



## Professional Experience of Teacher Students Enhances their Understanding of Evolutionary Concepts

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### Abstract

*During more than ten years we have been educating preservice preschool teacher students with early childhood education and at least three years of working experience from preschool. The studies give the students possibilities to use and connect their practical knowledge with theoretical studies in order to become preschool teachers. Large parts are self-studies, individually or in groups, using textbooks, films and other web-based material while they are working in preschool and only have lectures and exercises one day each week at the university campus. On the third semester, a 10 weeks course in science and technology is included. During this they write four reflections about exercises, lectures and theories from campus including how they shall use their knowledge at work. Here the fourth reflection about evolutionary theories is analysed. Instead of lectures or exercises about evolution textbooks, educational films and articles from newspapers were included to be used for reflections, and also gave comments on their student peers. These students showed a high level of professional experience but they were not aware of how to use their experience to understand patterns and phenomena in nature. The written reflections were assessed by using the quality markers 4R's of Doll's (Relations, Recursion, Richness and Rigor). The assessment was focused on use of evolutionary theories and if they gave comments on their experience working with children. The results show that many students used the theories correctly. Many also related to important issues that should be brought up in preschool. In general, the students used their previous experiences in order to construct their own, reasonable, views of the theory of evolution.*

**Keywords:** pre-school teachers, self-education, theory of evolution;

### 1. Introduction

Preschools in Sweden have limited number of educated preschool teachers. Their staff mainly includes early childhood educated persons without a proper teacher training but who possesses long experience of working with children at preschool. The attempts to increase the number of preschool teachers have included efforts to retain experienced persons at preschools. More than ten years ago Södertörn University started a three years education program for persons with early childhood education and working experience for at least three years in preschools. During their studies, the students are working in preschool and have lessons and exercises one day each week at the university campus. The rest of the education is done by self-education individually or in groups using textbooks, films and other web-based material. During the education the students can connect theoretical and practical studies with their practical knowledge.

Evolution is the fundamental to all biology and one of the aims in Swedish curriculum for compulsory school [1] is:

*Through teaching, pupils should get an insight into the world view of science with the theory of evolution as a foundation, and also get perspectives on how this has developed and what cultural impact it has had.*

To be able to guide children in biological inquiry using overall evolutionary perspective it is necessary to include evolutionary theories in preservice preschool teacher education. However, evolutionary theories are commonly misinterpreted and often teleological ideas are used as explanation for natural selection [2] [3]. Also, students often are poor in using evolutionary concepts and in understanding evolutionary theories [4].

### 2. Course description

45 preservice preschool teacher students participated in a 10 weeks course in science and technology on their third semester. They attended lessons once a week and the rest of the course was self-education, individual or in groups, and reading course literature at the same time as they were working in preschool. During the course the students should write four reflections, each of 400 words, about

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the exercises, lectures and literature they have been following at campus and how they could use these during their work in preschool. The students usually used their new skills when working in preschool. In the fourth reflective text they should choose between different themes of evolutionary questions. The students did not have any lectures or exercises about evolution but instead used textbooks, three different educational films and three articles from newspapers about human origin, development and future. The evolutionary questions to choose between were A. "What are typical human characteristics?" Define three acquired properties that differ between humans and other primates. Explain how they may have developed. Define three properties that humans share with other primates. B. "Are there human races?" Present arguments for and against and C. "Who will we be tomorrow?" Are there conditions where humans can develop into new species and acquire new properties? Can humans develop into new species?" In addition, they also should give two comments of 400 words on the texts by their student peers.

### 3. Methods.

The fourth reflection about evolutionary theories was planned to be assessed by using the quality markers 4R's of Doll's (Relations, Recursions, Richness and Rigor) [5] [6]. Of these only *Richness* could be used due to the short length of the texts. The assessment was focused on the use of evolutionary theories and if they gave comments on their experiences working with children. The number of evolutionary concepts used in the written texts was calculated [7].

### 4. Examples of answers from student.

Here some examples of student's answers from each theme are represented with their reflection, comment and professional linkage.

#### 4.1 A. "What are typical human characteristics?"

"It is found that we humans are very similar to each other and that the species *Homo sapiens* is very similar to other great apes. The difference between *Homo sapiens* and other species is the specific use of our genes that makes us human, or the transcription factors. [...] What separates us is not the actual gene but how they are used."

Comments:

"In conclusion, you highlight some of the abilities and qualities people have in common with the monkeys. I think that these similarities are something that can remind us of our common origin. Just these similarities and how the differences have occurred also helps explain the evolutionary theory, and may perhaps be useful examples in our profession."

Professional linkage:

"Working concrete is important for children and working with tools in the same way that monkeys (that is, our ancestors far back) doing can perhaps lead to exciting conversations about how we have evolved to where we are today."

#### 4.1 B. "Are there human races?"

"Of the overall genetic variation, it is found that approximately 85 percent of all population groups are independent of geographical origin. The vast majority of genetic variants, except those that are very rare, occur throughout the world."

Comments:

"Man has always been anxious to divide things into different compartments. In order to classify and categorize different objects, you must distinguish them and collect all similar items to belong to their own class or category. Something one has done since ancient time and it feels like it is a natural part of man. We have divided us in different countries, language and sex, therefore I believe that it is natural for some to divide human in different races."

Professional linkage:

"On the other hand, the curriculum for preschool states that, "The inviolability of human life, individual freedom and integrity, the equal value of all people, equality between the genders, as well as solidarity with the weak and vulnerable are all values that the preschool should actively promote in its work with children." Attention to the fact that all people have the same origin and belong to the same race can be a first step in creating an understanding of all people's equal value."



#### 4.1 C. “Who will we be tomorrow?”

“Thanks to accumulated knowledge in medicine, the number of children who die during pregnancy, during childbirth or during their first year of life has decreased. In addition, we live much longer and have better opportunities to propagate ourselves. Through knowledge and technology, modern humans can influence nature and change natural selection conditions.”

Comments:

“That there is an increased risk of hereditary diseases when closely related people get children with each other is an example that shows how important it is to maintain a large variation in the population. Such variation represents a variation reserve that can be expressed in case of adaptation to new environments. The earth is changing constantly and today faster than ever. If one species lacks genetic variation and thus the ability to adapt to new conditions, it will die. Could it be that the future person will have to rebuild variation in order to survive?”

Professional linkage:

“What causes consequences when we “get into” nature's own process? Because the children who go to preschool will educate their children and future generations that will make major changes and choices, we, as educators, have an important role. If the children do not come into contact with nature, animals and plants then maybe they make the wrong priorities?”

### 5. Results

The results show that many students can use the theories correctly described with several perspectives. Many students relate to important issues that should be brought up in preschool. In general, the students used their previous experiences to construct their own views of the theory of evolution based on random variation and natural selection. These students have high level of professional experience but they are not aware of how their experience can be put into a general context understanding patterns and phenomena in nature. Many students had high score of the quality marker *Richness* showing the students' ability to use a rich language describing out of several perspectives. Also, students used evolutionary concepts to a high degree but the quality was not dependent on the number of concepts used. Some students had a high score in *Richness* but used few evolutionary concepts and vice versa. This is in accordance with our previous results [8].

### 6. Summary

Although the themes of the reflections not were traditionally evolutionary many of the preservice students with working experience from preschool discuss evolutionary theories in a correct way using a variety of sources of theory such as education films, textbooks and articles. They often link their discussions with their professional experience and what is important, according to the curriculum, to bring up when working with children. Our results support earlier findings that open questions and own choices of themes enhance quality of students answers in written exams [9] and further, that the use of professional experience should be promoted in educational situations as it enhances learning.

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