancy.



**Source:** Ten years old girl.

In summary the drawings showed a diverse response to the task indicating varied observations and interest. Of the two youngest respondents (boys) one drew reproduction in organisms other than human. The other drew sperm around a circle containing two small human figures reminiscent of the homunculus. Two girls (aged 10 and 12 years) drew a frontal view of mother showing the baby in situ and one boy of six years drew a small figure with abdominal bulge and many heart icons above representing her happiness. An outline of the pregnant woman showing the external bulge and one with a foetus and umbilical cord. (Girls).



## 5. Discussions and Conclusions

This study has a limitation as the sample of drawings is small. However it indicates the diverse understandings of this sample of children reflecting their various experiences in everyday life with suggestions, such as the homunculus in an 'egg' (Figure 3) the happiness exuded from a pregnant woman (Figure 4) of situations they have experienced their lives. Figures (1) and (2) reflect observations made by the observer (Figure 2) or a taught cycle (Figure 1, a ten year old boy). Even so pupils do not have a clear grasp of reproductive sex organs and fertility although they are able to represent a pregnant woman and young pupils have idea's on the use of equipment to identify if the embryo inside the mother's uterus is alive. These drawings and comments suggest children's understanding is based in part on observations and comments heard in their lives. The occurrence of a pregnancy in their families was not explored. Our findings are related to previous publications stating that there is a development sequence of understandings of the basic principles of pregnancy related to the age of pupils. Further investigation is needed including children's ideas from other countries either developed or underdeveloped. Does it matter that these primary children do not have the curriculum understanding yet?

A better knowledge of the human reproductive organs and from where babies and other pet animals babies come from, in popular books for the general public written for this purpose or special programmes broadcast on TV, as in some countries a series in England called Sex Education may help explain to children the facts of life (Mayle, Robins, Walter, 1994) [42]. Additionally, a basic knowledge of the anatomy and process of copulation in mammals could prevent sexual abuse of children from relatives and neighbours and explain basic concepts of feelings and emotions and free consent (Sanders, 2016; Sanders and Jennings, 2017; Jacob, 2019; Arcari, 2020); Taborda, et al. 2014 [43-47].

However, children have an idea that a new life is growing either as in invertebrates and lower vertebrates as shown by Figure (1) and Figure (2). The same happens when a baby is growing inside the mother's uterus as represented by Figures (3-5). It is not clear from this sample if children understand the developing embryo is being fed by the food the mother is eating or from where food will come after birth and how is the process of

growing from a child into adulthood as represented by Figures (6-11).

## 6. Educational implications

Schools could organize practical classes and trips to zoos as a program for birth education as well as for parents:

- I. Identify if an object is alive or not alive (animism);
- II. Organisms are able to reproduce and have babies;
- III. Demonstrate that babies, such as puppies or human babies do not always look like the parents and some such as caterpillars, moths, tadpoles; have to undergo a complete change to the adult form. Whereas in puppies, humans and other mammals it is gradual change in body form.
- IV. Observations that employ stages such as eggs and birds, seed and a plant, transformed food that goes through the placenta to a baby;
- V. Hence we advocate that new life study is included in teacher training so children can learn accurately and teachers can tell them with confidence and no personal embarrassment, birth education. Additionally that schools work with their communities in developing understanding of new life as part of environmental and biodiversity education and sustainability.

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