



Understanding the variation in bioscience students' conceptions of learning in the 21st century



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ABSTRACT

Recent qualitative studies about students' conceptions of learning have been scarce. The present study explores university students' conceptions of learning in biosciences. The analysis was conducted by applying a phenomenographic approach. Five different categories of descriptions of conceptions of learning were found: (1) Reproducing knowledge, (2) Using knowledge in practice, (3) Integrating new knowledge with prior knowledge, (4) Evaluating different views and (5) Creating one's own worldview. The present study showed that conceptions of learning were relatively sophisticated and strongly emphasised integrating knowledge of different phenomena. Furthermore, the present study suggests that a shift in students' conceptions of learning has taken place in the 21st century where students do not emphasise increase of knowledge in their learning.

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1. Introduction

Universities are facing the challenge of educating students as life-long learners capable of critical thinking, problem solving and other work-life requirements (Dochy, Segers, & Buehl, 1999). One way of exploring students' critical thinking and argumentation skills is to explore their beliefs and conceptions about learning, which are strongly related to a student's learning process (Sinatra, 2001). Encouraging deep-level understanding in a student whose conception of learning emphasises knowledge transfer can be difficult (Light, Cox, & Calkins, 2009). Thus, understanding students' conceptions of learning is important in understanding how to enhance the quality of student learning. Recent in-depth studies about university students' conceptions of learning have been scarce. The majority of previous qualitative research concerning students' conceptions of learning has been carried out before 2000 (Eklund-Myrskog, 1998; Marshall, Summer, & Woolnough, 1999; Marton, Dall'alba, & Beaty, 1993; Säljö, 1979; Van Rossum & Schenk, 1984). These earlier studies have shown a large variation in students' conceptions but at the same time the conceptions, which have emerged, have emphasised memorisation and reproduction of knowledge (Marton et al., 1993; Säljö, 1979). For example, in a study conducted by Marton et al. (1993) in an open university introductory course, 12 of the 29 participants experienced learning as increase of knowledge. This study of Marton et al. (1993) is a pioneer article which is still a widely cited and an essential research concerning students' conceptions of learning. However, the needs of working life and universities have changed since 90', and thus, new in-depth studies of university students' conceptions of learning needs to be examined in order to see, whether the variation and distribution of conceptions have changed to according the new needs of working life and universities.

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Different disciplines in universities have different learning cultures (Ylijoki, 2000). In addition, students in different educational contexts can experience learning in different ways (1998). The Faculty of Biological and Environmental Sciences is a highly research oriented faculty where teaching is based on recent research in the area. The courses include mostly lectures and practical laboratory work, but also field courses, seminars and web-based teaching. Learning culture in the faculty is very heterogeneous because of the various subjects it comprises. In the Faculty optional courses are emphasised more than compulsory courses. Students can choose courses from a wide range of optional courses. Biology students, for example, can choose their learning paths from among 19 possibilities.

In biology, rote learning is also an important part of developing understanding. According to Donald (2002) biology is a heterogeneous area of science where students are expected to study facts and details and they feel that examinations stress more memorisation than students in other courses. In the Faculty of Biological and environmental Sciences first year students are introduced with a large variety of subjects and further studies emphasise expertise in one subject area. According to Virtanen and Lindblom-Ylänne (2010) bioscience students viewed learning mostly as the transmission of information, the collection of facts and the practical use of knowledge, whereas teachers' conceptions emphasised critical thinking, problem solving and independence in learning. In addition, time management and effort in studying as well as other students' support have been found related to study success in the first year of studies (Rytkönen, Parpala, Lindblom-Ylänne, Virtanen, & Postareff, 2012). Thus, understanding students' beliefs about learning especially in the context of biology is crucial.

1.1. Conceptions of learning

In the late 1970s, Säljö interviewed 90 participants about their conceptions of what learning means to them and found five qualitatively different conceptions of learning: learning as (1) *quantitative increase in knowledge*, (2) *memorising*, (3) *the acquisition of facts which can be retained or utilised in practice*, (4) *the abstraction of meaning*, and (5) *an interpretative process aiming at understanding reality* (Säljö, 1979). In other studies similar categories have emerged (Eklund-Myrskog, 1998; Marshall et al., 1999; Van Rossum & Schenk, 1984; Virtanen & Lindblom-Ylänne, 2010). Marton et al. (1993) found similar results when exploring students' conceptions of learning in the Open University and differentiated a sixth conception of learning: *learning as developing as a person*. In a study by Van Rossum and Taylor (1987) a sixth conception also emerged, which they called *self realisation*. These six conceptions have been divided in to two general categories: the first three emphasise reproduction in learning and knowledge as something given, whereas the last three focus on transforming or constructing knowledge and emphasise the meaning of learning (Marton et al., 1993).

Students' conceptions of learning are seen as relatively stable (Richardson, 2011) but they are related to students personal epistemologies, self-regulation and motivation (Lonka & Lindblom-Ylänne, 1996). Students' conceptions of learning are also closely related to their approaches to learning (Edmunds & Richardson, 2009; Lonka & Lindblom-Ylänne, 1996; Marton & Booth, 1997; Minasian-Batmanian, Lingard, & Prosser, 2006; Van Rossum & Schenk, 1984). Students' conceptions of learning, which emphasise knowledge transfer, have been found to be related to the memorising and repetition in learning, and conceptions which emphasise the construction of knowledge are related to the relating ideas in learning (Chiou, Liang, & Tsai, 2011).

The aim of the present study is to explore variation in students' conceptions of learning at the university level. In addition, the present study explores how students' different conceptions of learning are distributed. Universities are going through changes where objectives of learning have changed over time to promote students' diverse expertise which would be equivalent to the needs of the working life. From the working life perspective students are need to develop deep theoretical knowledge of their own field, willingness to lifelong learning and ability to constantly develop one's own expertise (Ministry of Education, 2009). Conceptions of learning may and should have changed during the last decades, and thus, new in depth research on students' conceptions on learning is needed to explore how these aims have affected students' conceptions of learning. Furthermore, studies concerning university students' conceptions of learning have been especially scarce in sciences. We expect the variation of students' conceptions to be extensive, because different students experience learning in different ways (Virtanen & Lindblom-Ylänne, 2010). We also presume that students' conceptions of learning are more complex in the 21st century than before that, because of the new challenges in learning at the universities.

2. Method

2.1. Participants

Altogether 24 students voluntarily participated in the present study comprising 6 male and 18 female students studying in two Bachelor-level courses in the Faculty of Biological and Environmental sciences. The student group participating in the present study was quite heterogeneous: 17 of the students had their major subject in the Faculty of Biological and Environmental Sciences, and six of them majored in other Faculties – namely two biotechnology students, three chemistry students, one mathematics student and one student studying education the participants comprised five first-year students, eight second year students, five third-year students, and six students who had studied at the university more than four years.

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