

GEOGRAPHY AND BIOLOGY AND TEACHER EDUCATION IN FINLAND

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Abstract. *Since 1990 the Finnish society, the school system and the teacher education have strongly changed. The aim of the article is to discuss what kind geographical and biological teacher education has been and how it is nowadays in the University of Oulu. The study reported here is a qualitative case study. The resultant data is based on reflective diaries written by 74 student teachers in 1998-2003. The data was analysed by using inductive and deductive content analysis methods. According to the student teachers, the programme of the geographical and biological teacher education in the University of Oulu creates a good basement for the development of teacher identity and for acting as a teacher.*

Key words: *education process, integration, geography, biology, subject didactics, school practice.*

Introduction

During last decade, there have been big changes in the society, the school system and the teacher education in Finland. Economic and social changes have been observed in the society. The school system and the teacher education have suffered of shortage of resources as a consequence of the economic depression. However, there have also been many positive things in school and university education. School and university geography have come closer each other. A common factor has been cultural geography what became stronger and connected the content of the university and school geography. University geographers have started to participate in the development of school curricula and in groups of school textbook writers (Rikkinen, 1998). Similar development has also been observed in biology. Environmental education, the idea of sustainable development and Information and Communication Technology (ICT) are factors connecting biology and geography in all school levels. Teachers in biological and geographical education from the departments of educational sciences have participated together with teachers from the geographical and biological departments in In-service courses in environmental education and science arranged both for class teachers and geography, biology and science teachers. They have done research work and developed not only university but also school education (Virtanen & Kankaanrinta, 1989). They have reconceptualized the teaching and learning processes and developed basis of teacher education from objectivistic toward constructivist theory. They have moved teaching processes from fact teaching to concept and action learning. They have strived to move the role of their own and schoolteachers from persons, who furnish all the answers and control the content, to facilitators who provide a structure that launches student exploration and help and guide students during learning processes. They have also tried to move role of students from information receivers to knowledge constructors (Davis *et al.*, 1993). This kind of work is becoming more and more important because, also in Finland, constructivism form the basis for the curricula. The aim of the article is to discuss what kind geographical and biological teacher education has been and how it is nowadays in the University of Oulu. This is important because the Bologna process strives teacher educators to make new plans for next years.

The Curricula of geography and biology in Finnish schools in 1994 and 2005

School curricula are important when planning teacher education for student teachers work at schools during their practice periods. As a framework for school education are national curricula for comprehensive school, secondary school and senior secondary school. Based on these, teachers locally plan their school curricula taking account pupils' needs and teaching and learning possibilities in the area. In the national curricula, some important values have been mentioned as a starting point for school curricula planning. The values identified are: Promoting sustainable development; Promoting cultural identity, multiculturalism and internationalization; Promoting physical, mental and social well being; and Growing to be a member of society (National Board of Education, 1994a).

The aims and the contents of the curricula in different school levels in 1994 are presented in the Table 1.

Table 1. Curricula in 1994 in Finnish schools.

School level	Aims	Content
Primary level: environmental and natural studies	Growth to an investigating, active citizen	Matter and energy Organisms and environment The globe and its areas Man and environment
Secondary level: Geography	To strengthen cultural identity To understand and appreciate other countries, peoples and their culture	Finland The rest of Europe The other areas of the globe
Biology	To build knowledge and understanding of the structure of organisms, ecology, and evolution	Ecosystems of the home district Man's structure and functions Man and the environment
Senior secondary school: Geography	To describe the structure and functions of inorganic and organic nature as well as the regional systems created by people	Functioning globe Man and his environment At least two optional courses
Biology	To describe systems of organic nature, interaction relationships, and evolution as well as control mechanism that affect them	Functioning world and organisms Genetics and evolution Optional courses: The structure and life processes of man and Factors that affect on health

In primary school (classes 1-6, pupils 7-12 years old), geography and biology are integrated with environmental studies and civics in environmental and natural studies. The main aim is *"to support and guide the students growth to an investigating, active citizen who is interested in nature, in the study of nature, and in nature conservation"* (National Board of Education, 1994a).

In secondary school (classes 7-9, pupils 13-15 years old) and senior secondary school (classes 10-12, pupils 16-18 years old), geography and biology are independent subjects with their own aims and contents (National Board of Education, 1994a). According to Rikkinen (1996, 1998a), the main content and purpose of geography has been nearly the same for the past

fifteen years. In secondary school, one of the aims is that the student “*becomes acquainted with Finland, the rest of Europe, and the other areas of the globe so that his/her cultural identity is strengthened and s/he learns to understand and appreciate other countries, peoples and their culture*”. Geography is thought to be a subject bridging natural sciences to social sciences (National Board of Education, 1994a).

In senior secondary school, the purpose of geography is to describe structure and functions of inorganic and organic nature as well as regional systems created by people. The instruction has thought to help understanding the past and the present of a region and its people, and to assess its future. The study of geography combines scientific and social scientific approaches (National Board of Education, 1994b).

According to Virtanen (1994), old traditions bother also biology curricula, new topics are added but the old ones are not rejected. In secondary school, “*Biology is a subject which studies life, its phenomena, and prerequisites. With it, the student receives material to build such a picture of the world, whose important part is knowledge and understanding of the structure of organisms, ecology, and evolution*” (National Board of Education, 1994a). The curriculum targets the natural world around the pupils, and equips them with both the natural history knowledge and underlying scientific understanding of their environment (Carter, 1999).

In senior secondary school, biology conveys an overview of biosciences as disciplines that are developing rapidly and generating new knowledge. It has been thought that the student is able then to assess his worldview based on scientific knowledge and values (National Board of Education, 1994b).

In 2005, the Finnish school system will get new curricula. In primary school, there are new integrating themes such as Developing as a human being, Cultural identity and internationalism, Communication and media skills, Participating citizenship and enterprise spirit, Responsibility about environment, Welfare and sustainable development, Safety and traffic, and Man and technology.

In the classes 1-4, geography and biology are integrated with environmental studies and civics in environmental and natural studies. The main aim is that the student learns both to know and understand nature and built environment, her/himself and other human beings and health and illness. The first topic is the same as in 1994. The second topic is The own neighborhood, home district and globe as living environment of human being and the third one Environmental phenomena. The aims are nearly similar as in 1994 but investigation skills and their development are more stressed. In the classes 5-6, biology and geography are independent subjects. In geography, the globe and its areas are to be studied. The student should get a view of nature and culture environments in different parts of globe and learn to value them. In biology, life and its phenomena are to be investigated. The student should learn to identify plant and animal species, to understand relationships between organisms and their environment and to value and take care of biodiversity (National Board of Education 2003a).

In secondary school geography, the topics are otherwise similar as in 1994 but there is also the fourth one, Our common environment, where environmental and developing questions are discussed at local and global level (National Board of Education 2003a).

In senior secondary school, the purpose of the instruction in geography is the same as in 1994. Two obligatory courses, Blue planet (Physical geography) and Common world (Human geography) and two optional courses The geography of risk and possibility and Researching an area are also the same as in 1994 (National Board of Education 2003b).

In secondary school biology, e.g. supporting student’s personal development, cultural identity and internationalism and environmental protection are important aims as they are also in the curriculum in 1994. The themes stressed more than in the 1994 are: The role as European citizens, Communication, media skills and technology and Sustainable development.

Investigation and problem-based learning are mentioned as important teaching methods. In addition, there is a new course of Environmental education in the 9th class; the other courses are the same as in 1994 (National Board of Education 2003a).

In senior secondary school, there are two obligatory courses, Organisms and life, and Cell and heredity and three optional courses: Environmental ecology, Human biology, and Biotechnology (National Board of Education 2003b). The aims are the same as in 1994.

In the both curricula (1994 and 2005), geography and biology are integrated with each other. In addition they are linked to the other natural sciences for example biology to chemistry. Both in biology and geography, when studying environmental issues links to social sciences should be taken into account.

Relationships between geography and biology

Geography and biology are treated differently in the curricula of primary, secondary and senior secondary schools in Finland. In primary school, geography and biology are taught mainly as integrated subjects. This reflects the trend of dividing the primary curriculum into broad bodies of knowledge that maybe approaches in various ways within a particular school (Gerber, 2001). Traditionally, geography education in Finland has a strong physical basis. Geography is often classified as a natural science, for example in national examinations. It belongs to environmental and natural sciences also in primary school curriculum where it is a key component whilst adhering to broader aims of social and humanities education with children. In secondary and senior secondary school, geography and biology are separate subjects in their own rights. The practice is for large blocks of time, e.g. autumn and spring dedicated to the study of biology and winter of geography. In the Finnish curricula, both physical and cultural elements are strongly related to each other. There is underlying conception that people and their environment always have both physical and human aspects and that we cannot understand the one without the other (Rikkinen, 1998b). These physical and cultural partners are however, often seen and taught quite separately (Cantell, 1999).

Geography has strong physical character as a school subject in Finland and this is seen also in teacher education. Most of the teachers teach both geography and biology, because geography and biology are paired subjects. The cultural and human points of view have often been neglected in academic studies and teacher education (Cantell, 1999). Biologists as natural scientists stress objectivism and cause and effect - thinking. Many of them have the conception that it is important to find correct and exact answers (Virtanen & Kankaanrinta, 1989). However, in cultural and educational problems it is not always possible. Maybe from this reason and because physical aspects are more stressed also in teacher education, many geographical and biological teachers do not like to handle cultural questions. If they must teach cultural topics, they need help from history, language and religious education teachers (Ripatti-Cantell, 1997). On the other hand many environmental problems are linked to chemistry and physics and biology and especially geographical education at Finnish universities does not include enough studies on these subjects. Therefore, co-operation between different teacher groups is important. In many schools, teachers organize cross- and multi-scientific projects nowadays.

Research design

Subjects

All student teachers studied in biology and geography in subject teacher education in 1998-2003, participated voluntarily in the research. In total, there were 114 student teachers (together 86 females, 28 males). Most of the student teachers had studied two or three academic years geography and biology, but some of them had started a year or two earlier. Theoretical studies in educational sciences were carried out in the Department on Educational Sciences and Teacher Education and the school practice in the University Training School of the University of Oulu and in some city schools.

The theoretical background and the curriculum in pedagogical studies in subject teacher education in the University of Oulu

The pedagogical studies in the University of Oulu lay the foundation on the paradigm of teacher professional development (Niemi, 1990). According Niemi, the teacher professional development is a holistic growth and development process. There can be found three core areas: professional, personal and cognitive development. The aim is that student teachers develop their own educational philosophy and theory-based view of teaching and learning processes. During the research, geographical and biological teacher education was based on empirical and constructivist theory (Kansanen, 1990). Core concepts were metacognition, reflection and experiential learning. In this study, the term 'metacognition' has been understood as consciousness of cognitive acts and thinking, learning and knowing processes (Letiche, 1988). The term 'reflection' consists of thorough discussion on the student teachers' plans, suggestions for solutions, and evaluation of alternative ways of action. In addition, it includes observations on how student teachers become conscious of their conceptions and how and why they change their action when teaching geography and biology (Dewey, 1933). During the experiential learning cycle, student teachers bridge the gap between theory and practice, developing their teaching theory and metacognitive thinking skills (Ojanen, 1990).

During the research, pedagogical studies included 35 Finnish credits (1 credit = 40 work hour) and they were organized in five modules for one academic year (table 2). The first module stressed on educational and pedagogical sciences in general level. In the module 2, student teachers reflected on the growth of a human being and different kinds of educational conceptions in relation to subject education. In the module 3, student teachers familiarized themselves with subject instruction. In the module 4, they shared conceptions of the school system and the teacher profession in groups. In the module 5, they developed their own professional identity and educational philosophy and evaluated their own professional and personal growth using study diaries and portfolios. A portfolio is based on set goals and it includes the student teacher's works like essays, period and lesson plans, self-planned teaching material, seminar reports etc. In addition student teachers selected 4 credits optional theoretical or practical courses.

Methods

The study is a qualitative case study. The aim of the research is to get ideas how to develop the curriculum of the pedagogical studies of geographical and biological teacher education (Nikki, 1995). The research question is, how teacher education in 1998-2003 has succeeded in

- a. supporting student teachers when they construct own pedagogical knowledge?
- b. getting readiness for acting as a teacher?

Table 2. Subject education and its challenges.

Educational modules	Content	Means
Orientation into educational studies (1 credit = 40 work hours)	Core concepts of pedagogical and educational sciences Introduction into research work	Essay
Developing personality (6 credits)	Basics on educational and development psychology (3 credits) Pedagogical planning in subject teaching and learning (1 credit) School practice (2 credits)	Lectures Individual and group work Essay
Subject education (10 credits)	Teaching and learning theories and teacher's role (3 credits) Curriculum and evaluation theory (1 credit) Teaching skills, methods, materials and evaluation in subject education (2 credits) School practice (4 credits)	Lectures Individual and group work
Socio-cultural view of learning (4 credits)	Educational sociology (2 credits) School administration (1 credit) Integration and educational research (1 credit)	Exam Seminar work
Teacher's own professional growth (10 credits)	Educational philosophy and ethics (3 credits) Research in subject education (3 credits) School practice (4 credits)	Diaries, portfolios Learning by researching Seminar
Additional studies (4 credits)	Educational sciences or school practice	

The resultant data is based on reflective diaries written by 74 student teachers in 1998-2003. 40 student teachers did not allowed use their diaries as research material and these diaries have not taken into account in results. The data was analysed by using inductive and deductive content analysis methods (Berg, 1988). The data was allowed to 'speak for itself', trying not to impose a priori theoretical concepts and compel the facts to fit into the categories set beforehand (Eisenhart & Howe, 1992). Although preliminary research questions were posed beforehand, the research was also held open for new insights and questions arising from the empirical world.

Results

At the beginning of the pedagogical studies, 88 % of the geographical and biological student teachers thought that the most important aim is the personal development (Figure 1). Self-confidence and stage presence were the most often mentioned developing objects. 38 % of the student teachers mentioned that the interaction with pupils is the second important aim and 15 % stated the third one is the increase of subject knowledge. Only 7 % thought that goal-oriented action is important. At the end of the pedagogical studies, the most important aim mentioned was the goal-oriented action (61 %), the second was own development (18 %) and the third one interaction with pupils (9 %). Increase of subject knowledge was not important any more (3 %).

Only four of the student teachers evaluated the wholeness of the studies. In these comments, the main idea was that the structure is many-sided and clear. Only six student teachers wrote about the integration of the modules. After their opinion, the studies in the educational sciences are separated and fragmented, whereas the subject education and the school practice were well integrated with each other. Only eight student teachers discussed the methods used in the educational sciences.

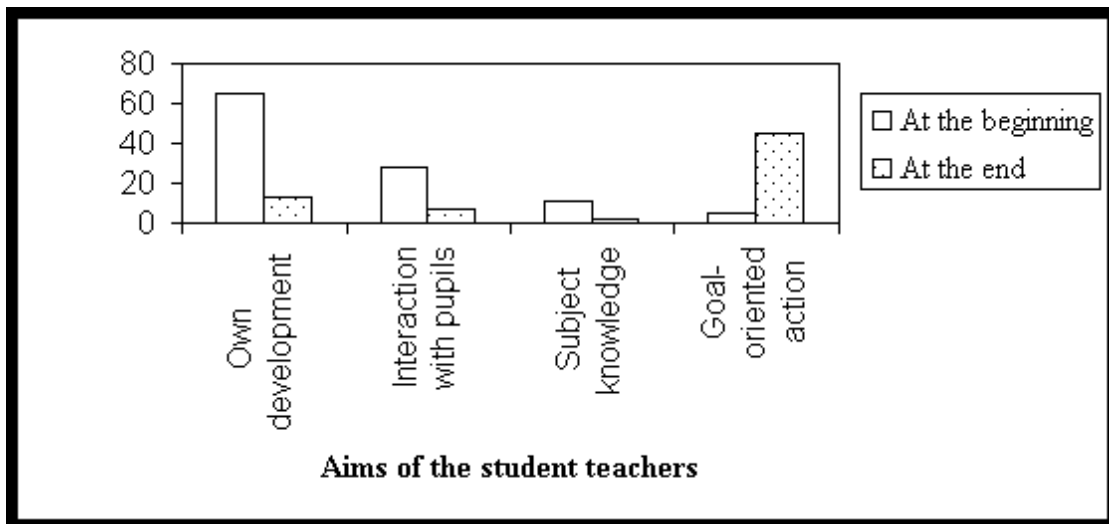


Figure 1. The most important aims mentioned by the geographical and biological student teachers at the beginning in pedagogical studies (n = 74).

Four of them liked most the group discussions and inquiries, the others thought that essay writing was useful because it develop critical thinking skills. 17 % student teachers wrote that lectures in the educational sciences were difficult to understand for the perspective was too theoretical. The most discussed topic was methods used in subject education. 66 % of the student teachers mentioned that they liked them and that methods were harmonized very well with the aims of the courses. Based of the opinions of the student teachers, the best methods are cooperative learning, visits, group work, and seminar. The student teachers also liked the way the methods were studied. E.g. a student teacher wrote: *“The integration of theory and methods to be studied was very succeeded in the lessons of subject education.”*

There were also some negative comments. In obligatory studies the ICT education and in optional studies the out door education, courses were not as well organized as four student teachers had wished. The student teachers wanted guidelines to be more exact in both courses.

Concerning the school practice there were only three opinions together. A student teacher wrote that feedback in the groups is an efficient method. However, the second one wrote that it was not as efficient as it could be because the other student teachers were too lazy in giving feedback. The third student teacher commented that the aims in school practice are too similar in all practice modules.

Readiness for acting as a teacher was increased during the pedagogical studies both in educational sciences and subject education (Figure 2). 14 student teachers mentioned that in educational studies, they got information that helped them understand better the development of pupils. Especially they were satisfied with the lessons of special pedagogy. They also liked the Internet forum and e-mail education. The most ideas concerned skills developed during the pedagogical studies. 72 % of the student teachers wrote that their skills to select and create methods developed. 57 % wrote that they are able to make good period and lesson plans. Also 57 % valued evaluation and assessment skills, and 41% developed skills in vertical and horizontal integration. Quite many student teachers also mentioned that they got readiness for selection and preparation of materials and for education especially values education was mentioned. Skills of using equipments were not developed very well after their opinions.

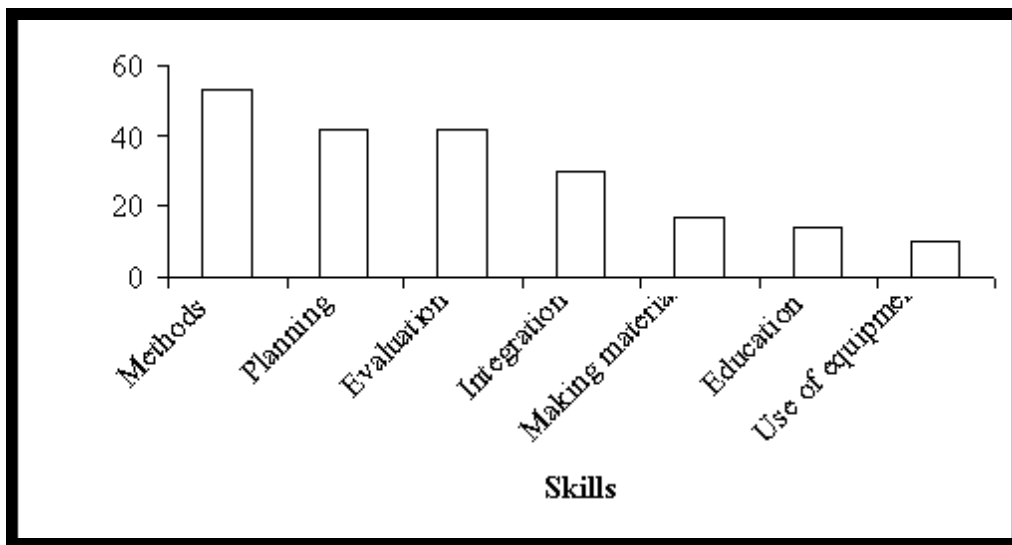


Figure 2. The developed skills mentioned by the geographical and biological student teachers at the end of the pedagogical studies (n = 74).

There were a quite a lot feedback of the good features of the pedagogical studies (35 mentions in educational sciences, 153 in subject education and 86 in school practice). The given comments in educational sciences included positive opinions of studied educational themes. E.g. school bath, ethical education and special education were seen to be very useful for opening the eyes and changing the thinking ways. Three student teachers mentioned to be very good that there were student teachers from different subject teacher lines in educational groups. In the subject education, the student teachers mentioned that they got good guidelines for practical work at schools. Many student teachers also valued offered possibilities to familiarize themselves with different work methods. Many student teachers, especially in spring term, liked that practical issues were linked with educational and subject didactical theories both in seminars and lectures. 22 student teachers wrote positive feedback of ICT learning. In the school practice the student teachers valued mostly possibility of getting feedback (n = 40) and having open atmosphere (n = 9).

There were 24 negative comments on the wholeness of the pedagogical studies. The most difficult problem was hurry (n = 23). A student teacher wrote: *“There are days when you have no time to eat - you can only take a bun.”*

And another: *“Not only student teachers are busy so are the supervisors, too. It has happened that you have got the feedback of your lesson over a week after you had the lesson.”*

24 student teachers gave negative feedback of studies in educational sciences. 13 criticized that the educational studies are too theoretical. Six of them wrote that the educational studies are fragmented and four that some lecturers cannot present issues. In subject education, there were 13 negative opinions. Seven of them concerned hurry, four the guidelines in ICT education and two that many lessons started after 4 p.m. There were 16 criticizing comments of school practice. Four student teachers criticized the way of feedback. Others supposed that they are not able to create a real image of schoolwork for the training school is too much different in comparison with other schools. 38 student teachers wrote that they were afraid at the beginning of pedagogical studies. The reason mentioned were that other student teachers had told how hard the winter could be. They also told that they were anxious about the timetables and the management of the subject knowledge beforehand. However, 17 student teachers concluded their study diary in similar feelings like a student teacher who wrote: *“This year is surely the most unforgettable and rewarding of all my studying years.”*

Many of them thought also like a student teacher who wrote: *“During the pedagogical studies, I noticed the situation is quite similar at the pedagogical studies as at the driving school; real studying and learning process starts when you have got the diploma. The pedagogical studies give good guidance for the teacher profession but to be professional means that you should be ready work hardly all the time.”*

Conclusion

The most of the reflections in study diaries concerned the subject education. This is understandable for the student teachers wrote their thoughts about modules in connection of subject education. Based on the study diaries of the geographical and biological student teachers, there seems to be a gap between theory and practice, especially between the educational sciences and the other parts of the pedagogical studies. The bridges both between educational sciences and subject education and subject education and the school practice seem to be quite strong. The educational sciences form the theoretical framework for the wholeness of the pedagogical studies. Therefore it is natural that it is more theoretical than the subject education and school practice are. However, we must try to find ways to link the educational studies more tightly to the other parts of the pedagogical studies. Otherwise there is a danger that student teachers reject the theory as a base of their profession.

At the beginning of the pedagogical studies, the geographical and biological student teachers stressed mostly their own development. Under half of them mentioned that interaction with pupils is important. The result is similar with the observation of Fuller (1969) and Tann (1993). They have reported that at the beginning of the training period student teachers direct their attention to their own surviving, until later on they take pupils into account. In the reflections of the pedagogical studies, the school practice and the practical information (e.g. about methods) were the most discussed and valued by the student teachers. According to Tippins *et al.* (1999), student teachers in natural sciences do not take educational theories into account during the school practice. However, in spring term the most student teachers had understood how important goals are in teacher's work.

20 student teachers mentioned to be satisfied that theory and practice were integrated with each other during the subject education.

The results of feelings showed that the student teachers were anxious at the beginning of the studies. The reason might be that they had conceptions of a good teacher and a good teaching. This is very common concerning novice teachers and if the conceptions are different in comparison with experiences student teachers become anxious (Stebbins, 1981). Based on the

results, it seems that co-operative work between student teachers and teacher educators support student teachers in developing their teacher identity and skills needed acting as a teacher.

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Резюме

ОБУЧЕНИЕ УЧИТЕЛЕЙ ГЕОГРАФИИ И БИОЛОГИИ В ФИНЛЯНДИИ

Эйла Еронен

С 1990 г. в Финляндии наблюдались хозяйственные и социальные изменения. Школьная система и образование учителей терпели недостаток ресурсов как следствие экономического застоя. Данная ситуация и Болонский (Bologna) процесс заставили учителей пересмотреть планы на будущие годы.

Цель статьи - обсудить образование учителя по географии и биологии и как оно проходит сейчас в университете Оулу. Вопросами исследования было следующее: как изменилось образование учителей в 1998-2003

а) в поддержке студентов-учителей, когда они строят педагогические знания?

б) в подготовке для работы учителями?

Данные основаны на дневниках, написанных 74 студентами в 1998-2003. Полученный материал был проанализирован путем использования индуктивных и дедуктивных методов анализа содержимого.

Основываясь на изучении дневников студентов по географии и биологии, кажется, что существует разница между теорией и практикой, особенно между воспитательными дисциплинами и другими частями педагогических предметов. Связи между воспитательными науками и образованием по предмету также, как и предметным образованием и практикой в школах довольно сильны. На обучении 88 % студентов по географии и биологии усилили главным образом свое собственное развитие. Около половины упомянули, что взаимодействие с учениками очень важно. Самой важной целью из упомянутых ими были: целенаправленность (61 %), саморазвитие (18 %) и взаимодействие с учениками (9%).

Результаты исследования показали, что половине студентов было тревожно в начале обучения. Причиной могли быть представления, которые они имели о хороших учителях и хорошем преподавании. Это общее для учителей практикантов и если предположения расходятся с опытом, то возникает чувство тревоги. Готовность работать увеличивалась во время обучения как в воспитательных науках так и в предметном образовании. 72 % студентов написали, что они развили свои умения выбирать и создавать методики преподавания, а 57 % указали, что они могут теперь создать хорошие семестровые и урочные планы. 57 % оценили умения оценивать студентов, и 41% развили навыки вертикальной и горизонтальной интеграции.

По мнению студентов, программа географического и биологического образования учителей в университете Оулу создает хороший базис для развития творчества и способностей учителя этих предметов.

Ключевые слова: учебный процесс, интеграция, география, биология, дидактика предмета, школьная практика.

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