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DEVELOPMENT OF CONCEPTIONS OF STUDENT TEACHERS IN INITIAL TEACHER EDUCATION IN BIOLOGY AND GEOGRAPHY EDUCATION

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Abstract. The article aims to interpret professional development of teachers, focusing specifically on the development of professional conceptions of student teachers in an Initial Teacher Education during their final school practice period in Biology and Geography. The study is a qualitative case study. The resultant data is based on reflective diaries and teaching practice reports written by the student teachers, and on recordings and videotapes from supervision meetings and lessons. The data was analysed by using inductive and deductive content analysis methods. According to the student teachers, their awareness of themselves as teachers and of teaching of Biology and Geography developed. At the beginning, they reflected their status, whereas at the end they considered the work of a teacher as a whole and what kind of teachers they want to be.
Key words: professional development, professional conceptions, strategies of student teachers, school practice, reflection.

Introduction

Although there have been published plenty of reports of the professional development and growth of a teacher in Educational Sciences since 1970`s (e.g. Jackson, 1971; Eraut, 1993; Wubbels *et al.,* 1993; Niemi, 1995; Zeichner, 1996; Squires, 1999), only a few studies in the area of Didactics in Biology and Geography exist (e.g. Eloranta, 1997; Virta *et al.,* 1998; Cheng, 1998; Cantell, 2001). The concepts "professional development" and "professional growth" have been used when discussing the development of teachers and student teachers from the perspective of the growth and learning processes (Niikko, 1998). Professional development means that people become more skilled and conscious of their own action, strategies and justification for doing (Smyth, 1989; Wubbels *et al.,* 1993; Bell & Gilbert, 1994; Niemi, 1996), whereas the professional growth has been linked with the attitude changes and the development of didactical skills and critical reflection (Väisänen & Silkelä, 2000). Professional growth consists of cognitive, personal and social development. In the cognitive learning process, people create new ideas and change their action (Niemi, 1992; Gunstone *et al*., 1993; de Jong *et al*., 1999). During the personal learning process, conceptions of action as a teacher and teaching of science subjects, such as Biology and Geography, change. In the social learning process, people develop and adopt new, co-operative work methods. (Bell & Gilbert, 1994.)

Many researchers have shown that school practice has an important role for the professional growth of student teachers. It has effects, for example, on conceptions of subjects and teaching, studying and learning processes. (Lamm, 1988; Gunstone *et al.,* 1993; de Jong *et al*., 1999;

Krokfors, 1997.) In the didactical sense, conceptions are schemes of teaching and learning (Syrjälä *et al.,* 1994, p.118). They can change through shared experiences and support given by supervisors and other student teachers (Huberman, 1993).

The theme of this qualitative case study belongs both to the area of symbolic interaction and didactics. The major aim is to increase understanding of teaching practice and its importance for the development of professional conceptions. The object of the study is school practice of student teachers in Biology and Geography in Initial Teacher Education. The focus of the study is on reflective action. It aims to interpret professional development of teachers from their own perspective, focusing specifically on the development of professional conceptions of a group of student teachers.

The first research task in the study was to describe the professional conceptions student teachers have, and how those conceptions develop during their final school practice period in Biology and Geography class. The second task was to describe conceptions that student teachers have of their own teaching strategies, and the development of those strategies. In addition, the study aimed to identify factors that support or prevent professional growth of student teachers.

Research design

Subjects

All student teachers who studied in Biology and Geography in Initial Class Teacher Education in 1992-1994, participated voluntarily in the research. In total, there were 50 student teachers (35 female and 15 male): 13 in autumn 1992, 20 in spring 1993 and 17 in spring 1994. Most of the student teachers had studied three academic years before the final school practice, but some of them had started a year or two earlier. All had completed their courses in Biology and Geography and all the other school practice periods. Most of them had taught Biology and Geography either during the earlier practice periods, or when acting at schools. 13 of the student teachers had no experience in teaching these subjects. The period was arranged in forms 3-6 in the University Training School of the University of Oulu. The school practice period was the last one, and after that the student teachers got their teacher diplomas.

The school practice in Initial Class Teacher Education in the University of Oulu

During the data collection phase of the study, there were four school practice periods. The first period put emphasis on educational sciences in general level, and the second one on educational sociology and psychology. The major aim of these first two periods was for the student teachers to familiarise themselves with the school environment and basic teaching skills of a class teacher, and with interaction between a teacher and their pupils. The third period focused on the student teachers developing their teaching skills and familiarising themselves with an entire school day, the school administration and co-operation with parents, from the perspective of a class teacher.

In the fourth period, called final school practice, the major aim was for the student teachers to develop their own educational and teaching conceptions, in co-operation with their peer student teachers, the class teacher and the supervisor. The period consisted of eight credits (a credit being equivalent to 40 working hours). Every student teacher taught two subjects, either Mother tongue or Mathematics, and some other subject, such as Biology or Geography. The major aim was that student teachers developed their skills in period and lesson planning, teaching, studying and learning processes, and product and process evaluation. The roles of the class teacher and the supervisor were different in the sense that the former helped student teachers when becoming familiar with concrete teaching processes; the latter stressed theoretical principles and conceptions of knowledge characteristic for Biology and Geography. (Opinto-opas 1992-93, Opinto-opas 1993-94.)

Theoretical background and description of supervision in Biology and Geography

During the research, Didactics and supervision in Biology and Geography were based on empirical and constructivist theory (cf. Kansanen, 1990). Core concepts in the co-operative supervision process 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, 27). 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 Biology and Geography (cf. Dewey, 1933, 4). During the experiential learning cycle, student teachers bridge the gap between theory and practice, developing their teaching theory and metacognitive thinking skills. (Ojanen, 1990.)

Supervision in Biology and Geography Education was made in individual and group meetings and during lessons in classrooms (Table 1).

Table 1. An example of the timetable of supervision in Biology and Geography.*

Day	Practice week							
	1	2	3	4	5	6	7	8
Monday		PL, IF						
Tuesday	GM1	DF			PM			PL, IF
Wednesday				GM2				DF
Thursday					PL, IF			
Friday	PM				DF		PM	GM3

*GM=group meeting, PM=preliminary meeting, PL=practice lesson, IF= immediate feedback, DF=deep feedback, GM3=final evaluation

During group meetings (GM), the student teachers, the class teacher and the supervisor planned the theme to be taught, and discussed about pupils and ways of action in a practice class. A preliminary meeting (PM) was arranged two days before each practice lesson (cf. Jarvis, 1984, 336), and it lasted about one hour. Every student teacher made a period plan and a lesson plan beforehand. In the period plan; they described topics, timetables, major aims, contents, methods, pupil tasks, and evaluation processes on a general level. They planned integration and differentiation and determined core concepts of the theme. Lesson plans were based on the period plan. In them, student teachers planned cognitive, affective and psychomotor aims and concrete teaching, studying and learning actions in more detail. For example, they checked places, materials and equipment taking pupils into account individually and in groups. In the preliminary meeting, the emphasis was on consciousness of aims.

During practice lessons (PL), the core aim was to foster consciousness of the relation between situations and stated aims. After a practice lesson there was a short immediate feedback (IF) (about 15 minutes). Its main aim was to reflect on feelings, and to give a possibility for student teachers to get feedback for personal development. The deep feedback meeting (DF) was arranged the next day after a practice lesson. It lasted about one hour. The student teachers reflected on the practice lesson by writing a study diary in preparation for this meeting. They also selected questions to be discussed. The main aim was to foster consciousness about goals, situations and methods when teaching Biology and Geography. At the end of a practice period, a meeting was arranged for final evaluation (GM3), where the student teachers and the supervisor reflected on experiences of the practice period. The major aim was to develop consciousness of educational goals and holistic conception of teaching Biology and Geography. (Cf. Sutton, 1970; Jarvis, 1984; Boud *et al*., 1985.)

Data gathering methods and types of data

As per the principles of the case study method, the approach of the research was holistic and multiple techniques of data gathering were used in it. The data gathering procedures for the study involved teaching practice reports and study diaries written by student teachers, and recordings and videotapes of supervision meetings and lessons. The first part of the data was collected in autumn 1992, the second part in spring 1993, and the last part in spring 1994. The final data consisted of 42 teaching practice reports and study diaries, 40 recordings and 30 videotapes. The data was comprehensive concerning the conceptions of 42 of the student teachers. The conceptions of eight of the student teachers were not taken into account in the final report, because the data was not comprehensive. The validity of the used collection methods was ensured using systematic participating observation during the supervision meetings and the practice lessons. The use of different methods as well as different times of data gathering allowed the comparison and validation of data (method and time triangulation) (Cohen & Manion, 1990, 269-277).

Data analysis

The research is descriptive. In the description, the focus is not only on the commonalities in the participants´ conceptions, but also on developmental questions, as well as on deviations from typical conceptions; that is, `negative and discrepant cases´ are highlighted.

The teaching practice reports, study diaries, recordings and videotapes were all fully transcribed. The data was analysed by using inductive and deductive content analysis methods (Pietilä, 1976; 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. An attempt to guarantee this was made by using the kind of data gathering methods that allow space for the student teachers´ own voice. (Cf. Eisenhart & Howe, 1992.) Although some preliminary research questions were posed beforehand, the research was also held open for new insights and questions arising from the empirical world.

What was striven for in data analysis and presentation, was an accurate description for which material was reduced and ordered (Morse, 1994, p. 224). Deep analysis by reading findings over and over again, and occasionally going back to the raw data for comparative checking, provided concepts and relationships that `turned up over and over again and thus appear to be significant´ in student teachers´ growth (cf. Strauss & Corbin, 1990, pp. 50-51).

Findings with discussion

During the practice period, the student teachers became acquainted with new pedagogical approaches and made efforts to implement them in the practice classrooms in the training school in the University of Oulu. According to the student teachers, their awareness of themselves as teachers and of teaching of Biology and Geography developed during the final practice period.

At the beginning, most of the student teachers (42/50) were nervous and reflected on their status. Most of them (38/50) discussed only single lesson plans. The results support the observations of Lauriala (1997, 271), who has called this phase a disorientation phase. It is followed by an orientation phase (Sacks & Harrington, 1984, 154-163) where student teachers are unsure about subject content knowledge and working methods (Fuller & Bown, 1975). Also in this research, the student teachers (37/50) were unsure of concepts of Biology and Geography, and wanted to develop themselves in these areas. According to Gunstone *et al*. (1993, 47-73), professional growth starts in this phase. At the end of the period, the student teachers (41/50) expressed that they were no longer nervous to the same extent and that their self-confidence had increased. They (34/50) started to consider lesson plans in relation to the period plan more and more holistically. They also started to use other information sources beside textbooks (37/50), and to put

emphasis on many-sided aims and learning processes, instead of facts, as the basis of teaching situations (38/50). They (41/50) considered the work of a teacher as a whole and discussed on what kind of teachers they want to be. Lauriala (1995, 23) has called this third phase an exploration phase. The results support also the research of Papoulia-Tzelepin (1996). According to Wubbels *et al*. (1993, 147), this kind of development is part of personal professional growth, and is typical when practicing in authentic situations.

According to Lacey (1977), the term ´strategies` means action-idea –systems connected to each other via principles or goals (Woods, 1990). Strategies used by teachers are classified into pedagogical, social, coping and professional strategies (Hargreaves, 1979; Prawat, 1989; Lauriala, 1995, 1997, 2000). The pedagogical strategies are meaningful reactions developed by teachers and student teachers, when encountering problems or difficulties (Hargreaves, 1979, 75). The results of pedagogical strategies in this research support the results of Lauriala (1997). Most of the student teachers (39/50) reported that they tried to move from traditional teaching methods to active, many-sided learning methods. They stressed the opinion that respecting and trusting pupils (42/50) and giving responsibility to them (39/50) is important. New ideas and action changes are part of professional growth in the cognitive area (Niemi, 1992; Gunstone *et al*., 1993; de Jong *et al*., 1999). The results are at least partly explained by the openly stated aims of the curriculum of the teaching practice period. Only three of the student teachers told that they used traditional methods instead of new ones. This can be a result of them adopting a certain technical orientation (Hartnett & Naish, 1980) or pedagogical strategy (Woods, 1990).

Lacey (1977, 67-72) has classified social strategies into situational adjustment and strategic redefinition. The former can be either an external or internalised adjustment. In this study, none of the student teachers changed their social strategies during the practice period. Most of them (34/50) followed the practices of the training classes they were teaching in. 31 of them used internalised adjustment strategy, which means they thought that all things considered, the strategies selected by the class teacher were the best ones both for pupils´ development and their own professional growth. Three of the student teachers acted using external adjustment. They told that they followed the guidelines of the class teacher although they did not accept them. (Cf. Lacey, 1977, 67-72.) Tillema (1997, 209) has stated that some student teachers have difficulties when changing their teaching and learning conceptions. Only nine of the student teachers changed patterns or habitual ways of acting in classrooms. Their strategy was strategic redefinition (cf. Lacey, 1977, 67-72). The results support the research of Tann (1993, 62).

Coping strategies are constructive and adaptive strategies (Hargreaves, 1979, 75-77). They help teachers and student teachers to cope with external pressure and hindrances (Lauriala, 2000, 5). In this study, coping strategies used by most of the student teachers (33/50) were action (cf. Woods, 1980, 23-24), interpretative (cf. Lauriala, 1997, 98), and pedagogical strategies (cf. Denscombe, 1980, 62-63), such as traditional teaching methods and adjustment strategies. The results support earlier observations that student teachers try to cope with problems during lessons using discipline, rituals and routines (Kagan, 1992, 129-169). Only one used humour (cf. Denscombe, 1980, 62-63).

In this study, the professional strategies of the student teachers developed through tutorial collaboration (cf. Rosenholtz, 1989, 102-103) and reflective, theory-based discussions with peer students, the class teacher and the supervisor (cf. Zeichner & Tabachnick, 1982; Zeichner & Liston 1985, 155-174). The most important factors supporting the professional growth mentioned by the student teachers are listed below:

- Supervision is based on the needs of a student teacher and is individual and supporting (42/50)
- A student teacher is allowed to present questions on problems (42/50)
- A student teacher gets didactical guidelines (42/50)
- Relationships between a student teacher and a supervisor are democratic (42/50)
- Feedback is positive and correcting (42/50)
- The first supervision meeting is arranged before a practice period (29/50)

In addition, a fifth of the student teachers put emphasis on a good co-operation between all student teachers. Only one student teacher wanted to work alone. The most important preventing factors for professional growth mentioned by the student teachers (42/50), were hurry and lack of time.

Based on the results presented here, it is however impossible to draw any long-term conclusions on the influences on professional development of student teachers, due to the results being based on the conceptions of the student teachers in these specific contexts, and the short length of the study period researched. To confirm whether there were long-term changes in their conceptions on teaching actions, further research on the group is required, when they work as teachers in schools.

Conclusions

Development of school practice and teacher education can be discussed, on one hand, concerning education in initial teacher education, and on the other, in the In-service level. In this study, student teachers suggested that the focus of supervision during the final school practice period should be in didactical issues. The idea is similar to the one stated by Cochran *et al.* (1993, 268). If studies in educational sciences formed a strong basis for professional growth, it would be possible to change the focus later on, from learning contexts, to the teaching of subjects such as Biology and Geography. Instead of the traditional supervision meetings, arranged in contact education, it could be useful to emphasise open and distance learning methods. From individual supervision systems, it could be worthwhile to move into group processing, especially at the end of the final practice period. Beside individual and group discussions, it could also be interesting to use different kinds of action methods (e.g. drama pedagogic, role playing or simulations). Peer tutoring could be useful; student teachers could possibly discuss more freely without the presence of external authority. The ecological validity of the teaching practice would be better, if only the first of the practice periods was arranged in a training school and the others in field schools around the country and the world. Some of these ideas are currently already being experimented with in the University of Oulu.

Context and values issues should be stressed more, both in initial and In-service education. This is important because teachers should be able to observe and value environmental and human rights problems. They should be willing to construct connections, not only with parents, but also with society. Initial teacher education and In-service education should be linked to each other. The teacher educators should participate in professional In-service education more than they currently do. Based on collaborative research and development projects between teachers and teacher educators, it would be possible to create a strong and prestigious professional teacher culture, basing on shared expertise and responsibility, and continuously developing theory.

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Резюме

РАЗВИТИЕ КОНЦЕПЦИИ ПОДГОТОВКИ СТУДЕНТОВ – БУДУЩИХ УЧИТЕЛЕЙ БИОЛОГИ И ГЕОГРАФИИ

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Цель этого исследования - интерпретировать профессиональное развитие учителей, акцентировав его именно на профессиональной Концепции образования учителя начальной школы для группы студентов во время их педагогической практики, преподавая биологию и географию. Во время практики студенты – будущие учителя ознакамливались с новейшими педагогическими подходами и пытались внедрить их на практике в специальной школе университета Оулу. Всего 50 студентов было задействовано в исследовании. Эмпирический материал был собран за период с 1992 по 1994 год. Выводы делались, основываясь на каждодневных наблюдениях и отчетах о практике, составленными студентами, а также на аудио и видеозаписях отчетных собраний и уроков. Анализ данных проводился, используя как индуктивный, так и дедуктивный методы контент-анализа. Интерпретация главным образом фокусировалась на более типичных и наиболее уникальных идеях студентов – будущих педагогов.

Во время своей практики студенты развивали в себе самосознание в качестве учителей биологии и географии. Начиная практику, они только обдумывали свой статус, а заканчивая, в свою очередь они уже могли судить о работе учителя и какими учителями они желают стать. Студенты высказали мнение, что они не слишком долго волновались из за объема знаний, которые им надо учить, так как росло их собственное самосознание. Следует заметить, что они высказались также о своей неуверенности в знаниях преподаваемых дисциплин, и методах работы, но хотели развиться в этих областях. Они начали больше дискутировать об учебном плане и содержании знаний преподаваемых дисциплин. Студенты

– будущие учителя осознали насколько важно уважать своих учеников. Они начали акцентировать учебный процесс не на фактах, а на практических ситуациях. Они перешли от традиционных методов преподавания к активным методам обучения. Никто из студентов не изменил свою социальную стратегию. Большинство студентов следило за прохождением практики в специальных классах, где они преподавали. И только каждый пятый отошел от модели привычного пути поведения в классе. Стратегии, использоваемы студентами, переносились на различные другие ситуации. Они писали, что их профессиональные стратегии совершенствовались за время практики. Общая совместная работа и дискуссии, основанные на теоретических знаниях, помогали их профессиональному развитию. Значительную роль сыграла также поддержка учителей школьы и коллег.

Неоспоримо, что можно составить содержательное заключение о влиянии на профессиональное развитие студентов, сделанное на результатах, основанных на мнениях студентов – будущих учителей в этой специфической области, а также на непродолжительном периоде обучения, который был оценен всего лишь 8 кредитпунктами на группу (один кредит приравнен к 40 часам работы). Удостовериться в этом возможно в прогрессивных измениях собственных убеждений о школьных занятиях, и в позже запрошенных исследованиях в группах, когда они уже работают учителями в школах.

Ключевые слова: профессиональное развитие, профессиональное мнение, стратегии студентов – будущих учителей, школьная практика, отображение.

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