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IN EDUCATIONAL SCIENCES 140

Airi Rovio-Johansson

BEING GOOD AT TEACHING

Exploring different ways of handling the same subject in Higher Education

ACTA UNIVERSITATIS GOTHOBURGENSIS

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Errata

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65	2	1	All lectures and ...	Delete the sentence.
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129	1	2	There are ...	Delete the sentence.
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av

Airi Rovio-Johansson

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To the students and
their teachers in
the universities

ABSTRACT

Title: Being good at teaching: Exploring different ways of handling the same subject in Higher Education

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This investigation has had three main aims. The first was concerned with revealing and describing the different ways three teachers presented, varied and handled subject matter during three specific lectures in Management Accounting in Higher Education with first year students. The second was to examine the qualitatively different ways students experienced and apprehended the content of the lectures. The third, the main objective of the study, was to investigate the possibility of developing a model for observing, describing and analysing teaching skills in Higher Education.

The investigation involved three lecturers and fifteen first year undergraduate students. The empirical data consisted of three subsequent video recorded lectures by the three lecturers, comprising eighteen hours of video taped material. Five students from three different lecture groups were also interviewed after each lecture making forty-five recorded and fully transcribed interviews.. The students´ experiences and understandings of the subject matter were investigated through a problem solving process where the content of the problems was related to the lectures. The theoretical rationale for the analysis of the empirical material comes from the latest development within phenomenographic research, the theory of variation.

Differences between the three teachers´ ways of presenting, varying and handling the same lecture content were found and expressed in subject matter terms. The differences of the students´ experiences and understanding also expressed in subject matter terms seemed to be systematically related to the different ways in which the content of the lectures was handled by the teachers. content. The teacher teaching objects and the students´ learning objects revealed clear similarities. A model of description for observing and analysing teaching in Higher Education was developed.

CONTENTS

ACKNOWLEDGEMENTS

Having been a university teacher for many years I thought I knew something about teaching and learning life in Academe when I started the present thesis. However, I did not, as I had only a teacher´s perspective or only a student´s perspective and not both perspectives at the same time. Investigating both sides of an ongoing learning process has been a thrilling adventure.

The Council for Educational Development at Göteborg University was established and began its work the autumn semester 1989, as an advisory group in educational research and development and continued its work up to June 30, 1993. The members of this group were appointed by the then vice-chancellor professor Jan S. Nilsson, who also commissioned me to be included in the group as an educational consultant. The head of the Council was professor Ference Marton. The board, which consisted of faculty representatives from six different faculties, made me to believe that almost everything concerning the development of teaching and learning in the university was possible to accomplish, even without economic resources. I started to discuss many of the ideas which I had been carrying for many years with Ference Marton because of this. These ideas finally took the form of doctoral work.

The present vice-chancellor professor Bo Samuelsson was a keen member of the Council and he has ever since carried out sincere efforts to put learning and knowledge formation on the University's Agenda. The former vice-chancellor Jan Ling supported this Council by establishing a formative role for the Council as a committee for educational research and development, named the "Delegation for Institutional Quality Management", July 1, 1993.

Writing a thesis is a lonely and demanding work which you can not manage alone. I would like to thank my supervisor Ference Marton for excellent and challenging support, advise and a presence

throughout the work. I believe that the feasibility of the work depends on a continuously ongoing dialogue with the supervisor. Even after he had moved to Hong Kong as a visiting professor there, he still supported an ongoing dialogue. Even if the answers turned out to be shorter and shorter, he still answered. Thank you Ference for the excellent, creative and supportive discussions. I would also like to honour Roger Säljö for his ability to be supportive, positive and critical in reading manuscripts in different stages of the work during Ference Marton´s Hong Kong year. Thank you Roger for much good advice and good discussions. Thank you also my subject matter expert, Jan Marton, a lecturer in Management Accounting, who has given me much valuable advice during this time period. In his gentle way, he has also made signal fires when I have reached thin ice. The teachers and the students, who have supported the study with their participation, I thank sincerely. I hope that the thesis can challenge you to meet new teaching opportunities and new learning activities in the future.

The departmental context is important from many perspectives. Returning to "the father's home", which for me is professor Kjell Härnqvist´s department, I have met old and new colleagues, post graduate students and friends. They have all been available for endless discussions. My gratitude to them includes colleagues in many different departments and faculties and also colleagues and friends on all floors in the university´s main building. It is not possible to mention any names because I might forget one. So I prefer to say "Thank you all".

Finally I would like to express my gratitude to my family. My husband Roger, my daughter Sofie and her husband Dimitrios and their daughter Emelie; also including the supportive relatives and the family friends. A special thank to my husband for his ability to put up with such a non social person as I have been during the months when I have finished the work.

Partille, July 1999

Airi Rovio-Johansson

I. INTRODUCTION OF THE RESEARCH PROBLEM

Chapter 1

INTRODUCTION

The Universities in transformation

The 80s and the 90s are decades during which the universities and university systems in the Western European countries have been continuously exposed to different social, economic, institutional and political transformations. The Institutions of Higher Education have changed radically during centuries as well as during the last decades. More recently the history of universities and the effects of structural changes of Higher Education systems in Western European countries have shown that more market-oriented aspects of the university reform movement have been emphasised and have become the subject of intensive research. The consequences of the phases of transformation during the last century have turned out to be more and more intensive due to changing systems of politics, economy, the funding of Higher Education, and a continuously changing society with varying and mostly increasing proportions of age cohorts in education and "adult students in life long learning" education. During the 90s, the constitutions of the institutions can be characterised by a highly marked differentiation in structures and functions, which has brought identity problems for many universities as a consequence.

The institutions of higher education Europe-wide have had to cope with an exceptional increase of students, and the Swedish Higher Education system is no exception. The trend is from an elite university system towards a mass higher education in the next millennium when a university education of all people will be an expectation of the government. The funding of higher education

seems to be a severe problem on different levels in the organisation, not only on the governmental level but also on an institutional level. When the amount of the governments´ financial support to higher education goes up, "demands for greater accountability naturally increase and the bureaucratic intervention seems to rise almost exponentially" (Shattock, 1995, p. 158). In the beginning of this decade, this trend was discernible in Western European countries and supported a particular kind of development inside institutions, when economic crises become a reality.

> The conscious evolution of a differentiated mission in itself exposes difficult options. Some universities try to aim for international academic recognition and standards: long-term perspectives, fundamental research, theory orientation, publications through respected scientific journals, training for academic careers, research orientation. Other universities have taken shorter time perspectives: applied research, consulting work, advisory role, fewer publications, less generelizable theoretical work, more focus on local needs and direct answers to economic and social problems (Davies 1991, p. 229) .

Different research projects in the transformation of the universities have been focused on structural changes of domains like institutional autonomy and economy, funding support from Governments, national quality assessments of institutions, student enrolment, students and the changing labour market, changes in management structures, changes in the structural life of academe, and the relation of the institution to society and market orientation (Askling, 1998 a, 1998 b; Bleiklie, 1998; Clark, 1998; Davies, 1991; Maasen, 1996; Scott, 1995; Teichler, 1996 a, 1996 b, 1998;).

University education and evaluation

In the perspective of the ongoing transformation of higher education systems, each institution is an actor which tries to control and to co-ordinate higher education and public interest with market demands. The political influence through resource allocation systems has been more visible during the last decades for instance in Sweden, as in many other countries due to demands of accountability, quality management of teaching and research. Dill

(1998) and Henkel (1991) noticed a rise of an "Evaluative State" in which the state, the market and the academic oligarchy function as potentially competing policy instruments, aiming at social changes with continuously increasing total costs (Clark 1983).

The national and international assessments of Institutional Quality Management has in different ways focused on the output from education. The strategies for quality assessments have varied in Western European countries due to the existence or non-existence of National Agencies for assessments of Institutional Quality Management in Higher Education. International Peer-Review Systems for Research used for evaluations and assessments of research are working systems administered by the Research Funding Councils in Sweden. Similar systems exist in many Western European countries. For assessments and evaluation of education, particularly teaching, comparable systems are lacking. Education has most often been assessed in terms of the number of students, who have graduated per year, or the number of students passed per examination related to their study programme. The quantitative flow of students through the university programmes and courses have been reported in terms of input and output figures per year related to governmental funding. When assessing the output of education in quantitative terms, there are politicians claiming that it is an indirect assessment of the teaching quality of the institution.

In this study, the main interest is not an evaluation of the teachers´ teaching activities, but rather an investigation of what activities are taking place, how these might be observed and analysed, how they seem to affect learning conditions created by the teachers and the students in cooperation and ultimately the student´s learning. Therefore it is of importance to differentiate and distinguish between different evaluative activities of teachers in Higher Education. For instance, Ramsden and Dobbs (1989) distinguish between "evaluation", "appraisal" and "performance assessment".

An *evaluation* of teaching means the ordinary feedback a teacher wants to have after a lecture or having finished a course. It can be

regarded as a teacher´s process of judgement from collected information about his or her own work, aiming at "actions that might be taken to improve student learning through changes of curriculum, teaching methods and student assessment" (ibid., p. 2). This definition seems clear but it misses in my opinion distinctions between formative and summative evaluation, formal and action evaluation, process evaluation, production evaluation, product evaluation, process product evaluation, end-means evaluation, democratic evaluation, clinical evaluation, peer evaluation (or review) and is thus rather indiscriminate.

An *appraisal* of teachers is about management. In this case it is a judgement of the teachers´ effectiveness[1], a "top-down activity, focused on individual performance, but it does not have to be a punitive or negative one" (ibid., p. 2). Evaluation and appraisal are regarded as diagnostic and often considered in the praxis of educational development as a way to help teachers to develop and improve their performances. This definition is also difficult in not distinguishing very well between evaluation and appraisal.

A *performance assessment* is a top-down judgement of a staff member by the management and emphasises rewards and punishment since "its focus is on whether a member of staff has achieved or is maintaining a standard" (ibid., p. 3). The extrinsic character often means it is competitive, and from a teachers´ point of view, regarded as a classification of teachers and a method to promote them or to give an account for tenure.

Teaching and teaching skills

Teaching has more or less always been under the scrutiny of several different interest groups. Sometimes directly with the students, the teachers and their professional organisations, white collar and trades unions and the institutional management. And

1 "Effectiveness" is here interpreted as a question of external validity, meaning that the teachers activities are assessed as 'the correct activities', in this case by the society.

indirectly through inspections by representatives for the Government and stakeholders. Evaluation of teaching and the assessment of teaching qualities and teaching excellence have been intensively discussed in our country by the Commissions of Higher Education of 1970 and 1993.

Teaching in a university setting is a complex process that involves a number of interrelated factors. There are not one but several valid ways of teaching and even in an ideal teaching situation there are factors involved preventing optimisation (Brophy and Good 1988). Learning, in the same setting, is also a process, which is affected by many different interrelated factors. Teaching and learning will further on be focused, investigated and analysed further on in the present text in a specific departmental context.

The Commission of Higher Education 1970 (UPU 1970) discussed teachers´ competencies in teaching and stipulated particularly the need for excellent knowledge in the subject matter domain. The commission recommended a development of teaching methods, from transition methods to supervising methods. When discussing how to evaluate teacher´s merits, the Commission mentioned pedagogical development, experiences from teaching, development of objectives of courses and production of teaching materials. However, these together could not compensate excellent subject matter knowledge it was stated (ibid., p. 81). Teacher´s skills, effectiveness and teaching quality were not discussed.

The Commission of Higher Education 1993 (SOU 1992:1) focused on the university teacher's two roles: the role as a teacher and as a researcher. Consequently those two roles are included in the concept *"teacher skills"*[2] (ibid., p. 194). The Commission argued for a balance between these roles, which is possible in the ideal case. The concept of *"teaching skills"*[3] the Commission "reserved to

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2 There are some difficulties to find the corresponding words in English for the Swedish originals. Here "teacher skills" is used as equivalent to the Swedish "lärarskicklighet" (teacher skilfulness/proficiency).

3 Here "teaching skills" is used equivalent to the Swedish "undervisningsskicklighet".

indicate the teacher´s skilfulness and ability to communicate and interact with the students during teaching, education, examinations and supervisions" (ibid., p. 194; my translation;). An additional concept is *"pedagogical proficiency"*[4], which in the beginning of the 90s, was assessed as a necessary complement to research excellence when an academic was applying for a position as a professor or lecturer (Andersson, Jönsson, Mörnsjö and Rovio-Johansson, 1991 a; 1991 b). The Commission made an exposition of these different concepts, where *"pedagogical proficiency"* included the pedagogical merits of the individual teacher. Institutional programmes for the development of teachers´ pedagogical competence were recommended by the Commission. Few national attempts to evaluate teaching quality have been reported according to the Commission (SOU 92:1. pp. 188-191).

Here the Commission mainly relies on studies of "appraisals" reported from the UK with reference to "Audits", which at that time were regarded as assessments of Institutional Quality Management. The 1993 Commission's recommendations for the future development and evaluation of teacher skills included several activities such as "teachers´ self evaluations", collegial assessments and course evaluations. These suggestions have to be interpreted as recommendations, which imply using more than one form of evaluation when evaluating teacher skills (Dahllöf, 1991, 1995).

In a review of research on student evaluations of teaching in higher education, Dunkin and Barnes (1986) looked for studies using process variables as instruments for evaluating teaching. This criterion was fulfilled by a few studies and they have to exclude the great majority of studies of students´ ratings of teachers´ performances and effectiveness. This fact stresses the difficulty in producing reliable instruments for the evaluation of teaching and for making comparisons between different studies. At that time, little research evidence could be found on the usefulness of students´ ratings (ibid., p. 772).

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4 "Pedagogical proficiency" is used equivalent to the Swedish "pedagogisk skicklighet".

What is the student asked to evaluate? Stringer and Finlay (1993) report from research on students ratings of courses that several common dimensions or groups of items have been identified. In "course appraisals", the two most common dimensions for evaluation appearing in the majority of instruments devised are course organisations and structure and course workload and difficulty" (ibid. p. 99). They noticed that the majority of instruments included evaluations of organisation of the course and of the student´s workload. However:

> Other categories include marking exams and assignments, the learning value of a course, the breadth of coverage, the general impact of the course on students (including 'liking value') and the global or overall effectiveness of the course (ibid. p. 99)

As in many other studies, the aims of evaluations as well as the instrument are multi-dimensional and the focus of evaluations become unclear or is missing from the students point of view. In the Göteborg University a descriptive study of instruments used in undergraduate education as students´ "course evaluations" during 1994/95, revealed several problems connected to course evaluations. For instance the instruments used in the departments seemed to fill several functions such as to give information and feedback to teachers in order to develop courses, to give new students information about the courses, to give students some influence on their education, to give the management information to control the quality of the course and to give the students ideas about what the teachers wanted to know etc. (Toshach Gustavsson, 1996).

Even on a general level these types of instruments are problematic however. Firstly, the questions asked are vague and consequently open up for a range of interpretations from the person who answers. Secondly, the interpretations of these answers are, from the interpreters perspective, difficult to understand.

There are several examples where students are asked to evaluate their teacher indirectly, by answering a question about a specific lecture. In this way the teacher´s identity and name is unknown for an external person but well-known for the students, the department

and course teachers. There are also examples of "scales" applied in these course evaluations, where the definition of the poles of the scale are missing. As Toshach Gustavsson points out it is not possible to evaluate what the students have been assessing in such cases.

> The questions about the different lectures are often not open questions. Sometimes the students are asked to evaluate a specific dimension of the teaching of a specific content. The students are asked to give comments on the teaching with respect to quality and the aspect is not specified as quality of teaching, instead examples are given (on a two pole scale) such as 'rewarding - not rewarding' and 'valuable - not valuable' [my translation] (ibid., p. 73).

There are other studies of teaching quality, which are using assessment data from students´ evaluations of courses in institutions.
This seems to reflect the attitude shared by many institutions to the assessments of institutional quality management. During the time, when assessments of Institutional Quality Management were introduced in Sweden, the Chancellor of the Swedish Universities on behalf of the Swedish Government, included representatives for the National Student Unions in the Audit groups, unlike comparable assessments in several European countries.

Higher Education is a domain where more knowledge is needed of teaching and the teachers and the effect of the teaching process in different subject matter domains. Consequently, there is a demand for the support of research focusing on the pedagogical dimension[5] of different subject matter domains. There is also a need of more knowledge about students´ learning processes and knowledge formation both in different subject matter domains and in different contexts (for instance in different forms of distributed education where IT supported media is used) and knowledge about how learning comes about in different groups of students (i.e. freshmen,

5 The expression "pedagogical dimension" stands for knowledge of how to teach and educate students in a specific subject matter. This is to be compared with the "historical dimension", which often stands for the knowledge of the historical development of a specific subject matter domain.

adult and experienced students related to different learning conditions etc.). Related to this is the evaluation of teaching skills, which has to be related to the teachers´ ability to present, vary and handle the subject matter during different educational forms (the lecture, the course, self directed and IT supported learning, multi media supported context). So far, the teachers´ competencies and skills in teaching are scarcely or never evaluated in relation to how the teacher presents, varies and handles the subject matter of the course.

Accounting for skills and competencies is difficult as long as the lecturer´s merits are not his or her research papers on teaching in his or her subject matter domain but his or her research papers on developing and applying a new methodology to a research question in an established research area. According to Boyer (1996) teaching is "often viewed as a routine function, tacked on, something almost anyone can do" (p. 23). As Boyer points out, the reality is still that teaching is not highly rewarded in many universities. Teachers who "spend too much time counselling and advising students may reduce their possibilities for tenure and promotion" (p. xii). Today, professional competence of academic teachers seems to mean not only professional subject matter knowledge but also teaching competence. Unfortunately, the pedagogical work behind teaching is easily unappreciated in academic cultures where the merits accounted for are research papers in the traditional sense.

What has to be done ? To use Boyer´s words, "scholarship has to be reconsidered". He notices that earlier "scholarship" referred to a variety of creative work, but now we mean something more restricted and limited to a hierarchy of functions. Time have changed and we have to scrutinise the way academic mandates are described. Research outcomes are not only theories but also practices. "Theory surely leads to practice. But practice also leads to theory. And teaching, at its best, shapes both research and practice".

Boyer (1996) is an advocate of four scholarships which all have to be reconsidered, i.e. the scholarship of discovery, of integration, of

application and of teaching. The scholarship of discovery "contributes not only to the stock of human knowledge but also to the intellectual climate of a college or university" (ibid., p. 17). The scholarship of integration means making connections between different faculties, subject matters/disciplines and putting subjects in broader contexts, all closely related to discovery. The scholarship of application means first of all application of knowledge and that service to society must be regarded as a serious and important activity of an institution.

> To be considered scholarship, service activities must be tied directly to one's special field of knowledge and relate to, and flow directly out of, this professional activity. Such service is serious, demanding work, requiring the rigor - and the accountability - traditionally associated with research activities (ibid., p. 22).

Concerning teaching as a scholarship, Boyer points out that preparations for teaching, follow up and evaluation, have to be linked to "the subject taught".

> Teaching is also a dynamic endeavour involving all the analogies, metaphors, and images that build bridges between the teacher´s understanding and the student´s learning. Pedagogical procedures must be carefully planned, continuously examined, and related directly to the subject taught (ibid., p. 23-24).

Boyer implies a reconsideration not only of the academic mandate but of the entire institution in a new context, which from his point of view is the society of the 90s. Boyer´s four scholarships challenge existing epistemologies, institutional structures, the relation between faculties, between subject matter areas and between research in different discipline domains as well as interdiciplinary research and education. As has been pointed out earlier, the evaluation of teachers´ merits and competencies is another area, which is challenged. If an institution wants to take these scholarly activities seriously, then a strategy has to be developed to ensure a research and research oriented approach of and towards them. This could mean a paradigm shift, at least if teaching is reconsidered and shifted from a traditional education paradigm relying on instruction to a learning oriented scholarship.

Theoretical rationale

From the beginning of the 1970s the approach to student learning named the phenomenographic was initiated and developed by a research group led by professor Ference Marton at the Department for Education and Educational Research at the Göteborg University (Alexandersson 1985; Dahlgren 1975; Hasselgren 1981; Kroksmark 1987; Lybeck 1981; Neuman 1987; Ottosson, 1987; Pramling 1983; Svensson 1976; Säljö 1975; Theman 1983;).

The focus of phenomenographic research has been on the qualitative differences of experienced, apprehended and understood phenomena. In a broader perspective this research tradition can be regarded as movement towards a human science based educational research from a behavioural and social sciences one (Strasser, 1985), and can be compared with an earlier but similar movement in psychology (Alexandersson 1981; Giorgi 1975; 1986; 1994;).

A comprehensive outline of the genesis of phenomenographic research can be found in *Learning and Awareness* by Marton and Booth (1997) and therefore there will be only a few relevant examples included from this research tradition in the present thesis. The present study is in line with the phenomenographic research tradition and its latest development, where teaching is investigated from a theoretical learning perspective. This perspective is grounded in a non dualistic ontology, where learning is constituted as a relation between the learner (subject) and the phenomenon (object) of learning.

A substantial number of phenomenographic research studies indicate that there seem to be a limited number of qualitatively different ways a phenomenon can be experienced. The aim of the early studies was to use interviews to study learning through the eyes of the learner, which was named the second order perspective[6].

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6 Marton (1981, p. 188) defines "the second order perspective" as the "statements-about- perceived-reality". See also Marton, 1995, p. 178.

The method in the phenomenographic research approach has been the research interview. During the analyses of transcribed data from interviews, qualitatively different ways of experiencing the phenomenon are coming forth and these "ways of experiencing" have been depicted by means of "categories of descriptions" (ibid., , p. 127). These categories of description usually form a hierarchy and together they constitute the "the outcome space"[7] of the investigation. Marton and Booth (1997) thematise the concept "experiencing" by analysing the structure of conceptions of phenomena. Marton (1994, p. 4427) concluded that "a certain way of understanding something is a way of being aware of it. Awareness is seen as a person's total experience of the world at a given point in time".

The phenomenographic research tradition has developed through discernible stages (Entwistle, 1997). From the beginning in the middle of the 70s the focus was on qualitative differences in learning (Dahlgren 1975; Säljö 1975; Svensson 1976), but as the development of the approach went on, studies became more directed towards qualitative differences in conceptions of different phenomena (Dahlgren and Olsson, 1985; Dahlin, 1989; Ottosson 1987; Wenestam 1980;). A great number of research studies followed, which investigated more general phenomena in education.

Bowden and Marton (1998) imply in *The University of Learning* that some ways of teaching seem to be more fruitful than others, and consequently that learning is seen as the development of ways of experiencing a phenomenon which are more fruitful due to an awareness of more critical aspects of the phenomenon. They stress the importance of improving the quality of student learning as a

7 "The outcome space" has been discussed as a concept. It is constituted by the categories of descriptions, usually formed as a hierarchy, denoting the different ways of experiencing a particular phenomenon which are found in analyses of respondents´ answers. Categories of descriptions, in the phenomenographic research tradition, refers to a collective level (a group) and means that "nothing in the collective experience as manifested in the population under investigation is left unspoken" (Marton & Booth 1997, p. 125).

means to support the students for future activities in a society of growing complexity.

The students total environment during their studies in the university will not be investigated in this study. Here the main focus will be on teachers and students and their subject content relation and cooperation during lectures. In this study the academic lecture means one teacher, lecturing in a specific subject matter (management accounting), in front of a group of students. The teacher is not talking alone continuously but trying to communicate the subject matter with the group of students by arguing, questioning, telling, problem solving, inquiring and negotiating.

The question of how to improve the learning conditions, the potential for learning and the learning environment for the students, has often been met by changes in teaching methods and the planning and development of delivery systems in Higher Education. There seems to be few studies done directly on student learning during the 90s in higher education, indicating improved student learning, as a result of changes in teaching methods or as a result of new teaching methods having been introduced (Beach, 1997; Bowden and Marton, 1998; Engwall, 1998;).

The aim of the study

Teaching in Higher Education in Sweden, as in many countries, has institutional and internal determinants influencing its activities as well as the effect of governmental resources and formal rules stated in the Higher Education Law (SFS 1992:1434) and the Higher Education Ordinance (SFS 1993:100). There are many factors influencing teaching, student learning and the departmental context. In Sweden, as in most western European countries, there are no formal teaching qualifications demanded by the authorities in order to become an academic teacher in the university and the university college. The excellence in a discipline seems still to be enough for lecturing, tutoring and supervising students on undergraduate as well as on graduate levels.

Focusing on merits does not mean that formal merits can be regarded as a guarantee for excellence in teaching performance or specific personal skills. Teaching assistants are often newly appointed teachers, starting to teach or supervise for instance students´ laboratory work, group work or group discussions, in a department's education. These teachers grow in experience and sooner or later some of them become lecturers. At that time the "teaching culture" of the department has been mediated to them.

There are organisational variations in different departments due to the number of students in undergraduate education. These variations can sometimes range from 250 students to 40 in a lecture group, which are two different teaching situations if you are the lecturing teacher. The organisation of group work and supervision of students is even more difficult, if the number of students varies too extensively. The characteristics of the students and of the teachers vary as well and they all influence each other mutually. They come together in an institutionalised context, where the context itself has the power to influence the teaching and the learning activities of the students.

It is extraneous to the focus of the present study to analyse all of the multitude of variables influencing teaching and learning as institutionalised phenomena in Higher Education. Rather, the present study focuses on some of them only, in a teaching and learning context in Management Accounting for first year students in the subject named Business Administration, in the School of Economics and Commercial Law at the Göteborg University.

In the discussions about "scholarship of teaching", "teaching skills", "pedagogical proficiency", factors affecting those capabilities, ways of assessing them have frequently been touched upon. More rarely has the nature of those capabilities been focused on and to the extent it has, it has been discussed in general terms such as in terms of being sensitive to the students´ perspectives, being good at stating aims, communicating with the students and assessing their achievements. It has also been pointed out - as was mentioned above - that deep insight into the subject matter are

essential for teaching. Oddly enough, hardly ever has the fact been discussed, that the very same content can be structured and angled in different ways, viewed from different perspectives, being given different emphasise. Nor has it been very much recognised that such qualitative differences in the way the object of teaching is dealt with might have important implications for how the object of learning is made sense of by the students. In this respect such content-related differences are in all likelihood fundamentally relevant to the question: What does it take "to be good in teaching"?

But do such differences really exist on the undergraduate level in highly structured content domains? Are the views on "the barriers" of the disciplines not agreed upon and standardised sufficiently to rule out this kind of variation? And if there are still some subtle differences between different teachers´ ways of teaching with the same content, does it make any difference as far as the students´ learning is concerned? These are the general questions I am setting out to illuminate and I will do so in a specific context.

The aim of the study is to investigate:

- the different ways a specific subject matter in Management Accounting is handled by teachers, during three particular lectures in Higher Education
- the different ways the students experience and apprehend the content of these three lectures in Management Accounting in Higher Education.
- the possibility to develop a model for observing, describing and analysing teaching from a theoretical learning perspective.

The teachers participating in the study are experienced lecturers in Business Administration. The students were finishing their first year of studies at the University and participating in a course, "Accounting in Organisations", included in the first year of a four year programme for economists.

In this study a first order perspective[8] is applied in the analyses of the lectures and a second order perspective is applied in the analyses of the student interviews.

> From a first-order perspective the researcher´s focus is on the object of research, and her experience (i.e., the constitutive acts of her awareness) is bracketed[9]. But even from a second order perspective the researcher´s focus is on the object of research (other people's ways of experiencing something), and again her experience is bracketed. In one case the world is focused on and experience bracketed. In the other case experience (of others) is focused on and experience (the researcher's own) is bracketed (Marton and Booth, 1997, p. 120).

The distinction between the first-order and the second-order perspective can be seen as a question of research focus.

Structure of the thesis

The background of the study is the 1990s transformative University, which has to manage with audits of Institutional Quality Management and the exploding interest in quality assessments. On the national level there were systems for research assessments and research evaluations developed by the Research Councils while there were a lack of systems for assessing education. Several National Agencies, international audit groups and national institutions were lacking quality assurance systems as well as instruments for assessments of education.

During this transformative period the focus was directed towards undergraduate education, teaching skills of academic teachers and the quality of student learning. In chapter 1 a brief outline of the background of this and of the present study is given. The theoretical ground and the aims of the study are clarified and the structure of the thesis is introduced. The theoretical rationale is the

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8 The first order perspective means people's statements about the world, which also can be defined as "statements-about-reality" (Marton 1981, p. 188). "These statements are made from, what we call, a first order perspective. The ways of experiencing the world, the phenomena, the situations, are usually taken for granted, tacit transparent" (Marton, 1995, p. 178).

9 "Bracket" is a term from phenomenology which means to suspend judgement.

phenomenographic research tradition and its approach to learning and awareness. The theoretical perspective applied in the study is grounded in the phenomenographic research tradition and its extensive research on learning. The latest theoretical development in this research tradition, the theory of variation, is introduced later.

In chapter 2 a selection of research studies on research on teaching and a few examples of research on learning in Higher Education are introduced in order to present the research context to which the present study belongs.

In chapter 3, the ontological and the epistemological questions in the present study are clarified and the theory of variation is explained[10]. Some of the critics of the phenomenographic research tradition is introduced, analysed and commented on. In Chapter 4, is the research interview method discussed, which is one of the methods used for data collection. Video recordings, interviews, observations and fieldnotes are different methods, which are also used in the data collection process. The theory of variation is elaborated as a method applied in the analyses. The design, the empirical study, the participants and the data collection process are introduced and scrutinised in chapter 5. The selection of the discipline and the course in Management accounting in the School of Economics and Commercial Law at Göteborg University is explained. The reflections on the methods and on the data collection are included here, as is a discussion of the quality of the present study.

The results are presented in chapters 6, 7 and 8. The results of the analysis of the lectures are presented and discussed as different teaching objects. The analyses of the students problem solving processes are presented and discussed as different learning objects. The relation between the teaching objects and the learning objects

10 "The theory of variation" was introduced by Ference Marton during seminars and in the 'Collegium Fenomenograficum' during 1996/97 and the spring semester of 1998 in the Department of Education and Educational Research at Göteborg University. It was later presented in Bowden and Marton (1998; see chapter 2, pp. 23-45).

is indicated as well as the differences between the teaching objects and the learning objects.

Chapter 9 comprises a general discussion of the results in relation to the aim of the study and in relation to existing educational practice and future practice in Higher Education. A general model for studying, observing and analysing teaching in Higher Education is presented. The discussion of the assessment of the teachers´ teaching skills in a context of Higher Education is pursued on a general level and some implications for Higher Education are explored.

Chapter 2

RESEARCH ON TEACHING

The following chapter is an outline mainly of research on teaching and some research is included relating learning and teaching in Higher Education. Some examples of research on learning are included to illustrate different perspectives on learning.

Research on Teaching

A review of research on teaching in Higher Education resulted in the following research domains: 1. student learning and students´ evaluation of instructions, 2. teaching methods (mainly method effectiveness) 3. teacher's skills in terms of qualities of teaching behavior and 4. research in evaluation and improvement of teaching in higher education (Dunkin and Barnes, 1986). In analysing editions of research publications and of computerised data bases of "Teaching Methods" several thousands of references can be the result.

These numerous studies seem to reflect the differentiation during the 80s and 90s of the research on teaching methods and on learning and the development of higher education as an independent and special research field, after the cognitive revolution. In research on education, teaching and learning, there are several trends discernible after the cognitive revolution in the late 1950s.

> It was not a revolution against behaviorism with the aim of transforming behaviorism into a better way of pursuing psychology by adding a little

> mentalism to it. Edward Tolman had done that, to little avail[11]. It was an altogether more profound revolution than that. Its aim was to discover and to describe formally the meanings that human beings created out of their encounters with the world, and then to propose hypotheses about what meaning-making processes were implicated. It focused upon the symbolic activities that human beings employed in constructing and in making sense not only of the world, but of themselves. Its aim was to prompt psychology to join forces with its sister interpretive disciplines in the humanities and in the social sciences (Bruner 1990, p. 2).

After the cognitive revolution a shift occurred in the research on teaching and learning during the 70s and 80s. The emphasis of the research on teaching was due to dissatisfaction with the narrow focus of behaviourist studies, the development in cognitive psychology and the increasing recognition of the teacher in educational processes (Calderhead 1996, p 709). At least four trends can be discovered among the numerous research studies in education and in research on educational psychology. One trend is for developing general principles for teaching, an other for general thinking and learning skills (including teaching "process and product" studies), another for the domain of teacher cognition, teacher thinking and teachers professional competence, and a fourth for cognitive psychology, where the research on human mental life has resulted in cognitive science and several sub domains. To use Bruner´s words, "the long cold winter of objectivism" was followed by "a new cognitive science", which managed to re-establish mind in the domain of psychology (Bruner, 1990).

> In the past, research on teaching and learning in Higher Education followed the idea that learning depended in a fairly simple way on the teaching provided and on the ability and motivation of the student. Thus the most effective teaching methods were investigated, and also the characteristics of the most successful students (Entwistle, 1990, p. 669).

Kember (1997) analysed 13 research studies conducted between 1991 and 1994 (except one from 1983), aiming at enhancing the quality of teaching in Higher Education. The results indicated major elements of communality between the studies reviewed. Results

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11 Bruner refers to: Edward C. Tolman, 'Cognitive Maps in Rats and Men', *Psychological Review (1948), 55,* 189-208. Tolman, E., C. (1932). *Purposive Behavior in Animals and Men,* New York: Century.

showed two broad orientations such as "teacher-centred/content oriented" and "student-centred/learning oriented" approaches to teaching. A transitory category named "student-teacher interaction" was formed to link the orientations. Under these orientations Kember found five conceptions of teaching, which were "well-defined categories within a developmental continuum" (ibid., p.273). The categories were

1. imparting information,
2. transmitting structured knowledge,
3. student-teacher interaction,
4. facilitating understanding and
5. conceptual change/intellectual development.

Kember is hinting on the one hand that these conceptions of teaching can change over time and on the other hand that one possible interpretation of the alternative conceptions (1 to 5 above) is that "they are seen as a developmental sequence" (ibid. p. 273).

Trigwell, Prosser and Taylor (1994), who are included in Kember´s study, used a phenomenographic approach to reveal the intentions linked to the teaching strategies of first year physical science lecturers. They found five qualitatively different approaches to teaching and a logical relationship between the intentions of lecturers (which were investigated) and the strategies they claimed they had used. "The description of approaches found in this study has elements in common with those identified for students´ approaches to learning" (ibid. p. 82). If the improvement of quality of teaching is through academic development, "the intentions and conceptions of teachers need as much attention as strategies if any improvement in student learning is anticipated" (ibid. p. 83).

That the outcome of teaching is student learning is a point of departure in many studies. How teachers´ approaches to teaching and students approaches to learning affect the outcome of learning has been investigated by Trigwell. Prosser, Ramsden and Martin, (1998). Results indicate that the classes of those teachers who report using more of a student-focused teaching approach contained students reporting higher quality approaches to learning, while

classes of teachers using more of an information/ transmission/ teacher-focused approach contained students who reported using more surface approaches to learning.

During the last decades research focusing on "Teaching" and on "Learning" in institutionalised learning contexts in Higher Education has been carried out and reported in numerous articles and books (Beach, 1995, 1997; Entwistle, 1988; Handal, Holmström and Thomsen, 1973; Laurillard, 1993; Marton, Hounsell and Entwistle, 1984, 1997; Prosser and Trigwell, 1999; Ramsden, 1988, 1992; Sutherland 1997;), and there are studies with a phenomenografic approach, which also have focused on teaching in comprehensive school (Åberg-Bengtsson 1998; Ahlberg 1992; 1997; Alexandersson 1994; Ekeblad 1996; Hesslefors Arktoft 1996; Pramling 1992; 1994;).

Studies of teaching as a process, where several methods can be used (for instance "problem based learning") seem to indicate implicitly that changing the method consequently results in better student learning (Dahle and Forsberg 1993, Kirch and Carvalho 1998, Söderlund 1998). These studies often give extensive descriptions of the process of teaching and the roles of the supervisiors, but they seldom evaluate if the change of teaching methods resulted in improved student learning. Beach (1997) found through focusing on student statements about what was learned, that "problem based learning" gave more of the same rather than new and better learning.

Studies exist from comprehensive shools, which have limited value for the present study due to several factors such as the differences in frame of reference, subject matter, differences in students´ age and students´ prior subject matter knowledge, differences in context and differences in relation between teacher and students.

Teaching and subject matter content

Schulman has attracted much attention due to his consistent advocacy of the importance of the subject matter and the teachers´ knowledge of the subject matter.

Shulman (1986 a) argued that three different potential determinants of teaching and learning are significant attributes of the actors in the classroom. Capacities are the relatively stable and enduring characteristics of ability, propensity, knowledge, or character inhering in the actors, yet capable of change through either learning or development. Actions comprise the activities, performances, or behaviour of actors, the observable physical activity or speech of teachers and students. Thoughts are the cognition's, metacognitions, emotions and purposes - the tacit mental and emotional states that precede, accompany, and follow the observable actions, frequently foreshadowing (or reflecting) changes in the more enduring capacities. Both thoughts and behaviour can become capacities (in the form, for example, of knowledge and habits or skills (ibid., p. 6-8). Shulman criticised research programmes labelled "teacher cognition programmes", where he noticed the missing "elucidation of teachers´ cognitive understanding of subject matter content and also the relationships between such understanding and the instruction teachers provide for students" (ibid. p. 25).

According to Shulman teaching is always teaching of something. This is Shulman´s way of always emphasising the importance of the teacher's subject matter knowledge, which consists of three different areas according to his statements. Firstly, the comprehension of the subject, subject matter knowledge, appropriate to a content specialist, i. e. facts of the discipline and how those facts are organised. Secondly, pedagogical knowledge, which Shulman called "the special amalgam of content and pedagogy that is uniquely the province of teachers" (Shulman 1987 p. 8). This pedagogical knowledge refers to knowledge that enables particular content to be used in teaching and is specific to particular subject matter, particular student groups and particular curricula. This expression also refers to the knowledge of how concepts, strategies

and principles are understood or misunderstood by specific student groups. Thirdly, curricular knowledge, the knowledge organised in the texts of curricula, the specific materials that are available, and the underpinning issues and concepts of the organisation. Shulman (1986 b) argued that the content of teaching, has to be re-initiated in research. He called this the "missing paradigm", by which he meant researchers studying institutionalised teaching and learning without taking into account the subject matter being taught. "What we miss are questions about the content of the lessons taught, the questions asked, and the explanations offered" (Shulman 1986 b, p. 8).

Gudmundsdottir (1990) advocates a focus on "values" in research on education and on teaching: "The act of teaching is saturated with values, both explicit and implicit, because teaching involves evaluation, judgement, and choice, all essential qualities in values. [...] Values build on aspects of culture, such as ideologies, ideals, and conflicting interests (ibid., p. 45) . Gudmundsdottir refers to Greene (1987) concerning the teaching of moral values.

> To be moral involves taking a position towards that matrix [principles, laws and ideas of what is considered acceptable], thinking critically about what is taken for granted. It involves taking a principled position of one's own (*choosing* certain principles by which to live) and speaking clearly about it, so as to set oneself on the right track. [...] There are paradigms to be found in many kinds of teaching for those interested in moral education, since teaching is in part a process of moving people to proceed according to a specified set of norms (ibid., p. 49).

Gudmundsdottir (1990 p. 47) points out that when future teachers study their subject matter which they later will teach, "they are not just learning facts; they are acquiring a world view imbued with values". She quotes Shulman´s notion of the "missing pieces in the missing paradigm", which were the value perspectives. When analysing four high school teachers teaching English and American history, Gudmundsdottir emphasised their perspectives on the pedagogical content knowledge. Values seem to have been influential in the teachers´ restructuring of content knowledge. Values also influenced their choice and use of pedagogical strategies in the classroom (ibid. p. 50).

Fenstermacher (1986, p. 41) claims that "... with our increasing understanding that science is replete with ideology and commitment, there is less concern about the possibility of moral and axiological bias in the scientific community". This has also been noticed by Gudmundsdottir (1990).

There are obvious difficulties in comparing studies on teaching and in making suitable definitions of what is included in the concept of "teaching" and in a concept such as the "belief". Although beliefs generally refer to suppositions, commitments, and ideologies, knowledge is taken to refer to factual propositions and the understandings that inform skilful actions. Research has identified a variety of content and forms that teachers´ knowledge and beliefs can take (Calderhead 1996, p. 715).

Shulman (1986 a) introduces a model for the study of classroom teaching. This model ("3 P´s") includes four types of variables, the presage variables, (teacher's formative experiences, training and properties), the context variables (community context, classroom context, pupil's formative experiences and properties), the process variables (the process between teacher and students and the result of that process) and finally the product variables (immediate and long-term effects on students). Although this model gives one description of the study of classroom teaching, Shulman points out that this model is not a comprehensive theory of teaching. It has to be accepted only as a representation of the variety of topics related to one another in the field of research on teaching and not a map of the domain.

A similar version of this model has been developed by Biggs (1978; 1989) and is known as "presage-process-product model". A further development of the model, has been introduced by Prosser, Trigwell, Hazel and Gallagher (1994) and Prosser and Trigwell (1999).

> In this model students´ perceptions of learning and teaching are seen to be an interaction between their previous experiences of learning and teaching and the learning and teaching context itself. They approaches their studies in relation to their perception of the context, and that approach is related to the quality of their learning outcome (ibid., p.12).

This model relates prior experience, perceptions of the learning environment, approaches to learning and learning outcomes - although it arose many questions - it seems useful for trying to understand the relationship between teaching and learning.

The relation between teaching and learning can be viewed from several perspectives. Shulman through his research on teaching emphasised not only the importance of the teacher´s subject matter knowledge but also their pedagogical model for thinking of, preparing, acting and evaluating teaching followed by some time of reflection on a new understanding of teaching the subject matter. Gudmundsdottir has contributed by exploring the ways teachers´ are thinking about their teaching in a subject matter domain.

Shulman and Gudmundsdottir have thereby contributed to the research tradition named the "teacher thinking" tradition. So has Alexandersson (1994) in a study aimed at investigating primary teachers´ experiences of their teaching and professional role as teachers and illuminating their awareness of their conception of their own working methods. Alexandersson asked the following question: "What do teachers direct their awareness towards during their teaching?"- He found three things: 1. activity going on at the moment, 2. more general aims and 3. the content that was taught. A linguistic analysis revealed that directness towards the activity dominated (65% of utterances) while directedness towards the content was least common (13% of utterances).

Pratt (1992) investigated conceptions of teaching by interviewing 253 adults and teachers of adults in Canada, the United States, Hong Kong, Singapore and the People's Republic of China. In this study Pratt described (ibid. 204):

> As a research method, phenomenography is useful for revealing how things look from the point of view of the respondent. Within this tradition, researchers take a second order perspective, not making statements about the world as such, but about people's conceptions of the world.

In constructing a general model of teaching he assumed this would be based on: 1. content, what was to be learned; 2. students, the learners and the learning process; 3. the teacher and his or her

functions and responsibilities; 4. context, internal and external factors influencing teaching and learning. We have to add teachers´ individual beliefs, values and norms and the relationships between these elements in order to identify people's understanding of teaching and their conceptions of teaching (ibid. p. 205). He found that all interviewees had an opinion of what teaching meant for them in their social context. Variation amongst the conceptions of teaching was examined in relation to three interdependent aspects of each conception: *actions* (activities and repertoires of techniques used in teaching), *intentions* (purpose and responsibility, what the teacher was trying to accomplish) and *beliefs* (either normative or causal propositions held with varying degree of clarity, confidence and centrality). These interdependent aspects were related to one or more of the five elements in a "general model of teaching" and their relationships: a teacher, the learners, ideals (purposes of education and (or an ideal vision of society), a subject content and a context (external factors influencing teaching and learning).

Data from interviews of 253 teachers from the five countries were analysed by Pratt. However, because the research started with an analytical framework and general model of teaching, the respondent's understanding of teaching was, in part, understood within and perhaps shaped to fit, an a priori framework and model. In this sense the studies differed from traditional phenomenography (ibid. p. 209). Five conceptions of teaching emerged:

1. engineering - delivering content;
2. apprenticeship - modelling ways of being;
3. developmental - cultivating intellect;
4. nurturing - facilitating personal agency;
5. social reform - seeking a better society;

It is interesting to observe that behind each conception is a different relationship between the teacher, the student, the content and the context. There are as well different metaphors of learning behind each conception. According to Pratt each of the conceptions has philosophical and epistemological roots according to a particular purpose, context and teacher. He argues that it would be wrong to

conclude that some conceptions are better than others and to associate specific methods with particular conceptions such as lecturing with "engineering" or discussion groups with "nurturing". These conceptions are dynamic and "they are evolving with experience that either confirms or challenges present thinking and beliefs". They are normative, not mutually exclusive but qualitatively different and the "learners experience all aspects of a teacher's conception of teaching, that is their beliefs and intentions as well as their actions. What is learned will be determined as much by those beliefs and intentions as by the activities used"(ibid., p. 217).

These concepts are broad and sometimes result in different interpretations. Pratt (1997 p. 7) argues that different perspectives on teaching emerge when some elements or interrelationships in the general model are regarded as important more than others and "educators show greater or lesser commitment to some elements than others when talking about their teaching. Commitment is defined here as a sense of loyalty, duty, responsibility, or obligation associated with one or more elements within the General Model of teaching"[12](ibid., p. 7).

To give just two examples. Pratt´s conceptions of teaching evoke metaphors of learning hiding behind expressions like

1. "engineering - delivering content"; the "container metaphor" is a common one. "We are physical beings, bounded and set off from the rest of the world by the surface of our skins, and we experience the rest of the world outside us.

Each of us is a container, with a bounding surface and an in-out orientation". Pratt meant that this conception had two dominating elements, the teacher and the content. The teacher knew what had to be learnt. Learning was believed to occur in observable and predictable ways that could be made more efficient through

12 Pratt is here referring to a "General Model", which is introduced above (see Pratt, 1992, p. 211).

systematically controlling the learning environment (Pratt 1992 p. 210).

2. "apprenticeship - modelling ways of being"; Again the teacher and the content were dominating elements and the teacher was the authority who knew what had to be learnt but here they seem to be inseparable.

Here the knowledge was identified as the teacher, who was "the expert practitioner", who handed over to the learner through a process of socialisation "the best ideas, values, and methods of practise available" (ibid. p.112). Here we have "the conduit metaphor", where the words are carriers of meanings in themselves and in a specific context. These are examples how metaphors hide other concepts and structures behind concepts like "teaching".

Lakoff and Johnson (1980 p. 29) found that there are three principal metaphors: container, physical object and a journey. The container metaphor was exemplified above. The physical object metaphor is referring to ideas and journey a passage. These examples are given here to illustrate the implicit mental models of learning, which are hiding behind convincing arguments of approaches to teaching.

Sedman (1987, p. 15) claims that everyone engaged in teaching has some strategy in mind concerning his or her own teaching activities. He labelled this basic outlook "pedagogical basic outlook", consisting of a holistic view of reality, a view of knowledge formation, a view of science and a view of the student as a human being.

Research relating teaching and learning

Different perspectives on learning

The cognitive science movement, with roots in cognitive psychology and instructional psychology, concerns human learning and development and are expressed as cognitive models concerned with internal mental processes and their instruction enhanced

development. A range of different movements exist inside this realm. Norman (1993) exemplifies "symbolic processing" as a movement, with roots in AI (Artificial Intelligence), focusing on the "processing structures of the brain and the symbolic representations of mind" (ibid., p. 3). At the same time he ironically notices that the ongoing discussion between "the situated cognition" (situated action) (Greeno and Moore, 1993), and "symbolic cognition" movements (Vera and Simon, 1993), seem to emphasise different behaviours and different methods of study, but they are within the same paradigm. A crucial point here is how the concept "symbol" is defined.

Learning from a constructivist perspective, also including several differing perspectives, means that in learning the learner is regarded as capable of creating his own knowledge formation process. Von Glaserfeld (1995), known as the founder of radical constructivism, claims that adopting a constructivist orientation requires the modification of all one has thought. What he means is that we are not aware our own habitual patterns of thinking" mediated to us through culture, language and earlier schooling. He points out that "knowledge, truth, communication and understanding" must be reconstructed because radical constructivism is a way of thinking, which does not produce an ultimate picture of the world. Rather:

> It claims to be no more than a coherent way of thinking that helps to deal with the fundamentally inexplicable world of our experience and, most important, places the responsibility for action and thought where it belongs: on the individual thinker (ibid., p. 19).

Knowledge and knowledge formation are seen as instrumental in the constructivist approach to learning. Von Glaserfeld points out that the traditional view of institutionalised learning is that students are imparted "value-free, objective knowledge". But such knowledge which does not exist.

> The first thing required, therefore, is that students be given the reasons why particular ways of acting and thinking are considered desirable. This entails explanations of the specific contexts in which the knowledge to be acquired is believed to work. [..) However, I am convinced that, in general, students will be more motivated to learn something (ibid., p. 177).

The branch of constructivism called "social constructivism", also referred to as "situated cognition", is stressing learning as a mental process through which knowledge is constructed and reconstructed in a social and cultural setting (Lave, 1988). This notion or idea about learning has been developed amongst others by Lave and Wenger (1991) in studies of learning outside traditional school settings, such as when the apprentice learns and gains knowledge and a repertoire of skills and abilities in a social and cultural environment.

A perspective on learning from a 'socio cultural activity' perspective by Bruner has its roots in the Soviet School of Thought, developed by Luria, Vygotsky and Leont´ev (Bruner, 1996). The socio cultural perspective focuses on communicative practices as a process of interaction and participation in which socially grounded and shared knowledge is mediated to the learner. Briefly, the research unit is a social practice. At least three concepts play a crucial role in the interpretation of learning from a socio cultural perspective (Wertsch, 1985; 1991; 1998).

First the concept "action", which is seen as a human action mediated through symbols and artefacts, which are parts of the socio cultural situation. Wertsch (1998) gives a revised formulation.

> The task of a socio cultural approach is to explicate the relationships between human action, on the one hand, and the cultural, institutional, and historical contexts in which this action occurs, on the other (ibid., p. 24).

The second concept, "inter-psychological plane of functioning" means briefly that functions in a child's cultural development, according to Vygotsky (1981), are developing first between individuals as a interpsychological category and then as a intrapsychological category (Nelson, 1998). Those categories are having remarkable similarities according to Vygotsky.

The third crucial concept is "mediation", which means a process through which tools, symbols and artefacts are incorporated and profoundly affecting human actions. Mediating tools, such as the natural languages (psychological tools), facilitate the actions but

they also continuously change the structures of mental functions seen in new actions, that follow.

Socio cultural research has been applied in a broad range of domains (Adelswärd and Säljö 1994; Resnick, Säljö, Pontecorvo and Burge, 1997; Säljö 1988; Säljö and Wyndham, 1993;).

Qualitative differences in Subject Matter Learning

Renström, Andersson and Marton (1990) studied how 13 to 16 year old students understood the concept of matter in chemistry, in the upper level of the compulsory school. A phenomenographic approach was used when 20 transcribed student interviews were analysed. The results revealed 6 different conceptions of matter due to differences in focus, which constituted the variation in the internal structure of each conception. This variation was related to what was focused or emphasised by the students´ and can probably be found between different conceptions, the research group argued.

> The idea is that when one is confronted with different problems, different aspects of matter are focused, stressed and emphasised. By focusing on certain aspects, certain insights have to be developed in order to solve the problem and in order to avoid contradictions (ibid., p. 568).

Patrick (1998) related to how their students understand the subject matter being taught in her research of the teachers´ understanding of their discipline (history and physics to students at senior school level in Australian school). In her study she stated that:

> Teachers are positioned as cultural agents, making curriculum - not merely interpreting and more or less effectively putting into practise a curriculum which has been fixed outside the classroom. The process of curriculum-making is understood as extending into the classroom. The curriculum in the classroom can be understood both as practice which is produced within and shaped by a particular cultural and ideological context, and also as a practice which itself shapes students´ experiences, thereby constituting for them a particular object of study, and contributing in a wider sense to the constitution and reconstitution of a field of knowledge. Teaching a subject involves more than translating written objectives into classroom practice. Teachers read curriculum requirements in the light of their understanding of the fields of knowledge to which the curriculum relates (ibid. p. 4).

Patrick related how the teachers´ understand, experience and handle the content in history and physics to their students´ understanding of the subject matter and pointed out that teaching of a subject matter means more than just translating written objectives into classroom practice. First of all, curriculum making is seen as an extended process which goes into the classroom. Secondly, the curriculum as such is researched as a practice in the cultural and ideological context of the classroom. And thirdly, the curriculum as such can affect the students´ experiences, and their knowledge formation and the reconstitution of their knowledge.

One of the main findings from Patrick´s study was that the teachers´ understanding of the subject matter, in history and physics, influenced their way of teaching the subject and consequently affected also their students´ understanding.

> Teachers can be seen as critical in production and reproduction of disciplines and disciplinary knowledge; and that their role deserves significant research attention in relation to the production of cultural capital (ibid. p. 277).

Patrick revealed the teachers´ understandings of the different meanings of their subject matter. These teachers were constructing different objects of study for their students and could on a general level be described as teaching different conceptions of what was to be. The teachers used the same formal curriculum but their students got different learning objects, which means that the students became introduced to different contents of learning.

Tullberg (1997) interviewed twenty-nine teachers in chemistry in upper secondary schools and thirty students in grades 10 to 12, aged 16 to 19. The teachers were applying a new clinical method in their teaching and the aim of the investigation was to examine how these teachers understood 'the mole' and its teaching and how their understanding was related to the students´ understanding. A phenomenographic research approach was adopted in the analyses of the transcribed interviews.

One of Tullberg´s main findings was that the teachers´ way of communicating 'the mole' to the students is profoundly influenced

by the teachers´ personal interpretations of the mole concept. Tullberg found that there were similarities between her students´ and her trainee[13] teachers´ ways of reasoning and depicting theories about the conceptual context in which "mole" is set. Further she states that "Some students´ learning difficulties with 'mole' can be plausibly explained in terms of teachers´ conceptions of teaching" (ibid. p. 117). She also found that more experienced teachers had distinctly different conceptions of how students should understand 'mole', probably because historically earlier conceptions of 'mole' are layered in a teacher´s experience. Tullberg argues that the teachers´ conceptions explain difficulties their students had, and that the "students learn to solve problems of a certain kind in a certain way" (ibid. 123). Only one student expressed what Tullberg calls "a scientific understanding" of 'the mole concept' and this student was taught by a teacher expressing that understanding in her teaching. The trainee teachers´ individual teaching models were analysed in the same way as the teachers´. Results indicated that every model lacked statements corresponding to "the general idea" [teachers´ general ideas about content and methods for the teaching and learning of 'mole'] and every model represented a fragmentary approach to how to teach the 'mole' (ibid. 128).

Strömdahl (1996)[14], in a study of the dynamics of concept formation and attainment "On mole and amount of substance", revealed in analysing his empirical results that the students and the educators had similar conceptions. Strömdahl saw these results as "an expression of the fact that the students have been made participants in a tradition handed over by the educators" (Strömdahl 1996 p. 207). Tullberg (1997), Patrick (1998) and Strömdahl (1996) all revealed that teachers´ way of understanding and introducing their subject matter influenced their students´ learning object.

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13 In Tullberg´s (1997) study included eighteen trainee teachers in their final semester from one Teacher Training College (tertiary level). They were asked how they would teach 'the mole'.

14 Strömdahl´s (1996) empirical results originate from interviews with 1. thirty students on the natural science programme in upper secondary school in southern Sweden, eighteen trainee teachers at one Teacher College and 28 educators in three different Teacher Training Colleges (tertiary level).

Most of the exemplified phenomenografic studies have tried to influence teaching and learning towards better understanding of a specific subject matter (Lybeck 1981; Pramling 1994;). From a theoretical and from a methodological perspective these are studies of special interest related to the methodology applied in the present study.

Pramling (1983; 1994; 1996) has been carrying out research focusing on early childhood education. The idea has been to reveal children´s abilities to experience objects in different ways and how the children´s abilities could be revealed and facilitated by the teachers. The foci, the methods and the content of teaching has varied according to the numerous studies. The teachers´ ways of drawing children´s attention to aspects of the content and then getting the children to express their experiences and reflections of the aspects have varied as have their ways of handling and varying critical aspects of the content of teaching. One of the consequences has been that the teachers´ have made the children aware that there are several ways of understanding things and their own understanding of something.

Ahlberg (1992) has brought in variation in learning in groups of children (nine years of age) by exposing them to each others experiences of problem solving in an experimental study. The problem solving was arranged in groups and the children decided which solutions they wanted to present to the class. These children also met a variation of situations, when they have to confront certain sorts of learning tasks. In the end of the experimental phase, the children in the experimental group had become better in problem solving than the control group. In another study, 38 six year old children solved different types of mathematical word problems (Ahlberg 1997). The results here showed that children's ways of handling different aspects of numbers simultaneously constitute their experiences of numbers. Children's ways of handling numbers were analysed and used as a basis for analysing their ways of experiencing numbers. These children were able to develop the same understanding of numbers by varying ways of handling the problem solving.

In a study of pupils in grade seven and eight (12 to 13 years of age) and how their five teachers teach fractions, Runesson (1999) found that all five teachers demonstrated an orientation to the subject matter content and an ability to use variation - although in different ways - when they were teaching. The teaching was studied from a learning perspective and the theory of variation was applied in the analyses of the teachers´ lessons. Three different teaching objects were identified, which means that the teachers developed their own ways of varying the subject matter content and that these ways were possible to express in specific subject matter terms. The results showed that the teachers own understanding of the subject matter as well as their attitude to the students understanding affected their way of teaching.

There are also other studies using the phenomenographic research tradition[15] which could be mentioned[16] as well as other research areas such as "reproduction theory related to curriculum development" and "metacognitive skills", but these areas have to be left out as they are extraneous to the aim of the present study.

Conclusions

In contrast to many other studies, there exists a subject matter relation between the teachers and the students, constituted as a relation between the subject matter content of a specific lecture and the teachers and the students in the present study. These relations are investigated, analysed and explored as well as students experiences of the specific subject matter in the present study.

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15 There are several studies in educational research and the phenomenografic research tradition on science education and on conceptions of different phenomena among students in compulsory schools (Andersson 1976 [development of thinking in science education], Lybeck 1981 [density and proportionality], Kärrqvist 1985 [electric circuits] and Renström 1988 [conceptions of matter].

16 Other examples of the phenomenographic research tradition are for instance Booth (1992) [programming], Emanuelsson [knowledge in natural science; in progress] and Helmstad(1999) [understandings of understanding].

On a more general level the aim of the present study is to contribute a body of knowledge which can be used to improve student learning and the ways teachers are teaching in their disciplinary domains in Higher Education.

Chapter 3

THEORETICAL FRAMEWORK

Reflecting on the teachers´ and the students´ views of reality as well as on what type of knowledge this study aims to achieve is of vast importance. As experiences are investigated and analysed in this empirical study, it is necessary to try to explain the character of the experiences reported. In this chapter some fundamental assumptions I have made about the ontological and the epistemological question will be described: i. e. the assumptions about what is real and what can be known.

Phenomenology as theoretical inspiration

In phenomenology, a philosophical and empirical research tradition, the main interest has been directed to human consciousness. How can consciousness be investigated and described? The phenomenologist has chosen the life and the world of human beings as a point of departure to investigate this question.

> The life-world is a realm of original self-evidences. That which is self evidently given is, in perception, experienced as 'the thing itself', in immediate presence, or, in memory, remembered as the thing itself; and every other manner of intuition is a personification of the thing itself. Every mediate cognition belonging in this sphere - broadly speaking, every manner of induction - has the sense of an induction of something intuitable, something possibly perceivable as a thing itself or rememberable as having-been-perceived, etc. (Husserl 1954/1970, p. 127-128).

Husserl created the foundations for the concept "life-world" in his "Logische Untersuchungen" (1900-1901) (Bengtsson, 1988). In that work, Husserl used the "natural attitude" as a point of departure. Later in his "transcendental phenomenology" he thought that the natural attitude could be overcome so that it would be possible to

differentiate between "what something is" and "that it is" (ibid., p. 43). Husserl separates distinctively between "what something is (content)" and "that it is (existence)" by "epoché", a reduction method used by Husserl for separating the "existence" and the "essence" of a phenomenon. The separation gave the content of phenomena, which Husserl called "the pure phenomena" (Bengtsson 1988, p. 36). To reach pure consciousness and the pure phenomena, not only the existence of the phenomena has to bracketed but also the "pre-understanding" of the phenomena.

Husserl´s transcendental phenomenology was criticised by several philosophers, among them the existensialists like Heidegger, Sartre and Merleau-Ponty and the hermeneutics like Gadamer and Ricœur. Heidegger (1981) used the expression "being-in-the world"; the hyphens indicate an indissoluble relation between man and the world. By continuously "being-in-the world", we take it for granted. The life world perspective, which has influenced this study, comes close to Merleau-Ponty´s (1962) life world concept including the experiencing body, which has been applied in studies of social sciences. The existentialists´ emphasis on the importance of the essence of a phenomenon and the existence of the experiencing human as inseparable.

> "If we want to do justice to reality we can not separate essence and existence from each other - on the contrary we have to keep them together in the original unity, which they constitute "(Bengtsson, 1999, p. 13; my translation;).

The ontological question

The teachers in this study are certainly using their experiences of previous teaching when they give lectures. They live in the world, to express it in the phenomenological language, and are conscious of the world at the same time. The students have the same situation. The students´ experiences are investigated in this study. Their worldly experiences are explored through interviews and it is through the students´ experiences of the phenomenon as explored through interviews, that we will get to know what and how the phenomenon is experienced.

Kroksmark (1987) argues that the core of Phenomenography and the phenomenographic research tradition is recognised as being grounded in the phenomenological paradigm and he also points out that the core of the phenomenographic research approach is or should be lived experiences. The experiences researched by the phenomenographers are constituted in the world we live in and the way we live in that world. Marton (1981, p.189) argues:

> "This focusing on conceptions of specific aspects of reality, i. e. on apprehended (perceived, conceptualised or 'lived') contents of thought or experience, as a point of departure for carrying out research, and as a base for integrating the findings, is in fact the most distinctive feature of the domain labelled 'phenomenography' [...]".

This, he says, is its most distinctive feature of phenomenography. Marton and Booth (1997, p. 114) stress:

> In our presentation, and in other phenomenographic studies, terms such as 'conceptions', 'ways of understanding', ways of comprehending', and 'conceptualizations' have been used as synonyms for 'ways of experiencing'; they should all be interpreted in the experiential sense and not in the psychological, cognitivist sense.

In this study it is the aspects of the conceived world around us which are researched, which is in line with the phenomenographic research tradition. The aspects of the conceived world around us can also be expressed as our lived experiences. The non-dualistic ontological assumption of phenomenography I take to mean in this specific study, that it is the students´ experiences[17] that is the object of research. The experiences and the meanings of the phenomena are constituted as a relation between the student and the phenomena in a specific context. In traditional phenomenology this means that an object (the phenomenon) and the experiencing subject (the student) are reciprocally dependent on each other. The interpretations of the students´ experiences of the phenomena are investigated and analysed, which indicate that the researcher focuses on the experiences trying to minimise the effects of his or

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17 The concept "experience" is used throughout this study both as sensuous experience and as conceptual experience in accordance with the research tradition from which the investigation springs from.

her preconceived ideas and without letting his or her own experience interfere.

In the present study a first order perspective (Chapter 1) is applied in the analyses of the teachers´ ways of handling the object of teaching (as they appear to the researcher) and a second order perspective is applied in the analyses of students´ lived experiences, which in this study means that the researcher interprets and analyses the students´ experiences of the object of learning (as these objects appear to them). Students´ interviews are transcribed and the researcher is then interpreting the interviews in their textual form[18] in the transcribed texts. The teachers´ actions and the teachers way of handling the subject matter during the lectures are also analysed in their textual form in the transcribed texts, whilst the researcher´s focus being on actions and communications during lectures.

It is not enough in a research project to observe what is happening but after the observation follows a phase of reading and rereading of the observations as transcribed texts. The analyses and interpretations have been made by the researcher with the ambition to try to understand the meaning of the experiences as expressed and interpreted and the acts as observed and interpreted. This reflects a hermeneutic approach to interpret the experiences of other humans by constituting a relation between the phenomena and the researcher, when he or she tries to understand the experiences of phenomena.

> A person who is trying to understand a text is always projecting. He projects a meaning for the text as a whole as soon as some initial meaning emerges in the text. Again, the initial meaning emerges only because he is reading the text with particular expectations in regard to a certain meaning. Working out his fore-projection, which is constantly revised in terms of what emerges as he penetrates into the meaning, is understanding what is there (Gadamer, 1993, p. 267).

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18 The concept "textual analysis" is used according to Faircloug´s definition (1995, p. 7). The concept is expounded in Chapter 4.

The reading and the rereading of the text is done many times in the phenomenographic approach. The relation constituted is the obvious sign of someone trying to understand the experiences of phenomena and the meaning of phenomena in their relative sense. "The constant process of new projection constitutes the movement of understanding and interpretation" (ibid. p. 267). This can never be reached in absolute terms, because the world we are living in is a subjective world. It is always experienced.

The epistemological question

The epistemological question in this study concerns the character and nature of the knowledge researched and developed. In this study the epistemological question implies the knowledge received through interviews and through video recordings. The lived experiences are content related and expressed in words, themes and perceptions, which means they form implicit knowledge about the phenomena. The type of knowledge I can develop depends also on my ontological assumptions and the methods I have used. The methods will be discussed in Chapter 4.

Why was it necessary to use video recordings and the interview method in the present study? In this present study, it is the content of the experiences which are interpreted. If our experiences are constituted as relations between a subject and a phenomenon then you may say that the reality, the world we live in and the way we experience this world, is constituted by human cognitions of the world. It is the cognitive content of the experiences, the cognitions, which are focused and analysed.

The aim of the study is to investigate the teachers´ way of presenting, varying, handling and using a specific subject matter content, which is analysed in the textual form and expressed in the transcribed texts. The aim is to investigate the students´ experiences of that specific subject matter and these experiences are also analysed in the textual forms expressed in their transcribed texts. The ambition is to reach a deeper knowledge about differences in

teachers´ way of handling a subject content and students´ experiences of that subject content. That is why only three teachers and fifteen students are included in the study. The intention is not to generalise the received knowledge and the results from the study in conventional sense.

However, the question of epistemology in the phenomenographic research tradition has also been discussed for instance by Kroksmark (1987, 1990), Bengtsson (1999), Bengtsson and Kroksmark (1990), Giorgi (1986), Svensson (1984) and Uljens (1992 a, 1992, b).

Theory of variation

A theoretical perspective on learning

The phenomenographic research tradition has been developing in new directions during several years (Chapter 1 and 2). In a phenomenographic research approach, learning is seen as a relation constituted between a subject and an object (the phenomenon), which is also an explanation of how a non-dualistic ontology is interpreted. This is the first important point. The second is that the students´ studies at the university are supposed to prepare them for their future professional work.

Learning in a university setting is often regarded as a theoretical learning opportunity which is sometimes abstract and sometimes very concrete, if related to an experimental situation as in experimental sciences. Institutional forms of teaching and learning are forms which are aiming at preparing the students for a future society of growing complexity. The tools used for that are today´s knowledge, what we know and what we know about the future. Bowden and Marton (1998, p. 7) stress the importance of learning and they say that "the most important form of learning is that which enables us to see something in the world in a different way".

To elaborate this expression further, the ability to learn must be seen as an ability to experience objects, subject matter concepts

and a lot of other things and at the same time constitute a relation between myself and the object (phenomenon). This is an internal relation and a potential for the student to experience the object in a specific way.

> Learning in terms of changes in or widening of our ways of seeing the world can be understood in terms of discernment, simultaneity and variation. Thanks to the variation, we experience and discern critical aspects of the situations or phenomena we have to handle and, to the extent that these critical aspects are focused on simultaneously, a pattern emerges. Thanks to having experienced a varying past we become capable of handling a varying future (ibid., 8).

The theory of variation, is a different approach to understanding learning. It will be expounded in the following text as well as in chapter 4. This approach to understand learning includes certain important concepts like focal awareness, variation, discernment and simultaneity. These will be further elaborated below.

Focal awareness

In researching experiences the focal awareness[19] is important and a prerequisite for us to be able to experience the variation of different aspects of an object (phenomenon). Our awareness is characterised as having a dynamic character and "can be characterised in terms of a generalised figure-ground structure" (Marton and Booth, 1997, p. 100).

> Certain phenomena or particular aspects of certain phenomena are figural and make up the core of our awareness, whereas other phenomena or other aspects of phenomena are nonfigural and constitute the field surrounding and temporally concomitant with the core (ibid., p. 100).

Experiences of a phenomenon concerns how and what we experience, how and what we experience as the figure- and ground relation[20] and what we experience as being in the centre and in the periphery of our awareness (Gurwitsch, 1964).

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19 The concept "awareness" is used according to Marton´s (1995, p. 175) definition, which is "the totality of our experiences".

20 Concepts usually related to the research of the Gestalt psychologists on the psychological foundation of perception.

The consistence of the object, its parts and the whole and the relation between the parts, and how the object is related to the context have in the phenomenographic approach[21] been termed "the internal horizon" and "the external horizon". These are expressions borrowed from phenomenology[22]. The external horizon means the relation between the object[23] and the context and the internal horizon means the parts and their relations to the whole, which they constitute. Those horizons, internal and external, make up the "structural aspect" of the experience. There is also a corresponding "referential aspect" of the experience, which stands for the "meaning aspect" of the experience.

> When a theme presents itself to consciousness, no scattered and isolated items are given. In its very appearance to consciousness the theme points beyond itself to other facts and data which appear along with, and are referred to, by it. The *appearance of a theme* must be described as *emergence from a field* in which the theme is located occupying the centre so that he field forms a background with respect to the theme. The theme carries a field along with it so as not to appear and be present to consciousness except as being in, and pointing to, the field (ibid., p. 319).

Gurwitsch´s idea of the structure of consciousness is differentiated in the theme (focus of attention; object), the thematic field (the totality of data and co-present with the theme) and the margin (includes data, though co-present, but have no relevance to the theme). The context of the object is of importance in understanding the object. Facts can be associated to the object and a theme and by that a context. An object can itself evoke certain thoughts, which can result in a theme related to a broader context. This is called the dynamics of the awareness, tantamount to focal awareness (Bowden and Marton 1998, p. 137).

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21 According to Husserl, human beings have an understanding of the world they live in, which regarding content can be indefinite or at least not completely settled; if this core does not exist in any form, we would not be able to experience anything. "Thus every experience of a particular thing has its internal horizon, and by 'horizon' is meant here the induction which belongs essentially to every experience and is inseparable from it, being in the experience itself" (Husserl 1948/1973 s. 32).

22 The expressions are used slightly differently, Marton points out in a footnote (Marton & Booth 1997 s. 87).

23 The term "object" is used in the most inclusive sense so as to denote whatever may be a topic of discourse of any kind.

In extending this thought about context to a learning situation (in the present study the lectures in the university, and the situations where the students are applying something they have learnt) or the student interviews, each situation has a relevance structure built into it. This means that the students know what is expected and even demanded of them for instance in a lecture and in an examination. The students´ awareness has been structured earlier. "It is a sense of aim, of direction, in relation to which different aspects of the situation appear more or less relevant. It is the way the learner experiences the situation as a whole [...] that renders the perspective on its component parts" (Marton and Booth 1997, p. 143; See also Bowden and Marton 1998, p. 38).).

Variation

Variation is an important feature of teaching and learning. So if the teacher wants to focus students awareness on something specific in for instance a concept, then he or she tries to make the students aware of this specific aspect of the concept. How can this be done? The teacher has several options for making use of variation (see for instance the following two alternatives).

Alternative 1. In for instance badminton, a teacher may be trying to teach her/his student a particular stroke, such as the clear. One way to do this is, the teacher may choose to focus on the stroke (object), which in this case is "clear", and to show how the stroke can be varied. Then the teacher may ask the student to identify differences between two players and their strokes. So he invites two players of the same age, one highly successful and experienced (Elite) and the other with less experience and not that successful (B classed)[24].

Alternative 2. Another option is, that the teacher may choose to present the stroke, just by talking about it and as a complement to it, do some demonstrations to make the separate parts of the stroke

24 The players in Sweden are ranked from the Élite (national top players) and after that in the following order and classes: A, B and C.

visible. The teacher can also show a video recorded demonstration of the stroke, where the elite player shows how to execute it.

In the following text, I will only elaborate the *first alternative* by giving an example of a badminton instructor, who's aim is to teach a group of youngsters of 16 to 18 years of age, how to make a "clear". This is a basic overhead stroke called "clear" where the shuttle is hit above the head by a player. This instructor chooses to let two different players demonstrate their way of making a "clear". He also instructs the younger players to watch carefully, since he is going to ask them about their observations afterwards. These two players are 20 years of age and they make the strokes several times, while the younger players are watching and carefully observing every part of the stroke.

Then the instructor asks the younger players to give their observations before they are allowed to practise themselves. He gets answers that reveal several different observations. The pool of answers from the group of observers concerned: 1. the grip around the racket; 2. the position when the racket hits the shuttle, such as "it was a bit in front of the body"; 3. the sound, when the racket hit the shuttle; 4. how far the shuttle went; 5. how high the shuttle went; 6. the position of the feet of the hitting player; 7. the movement of her/his legs; 8. the straight arm; 9. the total body movement forward (in a specific direction);

The instructor realises that the players are also trained observers. It takes some time to learn to observe a stroke and be able to reveal the different parts of it. It is a rapid play and for a beginner a stroke seems like just one movement. He commented on each answer but focused on the arm movement as a dimension of variation and opened it and varied by showing good, ordinary and bad examples. Then he focused on the hand grip as a dimension of variation and open it and varies. He chooses to show a good grip, the elite player's grip, which he contrasts with the grip of the B classed player. - There were still several aspects of the stroke which were not mentioned by the observers such as the physical strength behind the stroke, which contributes to the speed of the shuttle and

the angle between the strings of the racket and the shuttle, when the racket hits the shuttle.

In the *second alternative* the instructor chooses to talk about the stroke and reveals eight different dimensions, which he demonstrates and varies, before the group was allowed to practise.

Both instructors have demonstrated in different ways a stroke in badminton. Notice that these different aspects[25] have to be discerned simultaneously by a player.

All aspects in this example are dimensions of variation, which mean that they are possible to focus, open and vary in many ways. They are critical aspects, which have to be discerned by the player if she/he is to play the stroke well. The instructor varied all aspects in front of the group. He spoke about the "sound", which was a criterion revealing qualitative differences between players. He noticed but did not explore the answer "how far the shuttle went". He did not say anything about the physical strength behind the stroke. He explained that the ideal stroke is just exactly above the head of the player, and the player has at that moment a straight arm.

This aspect, "the physical strength", was focused but not varied by the instructor. In the following text, a focused aspect which is not varied is called a "focused invariant aspect".

To learn is to experience aspects, relations and wholes. A stroke can be differentiated in several parts, but it can also be seen as a whole movement. A qualitatively better way of observing is if several or if even all aspects of a phenomenon (object) are discerned and taken into account at the same time.

> A necessary condition is that the person in question experiences at the same time the different 'values' (i.e. instances) in this aspect or dimension that varies. If the person did not do that but experienced one instance at a time then there would not be any variation experienced (Bowden and Marton 1998, p. 35).

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25 "Aspects" and "dimensions of variation" are used as synonyms in the text.

Holding on to this stroke as an example, I would argue that "the hitting point" is a good example of what is called "different values in an aspect" in the quotation. By noticing the point when the racket hits the shuttle and that it was over the head, means that the player discerned the "hitting point" and that he knew it was possible to hit the shuttle in many different points in the air above the head.

> To experience variation we must experience instances that we have encountered, on different occasions, at the same time (ibid., p. 35).

By discerning different parts of the body and different parts of the forward movement, a structural aspect is observed in the body movement. The whole of the body movement is discerned as consisting of different parts. In this case these were the grip of the hand, the arm, the legs and the feet.

This structural aspect (whole and parts) has a related referential aspect (meaning). These are discerned and related to each other in terms of meaning. "So neither structure nor meaning can be said to precede or succeed the other. Nor can we imagine them other than in relation to each other" (ibid., p. 31).

In the example given, the players are instructed to observe two players and the variation between the players but also the variation in several aspects or dimensions of variation of a specific stroke. In the example, what has been exemplified is the theory of variation and its key concepts, which are variation, discernment and simultaneity.

Discernment, variation, simultaneity and space of variation

Here, I will in anticipate the result of the present study. The theory of variation will in this study be applied to teaching and learning in a university setting. The students are aware of different aspects of a subject matter (Management Accounting), when they in the following interviews are given an example of application. For instance they are aware that different resources are needed in a production process, that quantities involved are expressed as

amount of resources, that the relation between different demands from buyers probably affects the volume of production, that restrictions in production processes exist and that a lot of other factors can also affect the result in a company, which usually is expressed in profit terms.

During a lecture the teachers present, handle, use and vary a specific subject matter. If we express this in terms of the theory of variation, we will express it slightly differently and by doing so anticipate the empirical outcomes of this study. When teachers are teaching, they will focus on a dimension of a concept (an object) and open it and vary the dimension. This dimension of variation will be lifted up by the teacher, when the teacher is explaining the concept. So, what will happen is that he or she focuses on an object and lifts it up as a dimension of variation, varies it and offers it to the student to experience. As has been said, some dimensions are focused but not varied and they will be called invariant aspects. When the teacher is explaining a concept he will in copoeration with the students constitute a space of variation, which will most often be called the teaching object. This teaching object have been constituted by the teacher and the students in cooperation and consists of the varied dimensions of variation and the invariant aspects of the concept (the object). A new object is experienced by the student because the student discern some critical aspects of the object. The discernment means that they have been exposed to variation and experienced variation in these aspects.

> We make sense of new situations in terms of critical features. These critical features are dimensions of variation constituted by the new situation and the previous ones which it resembles in critical respects The thesis is that we will be capable of dealing with varying (and novel) situations in the future because we have experienced varying (and once novel, but now known) situations in the past (Bowden and Marton 1998, p.34).

"Critical aspects" are aspects which are discerned and are simultaneously in focus. However, at the same time the relation between the dimensions of variations, invariant aspects and in the subject matter context in which the object is presented, are also important when we think of actual learning opportunities. The student recognises these, here called critical aspects of the object in

the new situation. The claim here will be that the student construes a learning object, grounded in the content of the lecture, during the problem solving process in the interview situation. These learning objects include the dimensions of variation and the invariant aspects of the student's object.

The relation between teaching and learning

A theoretical perspective on learning is used to investigate teaching and teachers´ different ways of presenting, varying and handling the subject matter. What does it mean to use a theoretical learning perspective for studying teaching? The starting point is the non-dualistic ontology. In this study this means that teaching constitute different learning conditions, which the teacher and the students constitute in cooperation. Depending on what the teacher chooses to do with the subject matter (the object) in the lecture, in cooperation with the students, differing teaching objects as well as learning conditions are offered to the students for experience. When lectures and the students experiences are analysed in this study, the theory of variation is applied (Chapter 4).

The critics of phenomenography

Criticisms of phenomenography have concerned different aspects of it as a research tradition. Firstly, critics have focused the conceptions, the decontextualisation of conceptions and how these are revealed in the data. Secondly, some of them have focused on the method used in collecting data. Finally, a few of them focus on the interview as a communicative practice.

Critical viewpoints have come from researchers outside and inside the phenomenographic research tradition (Hasselgren, 1993; Hasselgren and Beach 1996; Kroksmark 1987; Theman 1983, Uljens 1992 a, 1992 b, 1996). During 1993 - 1995 there was a critically constructive debate in the *Journal of Nordic Educational*

Research (Nordisk Pedagogik[26])[27]. Marton (1995, p. 173) commented on the discussion and noticed the development of phenomenographic concepts. For instance he stressed that the meaning of "conception" actually expressed "ways of experiencing [as a general term]".

Kroksmark (1987) argues that there are differences between different conceptions people can have. On the one hand there are conceptions of thoughts and ideas about the world around us and on the other hand there are conceptions of phenomena, which he classifies as "pure conceptions". In phenomenography the aim is not to detect "pure conceptions" but rather to reveal the people's conceptions about a specific object. The results reveal how people experience and apprehend an object. Kroksmark terms this what is "thought-after"[28], which means you have been reflecting on and which is an "intentional object". This opens up for an interdisciplinary debate concerning the ontological character of the conceptions. Marton (1995) takes criticisms at this point from an epistemological perspective and as a methodological critique.

Säljö (1994) criticises the phenomenographic approach for a lack of interest in theories of language and communicative practises as negotiable activities as well as for the consequences of decontextualisation of conceptions and categories of description. In the phenomenographic approach the research interview is used in collecting data. Säljö argues that the content of the interview is a result of a negotiation between the interviewer and the interviewee. The discourse is what we get access to in the interview and therefore he argues that we have to be "extremely careful in deciding what the talk is about" (ibid., p. 72). Säljö (1997) argues that the decontextualised character of the conceptions can be questioned from a socio cultural perspective. His criticism includes

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26 See *Journal of Nordic Educational Research [Nordisk Pedagogik], 13,* 1, 2, 3, *14,* 1,2,4 and *15,* 3.

27 Some of the articles has been edited by Dell'Alba & Hasselgren (1996) *Reflections on Phenomenography. Towards a Methodology ?,* Report No. 109, Department of Education and Educational Research. Göteborg: Göteborg University.

28 In Swedish "eftertänkt".

concerns about the interview, the interview data and the relation between discourse and experience. Further on he claims phenomenography also clearly lacks a specified methodology, by pointing at the fact that the method seems to be equivalent with the non-dualistic ontology.

Hasselgren (1993) questioned the content of conceptions due to the lack of contextual descriptions. Hasselgren and Beach (1996, p. 15; 1997) assert that by asking the questions "how and about what data are generated in phenomenography", it is possible to perceive five different contexts, which can constitute a theoretical framework where the results can be analysed and discussed. These they termed the: 1. discursive, 2. experimental, 3. naturalistic, 4. hermeneutic or 5. phenomenological frameworks. The interpretative approach in a specific context has been exemplified in studies by Theman (1983) and Sandberg (1994).

Ashworth and Lucas (1998) have criticised phenomenographic studies aiming at investigating key disciplinary concepts from a life world perspective. Their critical points are, firstly, if the point of departure in phenomenographic studies is the life world of students, then they claim that phenomenographers have failed to fulfil certain methodological requirements related to a life world perspective. Secondly, they criticise the categories of description, which are the the result of a phenomenographic study. They are arguing that, if the aim is a structure of categories of students conceptions of a phenomenon, then these "threaten to subvert entry into the actual student life world, which may well have less coherence than phenomenography requires" (ibid., p. 415).

Conclusions

Marton (1995) accepted Säljö´s critic (1994) concerning more general conceptions, but if it is a criticism of experiences of specific phenomena in genuine phenomenographic studies, it is not constructive to assert and give priority to a socio cultural perspective, since the experience comes from a cultural context and

a dialectic relationship exists between the experience and the cultural situation, like different sides of the same dimension (Marton, 1995, p. 171). Futher on, Marton argues that the decontextualisation of conceptions has to be regarded more as an ontological than a methodological question. It is a question of believing in the existence of qualitatively different descriptions of phenomena.

According to these and many other studies it seems obvious that the phenomenographic approach has been applied in many subject matter domains today. Several different and interesting versions of the developments of the phenomenographic approach is going on in different countries. As a consequence, as I see it, it seems to be fairly easy to misinterpret the conceptions in a traditional phenomenographic approach in different ways and to make the following, in my view unwarranted, assumptions: 1. Conceptions are representing one individual or a group of individuals. 2. Conceptions are understood as pre decided.

So far, the studies in the phenomenographic research tradition, have primarily used a non-dualistic ontological standpoint as a point of departure, and a second order perspective in researching the qualitative differences in experiences, which make the individuals "life" and their "world" internally constituted as a relation. Consequently, when doing analyses according to the phenomenographic research tradition, conceptions are not representing an individual or a group of individuals. The process of analysis of the interviewees answers is described by Marton:

> The analysis is carried out on the protocols thrown into a common "pool of meanings" in which the borders between individuals are occasionally abandon or bracketed. One is looking for qualitatively different ways of experiencing the phenomenon in question, regardless of whether the differences are differences between or within individuals. One keeps iterating between two contexts: what an individual has said about something is interpreted partly against the background of what the same person has said about other things and partly against the background of what the other participants in the investigation have said about the same thing. As variation is the object of research, a certain way of experiencing the phenomenon of interest very much derives its meaning from other ways of experiencing the same thing (Marton, 1995, p. 177).

In phenomenographic studies the focus is on variation, i.e. the qualitatively different ways of experiencing and apprehending an object (the phenomenon). In the present study, the analyses of the lectures and of the student interviews are in accordance with the phenomenographic research tradition.

II. THE METHODS AND THE EMPIRICAL STUDY

Chapter 4

THE METHODS

In Chapter 3 the theoretical frame work for a phenomenographic investigation was elaborated on. In the present chapter, the investigation methods and the objects of research will be introduced.

A phenomenographic research approach

The research problem has been introduced in chapter 1 and 3 and its framework was established in chapter 2. The phenomenographic research approach is a qualitative approach, which was chosen after the research problem had been formulated. The theoretical ground for a phenomenographic approach is a non-dualistic ontology, where learning is regarded as an experience constituted as a relation between the learner (subject) and the object (phenomenon). This is an important aspect in this study, where teaching is regarded as relation constituted between the teacher and the students and the object of teaching, is a specific part of the subject matter.

The aim of this study is to obtain better understanding of how teachers´ use, handle and vary a specific subject matter in management accounting during lectures and to investigate the students´ experiences of this specific content. This should help us to gain a profound understanding of the students´ experiences of the particular subject matter. The aim is not to generalise the results to other groups of teachers, students or disciplines. However, I do hope we can gain better and more substantial descriptions, which can contribute to the development of a higher quality in students´ learning and a higher quality of the teaching in higher education.

Consequently, as implied in chapter 3, a questionnaire method could not be used, because the form of knowledge this study aiming to reveal can not be investigated by this method and multiple choice questions.

The research interview

In phenomenography the method of collecting and producing data is the semi-structured research interview. The aim of this interview is to get access to the interviewees´ understanding of a specific phenomenon. In the present study the students´ experiences of a specific subject matter during a lecture is investigated in relation to the problem solving processes and the solution of specific examples. That is to say, when the student applies his or her knowledge in solving examples.

In the semi-structured interviews, domains of questions planned by the researcher, make up the interview. Thesis structure of content of the interview, including the planned questions, means that the researcher can follow up each question and each area of questions to avoid misunderstandings and ambiguities. These student interviews in the present study lasted between 45 to 90 minutes.

> The interview has to be carried out as a dialogue. It should facilitate the thematization of aspects of the subject's experience not previously thematized. The experiences understandings, are jointly constituted by interviewer and interviewee. These experiences and understandings are neither there prior to the interview, ready to be "read off", nor are they only situational social constructions. They are aspects of the subject's awareness that change from being unreflected to being reflected (Marton 1994 p. 4427).

Although the concept "dialogue" is not further elaborated, is interpreted as the communicative practice developed during the interview. The dialogue includes different aspects of the interview; for instance the situation of negotiating concerning a given answer. The interviewee has given an answer, which is not clear for the interviewer, and he or she decides to explore by asking the interviewee to explain and elaborate it. To grasp and understand the

respondent's answer the interviewer must realise that the dialogue is, now and then during the interview, like a negotiation of meanings. Sometimes it is more or less a straight follow up of the direct answer to the question from the interviewer and in other cases it is more a "zooming in and out to get the contours and the meaning of the target" until the meaning of the answer is revealed.

In this study where the interview as a method has been applied, each theme of the interview and the specific questions has to be formulated in advance. According to Kvale (1996), thematisation signifies the different domains of questions, the different subject areas, which are specific for each study. Kvale introduced a model consisting of seven phases, where each phase emphasises the complexity of the interview as a research method. The stages include: 1. Thematisation, 2. Designing, 3. Interviewing, 4. Transcribing, 5. Analysing, 6. Verifying and finally 7. Reporting. Kvale suggests a planning of the interview including all seven phases before the interviewer starts interviewing (ibid., p. 88).

In the phenomenographic research interview the questions during the interview, have to be prepared and carefully followed up. "This type of interview should not have too many questions made up in advance, nor should there be too many details determined in advance. Most questions follow from what the subject says" (Marton 1994 p. 4427). Nevertheless, it is important to stress that the semi-structured interview gives a framework and a content structure to the interview, even if the sequence of questions can vary between interviews.

In this study fifteen students were interviewed on three occasions. The interviews followed a pattern with semi-structured questions. In first and the third interview, the example of application was presented in English. At this point the interviewer[29] realised that there were maybe some words which the students did not know so well so they were offered a translation if they needed this. In the third interview, the interviewer observed that the students, when

29 The interviewer is the author of the thesis.

asking for translations of words, tried to start a conversation about the problem-solving process. In the excerpts from the third interview the interviewer's role is therefore slightly different. The presence of the interviewer is more marked and can be observed in the excerpts.

In quantitative methodology "the repeated measurement" can be notified as a potential error. In this study "the repeated interview" was built into the design. The awareness of "the repeated interview" was important for the interviewer during the observations of the students approaches to the problem solving process. There were no circumstances that lead to any specific problems. The interviews were all fulfilled in a pleasant atmosphere. Every interview meant a new example and new supplementary questions. The students gave no specific comments on these repeated meetings.

Methodological implications of the theory of variation

The theory of variation opens a possibility to further explore "the differences of the experiences" of a phenomenon (object) by using "discernment", "variation" and "simultaneity" as tools in observing and analysing empirical data from teaching and from learning occasions. The rationale for the development of the phenomenographic approach is the qualitatively different ways the phenomenon can be experienced. The object of research can be expressed as "the variation" in ways of experiencing a phenomena. This expression implies an interest in the variation and in the development of the student´s capability to experience certain phenomena in certain ways. The theory of variation is grounded in a theoretical and phenomenographic perspective on learning and it is applied in this study as a conceptual tool for observing, describing and analysing the teachers different ways of presenting, varying, handling and using the subject matter of management accounting as well as for analysing the different ways students experience and solve the introduced example of application during the interviews. The general outline of the analyses is in accordance

with the theoretical framework described earlier (Chapter 3). In the appendices, each lecture is introduced as a summary including the examples of application solved by the teacher and the students during the lectures.

All lectures and all interviews were transcribed, read and analysed from a first order perspective according to the phenomenographic approach. The theory of variation is applied and used in the analysis of the teaching object, which was constituted between the teacher, the students and the subject matter of the lecture. This means that the object was analysed and the key concepts, "discernment", the "variation" and the "simultaneity" were applied to the analyses of the texts.

The analyses of the lectures and interviews have been carried out from a theoretical perspective of learning (see also Chapter 2)[30]. As a point of departure the theory of variation is assuming variation of a specific dimension of the subject matter. This variation of different dimensions and aspects[31] of the subject matter necessarily has to be discerned and experienced by the students in order for them to perceive and apprehend the focused concept (object). A dimension of variation can be experienced i.e. discerned if this dimension is varied (implicit, explicit). In discerning the variation in the subject matter, the specific dimensions varied by the teacher appears and stands out as "figure" against the "background" of the subject matter context. The figure - ground relation is offered to the students to be experienced simultaneously. There are aspects of the object, which the teacher chooses to focus but not to vary and these aspects are expressed in the analyses as "focused invariant aspects". This is the teacher´s way of focusing on the structural aspect of the object and as well as the meaning of the object, the referential structure. These aspects, the structural and the referential aspect are different but integrated sides of the same dimension of variation and can be expressed as the structure of meaning of the

30 Runesson (1999) applied the theory of variation in analyses of lessons (Chapter 2).

31 Dimensions of variation and aspects are used as synonyms in the text.

subject matter. This is often exemplified and focused in the example of the lecture and sometimes also by an external example brought in by the teacher to illustrate the applied character of the subject matter.

The students´ ways of experiencing the subject matter are explored in the interviews with a focus on how they apply their knowledge in problem solving processes. A theoretical learning perspective has also been used in the analyses of the interviews. The theory of variation is also applied in the analysis of the students´ learning objects, which was constituted in the problem solving process between the students and the example of application. The claim is that the students´ learning object is grounded and construed in the subject content of the specific lecture. When the student meets the example of application, the learning object is constituted as a relation between the student and the content of the example and applied during the problem solving process.

In the analyses the focus of this study is on the teachers´ ways of presenting, handling, using and varying the subject matter. In doing so, the teachers offer the students possibilities to experience, apprehend and conceive the subject matter, the object of teaching. In cooperation with the students, the teachers build a space of variation (teaching object), which is unique for each concept or each lecture. This space of variation, symbolic in its character, consists of the dimensions of variations and the invariant aspects of the subject matter. The teacher opens and varies dimensions of variation or he or she chooses to focus on aspects which are held invariant. Invariant aspects are aspects taken for granted by the teacher. The teaching object (the space of variation), is developed in cooperation with the students during the lecture. The teaching object includes all the symbolic content of the lecture, such as all questions from the students as well as the questions from the teacher to the students and the teacher´s way of presenting, varying and handling the subject matter.

It is important to clarify that the analyses of the lectures are done from a first order perspective and the analyses of the interviews in

the second order perspective (Chapter 3). The theory of variation is applied in analyses of the transcribed text. The teaching object and the learning object are described in the results in dimensions of variations and in focused aspects, which are held invariant, i.e. taken for granted.

The analyses of the lectures

The "traditional academic lecture method" is often regarded as a fairly homogeneous method, but when observing teachers teaching, there are obvious variations. In a university setting and a departmental framework the teachers are presenting many variations. The three teachers of the present study are all experienced and appreciated teachers by many groups of students during many years. Their way of teaching, their pedagogical strategies, are exposed in their way of presenting, varying and handling the subject matter (the teachers 'subject matter content knowledge'[32]) and their way of bringing in pedagogical teaching materials (the teachers´ pedagogical content knowledge); including their way of using IT, TV, Multi-media, the white board and other artefacts.

The teachers use language and the economic and departmental discourse[33] to facilitate students´ experiences of the subject matter.

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32 Shulman (1986 a).

33 The concept "discourse" is used according to Fairclough´s definition (1995, p. 7): "My view is that 'discourse' is use of language seen as a form of social practice, and discourse analysis is analysis of how texts work within sociocultural practice. Such analysis requires attention to textual form, structure organisation at all levels; phonological, grammatical, lexical (vocabulary) and higher levels of textual organisation in term of exchange systems (the distribution of speaking turns), structures of argumentation, and generic (activity type) structures. A working assumption is that any level of organisation may be relevant to critical and ideological analysis". Fairclough argues that textual analysis demands diversity of focus, such as functions and levels of analysis. In a broader perspective Fairclough says: "I see discourse as a complex of three elements: social practice, discoursal practice (text production, distribution and consumption), and text, and the analysis of a specific discourse calls for analysis in each of these three dimensions and their interrelations" (ibid., p. 74).

In this study, the teachers are using several language functions[34] and these has been video recorded and transcribed. The teachers way of using the language in the institutionalised discourse is as a tool for asking questions and for several other aims (Fairclough 1992 a, 1992 b) to facilitate the students´ understanding of the subject matter. Textual analysis has been applied to the transcriptions in line with Fairclough´s definition of discourse and are thus understood as texts.

> A text is traditionally understood to be a piece of written language - a whole 'work' such as a poem or a novel, or a relatively discrete part of a work such as a chapter. A rather broader conception has become common within discourse analysis, where a text may be either written or spoken discourse, so that, for example, the words used in a conversation (or their written transcription) constitute a text (Fairclough 1995, p. 4).

The concept (the object) is focused in the analysis, which is a specific part of the subject matter. The subject matter context is identified where the teachers are pointing out critical aspects, dimensions of variation of the subject matter object. When the concept of analysis is focused, the dimensions of variation and the invariant aspects are identified. Having illuminated the dimension of variation, you have shown the figure and the ground relation. The subject matter context of the object is then identified. The object is put forward in different contexts, which means that the total subject matter context constitutes different learning conditions for the students. The space of variation, the teaching object, created in cooperation between a teacher and the students, is described for each of the concepts and each of the lectures, in dimensions of variation and in focused aspects held invariant by the teachers.

The summaries of the lectures include the teaching objects, which have been revealed through the analyses. There is a variation in how the teachers choose to present, handle, angle and vary the subject matter content as they use different pedagogical strategies. Pedagogical strategies means here the teachers´ different ways of

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34 Language functions are concepts in the sociocultural realm of research but they will not be explored in the present study (Clark 1992; Fairclough 1992 a and 1992 b; Halliday 1978;).

teaching. By and large, the teachers create their own lecture method within the departmental framework.

The analysis of the students interviews

In the student interviews the analyses have been limited to the part, where the students solved the offered example and the end of that problem solving process. The analyses and the excerpts from the student interviews are focused on the students´ problem solving activities. The students´ approaches to the example of application and the problem solving process are observed and analysed. The subject matter concept is focused and identified and the student's way of handling the concept and the conceptual framework is observed during the problem solving process. The interviews are audio recorded and transcribed. The transcriptions of interviews are analysed and the same method of analyses, the theory of variation, is applied in the textual analysis of the transcripts of the interviews.

As pointed out, the claim is here that the students construe a learning object grounded in the content of the specific lecture. The learning object is constituted as a relation between the student and the content of the example. The analyses reveal the dimensions of variation and the focused invariant aspects used by the student during the problem solving process are also identified. The space of learning, here called learning object, is exposed by the students during their problem solving process. There are a lot of factors[35] which affect the students´ learning and knowledge formation.

The theory of variation applied in the analysis

This investigation may seem to be an investigation of differences between the teachers´ ways of teaching a subject content. However, the focus has not been on these teachers´ personal abilities or teaching skills but on the learning conditions they constitute

35 Among these are for instance the students pre-knowledge, when they began the course and the self-directed learning, which could have happened during the period between the lecture and the interview.

together with their students. Towards the third aim of the study, to develop a model for observing, describing and analysing teaching, the following model has been applied in the analyses.

1. A starting point of the analysis is to identify the object, the part of the subject matter content, which is focused by the teacher. Then the subject matter context of the object is identified.

2. A focused concept is presented by the teacher. The variation is the most important part, because then a dimension of variations is revealed, opened and varied and at the same time offered to the students to experience. There are aspects, which the teacher chooses to focus on, but which are not opened and varied and these are called invariant aspects; i.e. taken for granted.

3. Having illuminated the dimension of variation and the invariant aspects, then the figure - ground relation is revealed by the teacher. In the text it is expressed as "the teacher is lifting up a dimension" and at the same time it is shown against a specific subject matter background. The dimensions of variation and the focused invariant aspects are presented by the teacher in a specific subject matter context.

4. The analyses reveal the dimensions of variation and focused invariant aspects as the results of the teacher´s presentation of the subject matter concept. The result of the analyses is presented as a teaching object, space of variation, which is constituted jointly by the teacher and the students during the lecture.

In the following text, firstly, the space of variation is most often referred to as the teaching object. Secondly, the invariant aspects which are focused by the teachers but not varied, are taken as aspects which are taken for granted.

Chapter 5

THE EMPIRICAL STUDY

The selected subject matter

The study programme for economists at undergraduate level at the Göteborg University, School of Economics and Commercial Law, can be characterised as offering functional and instrumental knowledge. Special Masters Programmes are also offered to graduate students, who have two minimum years of experience as professionals. These are given in recurrent education programmes. During postgraduate studies a four year research oriented programme is offered. The aim of that programme is to develop independent researchers.

The course in Financial and Management Accounting, named "Accounting in Organisations", focused in the present study, is offered to students during their first year of a four year study programme. This course consists of two parts, starting with "Financial Accounting", followed by "Management Accounting" in organisations.

The main focus in this study is how structured knowledge from a discipline, Management Accounting, can be represented by teachers in the educational and traditional academic lecture context, and what and how the students experience and apprehend the subject matter content. These students have passed the application process of the Swedish Higher Education System and they have been accepted as students, in either a specific four year programme for economists or as students in a two semester primer course in Business Administration. The department of Business

Administration has integrated the latter group of students in the programme of the first group of students, those who belong to the four year study programme. Both groups are taught the subject Management Accounting at the same time during the two semesters.

An outline of the growth of an academic discipline

Cost Accounting, Standard Costing and Variance Analysis are subjects and methods introduced between the two world wars and up to the 70s as a subject matter in Higher Education Accounting was introduced mainly as a technique in accounting records, i.e. book-keeping (Albach 1995; Jönsson 1995; 1999[36]) At that time the influence of the professors was utilised to affect and direct the aims of the education to obtain an education for book-keepers and accountants (Jönsson 1995). The main idea was that the new accountant should be able to start in productive work as soon as he or she left the University.

Different paradigms exist implying that the actors in the field have different opinions of reality (Riahi-Belkaoui, 1996). Some of them believe that accounting is a way of measuring something in a way comparable with a traditional measurement in science. They argue that the measurement gives values that are "the truth", in an epistemological sense. There are rationalistic opinions claiming that Accounting and products from accounts are used as supporting evidence for decision making. Rationalistic models for decision making are used with supporting evidence and the results are rational decisions. Different developments and differentiation of the subject matter domain have been noted for instance in England in relation to Institutional Theory, Critical Theory and also Social and Environmental Theory. Today, names of subject matter domains like "Behavioural Accounting" exist, in which subject matter from behavioural as well as social sciences has been integrated. The

36 An outline and a description of Management Accounting as a subject matter in Higher Education in Sweden was given in a seminar March 1999 by Sten Jönsson, professor of Financial and Management Accounting at the Göteborg University.

research traditions in the domain of accounting during the last decades has been divided into, on the one hand the American survey research and on the other hand the European field research, which particularly in the Scandinavian countries have been characterised by empirical approaches to management oriented problem areas. European accounting research has developed a closer relation to research in social sciences and has sometimes even borrowed methods and approaches from social and behavioural sciences.

Influence on Financial and Management Accounting comes through the European Union (EU) and a harmonisation is going on among the EU countries, where adjustments of rules and norms between Italy, France, England and Sweden are going on in order to make it possible to read and understand accounting records in different countries (Jönsson 1999). The department of Financial and Management Accounting at Göteborg University is well known for its field studies during the 80s and 90s (Grönlund 1989; Johansson 1995; Solli 1991). During the 90s, the department has conducted extensive empirical field studies, micro studies of specific areas and is now in the research front-line of European accounting by introducing ethnomethodology as an approach to explore communicative practices of management in specific areas (Jönsson 1992, 1998, Jönson & Macintosh 1997).

The investigation

Design

The course in Business Administration and the discipline Management Accounting, were selected due to the highly organised internal structure of the domain and of the subject. Business Administration is a research discipline which is included as one of

the subjects in the four year programme for economists in the Faculty of Economics[37].

The empirical data production was carried out during the last part of the spring semester 1994. Three consecutive lectures of the three teachers were video recorded during the end of the course in Management Accounting. It was three consecutive lectures. Each lecture lasted two hours, and with three lectures, this means that six hours lecturing was recorded for each of the teachers and for three teachers 18 hours altogether.

The fifteen students were each interviewed after each lecture. Consequently, each student was interviewed three times.

All video recordings were done in a traditional lecture room with a theatre seating arrangement. The rows of benches formed a gradient in the lecture room. The traditional position of the teachers during the lectures was to stand in front of the group and face the group. When they wrote on the white board they had to turn the back to the students.

The curriculum of the selected course

The subject domain in the study is "Financial and Management Accounting" and the specific course, which has been studied is named "Accounting in Organisations[38]" (10 credit points; FEAB 20, 1993). This course is included in a four year study programme for undergraduate economists and is in two parts, "Financial Accounting" and "Management Accounting" respectively.

The students admitted to the ordinary study programme start their four year programme in the beginning of the autumn semester. In the beginning of the second semester (spring semester), the students

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37 During the planning phases of the investigation an inquiry was put to the board of the department of Business Administration, where the investigator asked for the board's permission to carry out the investigation. The inquiry was supported by the board of the department of Business Administration.

38 "Extern och intern redovisning" in Swedish.

on the programme start their course in Management Accounting, where the teaching is integrated with the students who are taking the course in the Business Administration primer. These are admitted to the course at the beginning of the spring semester (in January). They start by having a preparatory course in economics before they enter "Financial and Management Accounting".

The aim of the course according to the "Financial and Management Accounting" curriculum is as follows (my translation).

> The aim of the course is to give an introduction to the subject matter "Accounting" and to illuminate practical, normative and theoretical aspects. Our ambition is that the students who have passed the course have knowledge of different aspects of modelling and of applying of accounting. Further on, the students have to be familiar with basic theories and research traditions in the subject matter (FEAB 20, the autumn semester 1993).

Abilities in applying economic models in problem solving and in assessing economic problems, are trained as an integral part of the curriculum of this specific course during the lectures in the problem solving processes and in the discussions. The discourse of the subject matter is an aspect of the entire context of education in the School of Economics and Commercial Law. The lectures observed were planned to include a problem solving process, which the students are offered to take part in. When these examples of application are solved, the teacher invites the students to scrutinise the solutions and discuss different solutions.

When the course in Management Accounting starts, the teachers meet students who have spent one and a half semesters of the four year programme or a half of a semester of the "separate course" at the School of Economics and Commercial Law. The course in Management Accounting is a new subject matter for them in their study programme. At this point in time in their programme, most students feel acquainted and familiar with the institutionalised teaching and learning offered at the School of Economics and Commercial Law. They are members of the Student Association of the Business School and meet former students, students in front of them in the study programme and external businessmen and

businesswomen during meetings, parties and at different "net works" arranged by the Student Association.

The selection of subject matter concepts

During the planning phase of the empirical study, the selection of topics was discussed and the selection of focused topics was decided on in cooperation with the teachers. The main criterion used in the selection process was that the selected topics included have to be fundamental for the students´ understanding of financial and management accounting and thereby relevant for the present study. The concepts (objects) differ from lecture to lecture. The theory of variation is used in the analyses of how the concepts as handled by the teachers and understood by the students. On one hand in analysing how the teachers are using the subject matter in explaining the concepts. On the other hand in analysing how students have experienced the concepts during the lecture.

The delimitation of selected excerpts

The excerpts of the lectures included in this presentation have been selected due to the subject matter content. As mentioned the concepts of the lectures were decided together with the teachers. So the selection process consisted of identifying the concept in the transcribed text of the lectures. The main difficulty was to limit the excerpts. Most of the time they tended to be too long. The excerpts were scrutinised several times and further limitation was done each time.

The excerpts from students´ solutions are of different length. These were the most difficult to limit. The included excerpts are concentrated around the end of the problem solving phase. Finally, all excerpts have been tested in discussions with colleagues in seminar groups.

The subject matter expert

In accordance with the aim of the investigation an expert a researcher and lecturer in Management Accounting at the School of Economics and Commercial Law was asked to take the role of an adviser in this study, when the problem solving exercises had to be chosen. One of the difficulties in that phase of the investigation was to choose exercises which were similar in content as well as in difficulty compared to the problems the teachers used in their lectures. Three specific examples were selected in co-operation with the subject matter expert. Each example was related to the content of each of the lectures, and used by the investigator in the student interviews.

The subject matter expert has been available for consulting and discussions whenever it has been necessary.

The interviews and the interviewer

In order to do 15 interviews between the lectures a room in the neighbourhood of the School of Economics and Commercial Law was searched and found. The students were able to reach the room in about ten minutes and walk back, if they needed, to continue their group work. That happened several times during the third round of interviews. With two exceptions, one early morning and one lunch time interview. Most of the interviews were conducted in the late afternoon (after 5.30 pm), when the students were on their way back to different student rooms and student flats.

The investigator, the interviewer and the author of the thesis is the same person. I have carried out the 48 audio taped interviews, 45 student interviews and one interviews with each of the teachers. The procedures for achieving faithful answers from the interviewees were based on my honest and sincere interest in the aims of the interviews and the investigation[39].

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39 The professional training I have as an the interviewer is from my education as a psychologist. Furthermore, my professional work in research and development of higher

Participants

Teachers

The selected teachers were all experienced[40], one senior lecturer (Bess) and two associate lecturers[41] (Adam and Carl). The investigation was introduced to the teachers by the investigator during the planning phases of the investigation and before the course has started. The teachers have planned the course and decided on the content of each lecture together. They have also decided and settled which examples of application they were going to solve during the lectures. The teachers were asked to give priority to a central concept of the content included in each of the lectures. After discussions one concept per lecture was selected and the teachers were asked to include the selected concepts in the content of their lectures. The three lectures were settled and the teachers were asked to act during the course and the specific lectures as if these were "ordinary lectures", despite of the video recording. Finally, the investigator invited the teachers to interviews after the course was finished and to three seminars. The aim of the seminars was to watch and analyse the recordings and to discuss the role of a lecturer in Management Accounting and miscellaneous questions related to the investigation.

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education for many years, has given me extensive experiences from interviewing, which were of great help in getting faithful information from the students.

40 The three teachers are university teachers in the School of Business and Commercial Law at Göteborg University. In the present study they have been given fictive names. Adam, the first teacher, has been teaching more than 12 years in Management Accounting. He has extensive experience as a consultant during many years in the national companies and the business sector. The second teacher, Bess, is a female teacher (PhD) and she has about 9 years experience as a lecturer in Management Accounting. The third teacher is Carl. He has about six and a half years of teaching experience as a lecturer in Mangement Accounting and a few years of experience as a consultant in national companies and the business sector. Two of them have more than once been acquired the Student Association's "The Teacher of the Year" award. When this study was carried out, none of the teachers have participated in the "Pedagogical Staff Training Course for Teachers in Higher Education", which was regularly offered to the teachers at the Göteborg University.

41 In Swedish called "universitetsadjunkter".

Students

The students were all admitted to undergraduate studies at Göteborg university, although they came from different programmes on the upper secondary level.

The participation of students has to be built on their willingness to join voluntarily in the investigation. These students were invited in the beginning of the course, during a lecture, to take part in the study voluntarily. All students were expected to be good informants and they were guaranteed the protection of anonymity.

Altogether there were 124 students split into four lecture groups. From three of the groups, five students from each group, declared themselves willing to participate and they were accepted as participants.

It was settled from the beginning of the study, that it was the students opinions as a group, which the researcher should give as a feedback to the teachers during the seminars which were scheduled after the study was finished[42].

Table 1. The students and their secondary level programme

	Gender		
Secondary level*	**Male**	**Female**	**Sum**
Economic (E)	2	3	5
Science (S)	2	2	4
Technology (T)	4	1	5
Social science (So)	1	-	1
Total	9	6	15

* 3 year programme.

Out of 15 students (Table 1 and 2), 11 (6 male and 5 female) participated in the four year programme for economists, while four students (3 male and 1 female) were participants in the one year

42 Three seminars took place in September and October 1994.

course (40 points) in Business Administration. These last four students took a preparatory course in economics in January 1994 before they entered the course in Business Administration.

The participants in the investigation came from three different lecture groups. In the study, the groups are named A, B and C. Group A had Adam as teacher, group B had Bess as a teacher and group C had Carl as a teacher.

Three of the four students who started in January were in group B. All students who belonged to group C had finished the three year upper-secondary school programme in economics. In group A (Table 2), three out of five students had finished the programme in technology at the upper-secondary level, one the programme in economics and one the science programme.

Table 2. The students organised as groups A, B and C and their secondary level programme

	Gender								
	Male				Female				
Secondary level	**E**	**S**	**T**	**So**	**E**	**S**	**T**	**So**	**Sum**
Group A	1	1	2[1]	-	-	-	1	-	5
Group B	-	-	2[1]	1[2]	-	2[1]	-	-	5
Group C	2	-	-	-	3	-	-	-	5
Total	3	1	4	1	3	2	1	-	15

1. One out of two students was admitted to the Business Administration course in January.
2. The student was admitted to the Business Administration course in January.

At the end of the course there was an examination and the students were invited to a test. The first opportunity to take the test was in the second week of June and the second opportunity was in the middle of August. The test signified that the students had to answer essay questions and solve examples of application. Twelve of the students took part in the first opportunity and four of them got the

mark "passed with distinction" (Pd), six "passed" (P) and finally two students were marked "not passed" (Np). One of the last two students had a second try in August and got the mark "passed" (P). Altogether 11 of the students passed this specific course before the next semester started.

Three of the students did not make a try despite of two test opportunities (Na=no attempt).

The results from the examinations are presented as related to the students´ educational background (Table 3).

Table 3. The students´ marks in the examination related to their secondary level programme

	Gender								
	Male				Female				
Secondary level	**E**	**S**	**T**	**So**	**E**	**S**	**T**	**So**	**Sum**
Group A		2	2[1]	-	-	-	1	-	5
Results: group A	-	2P	Na/Np	-	-	-	P	-	3
Group B	-	-	2[1]	1[2]	-	2[1]	-	-	5
Results: group B	-	-	Na/Pd	Na	-	P/Pd	-	-	3
Group C	2	-	-	-	3	-	-	-	5
Results: group C	Pd/P	-	-	-	Pd/2P[5]	-	-	-	5
Total	2	2	4	1	3	2	1	-	15
Number passed after second examination;	2	2	1	-	3	2	1	-	11

1. One of the students was admitted to the Business Administration course in January.
2. The student was admitted to the Business Administration-course in January.
3. Na=No attempt; Students who didn´t take part in the first or the second examination;
4. Marks: Np=Not passed; P=Passed; Pd=Passed with distinction;
5. One of the students passed (P) after a second attempt;

The results are presented per group from the first test opportunity. The student from group C, who had to try a second time is specially noted. However, in group A three students passed, in group B another three students and in group C four passed after the first opportunity and one in the second opportunity, five all together.

The total result was, that six out of six female students and five out of nine male students passed the course.

Data collection

Video recordings of teachers

Using video tape recording does not mean that you are making an unbiased data collection. Every time you record actions and activities you are making a selection of information. Using videotape means you know "how" to do the representation, but still you have to decide "what" to represent. To minimise the "selection possibilities" the cameras were positioned in exactly the same way each time and in the same position in relation to the teacher. The teachers were asked in advance how they usually used the space in front of the students. The teachers answered that they were predominantly going to use "the chalk and talk" teaching-model of the traditional university lecture. According to that information it was possible to plan and decide the positioning of the camera during the recordings. This information from the teachers, was discussed with the technicians involved in the study.

The focus was on the teachers and the video camera was following the teacher during each of the three lectures. "One-camera technique" was used, during the 18 hours of recordings in order not to cause a lot of disturbances during the lectures. The technical equipment was handled by professional technicians and so was the recording[43].

Interviews with teachers

The teachers were interviewed after the course was finished. Semistructured interviews were used. The areas of questions were

43 They were experienced technicians and they had earlier recorded university lectures. Their former experience, of this kind, was from February and March 1994, when they took part in a similar study carried out by the investigator.

about the strategies the teachers used in planning each of the lectures, the content of the three different lectures, if teachers used follow up questions to the students about the lecture content, the teacher´s opinion of his or her performance, the teacher´s opinion of the most important content of the course and their views of learning, on knowledge and on studies in higher education in general. The final questions concerned the specific course in Management Accounting and if there were changes according to the teacher´s opinion, which have to be done before the next time the course was offered. The time for the interviews was late afternoons (after 5.30 p.m.) after the teachers had finished for the day.

Interviews with students

The student group was interviewed three times, which means that a total of 45 student interviews were conducted. All interviews were audio taped and carried out in a room four blocks from the School of Economics and Commercial Law. The time for the interviews was always late afternoons (after 5.30 p.m.) after the students had finished for the day except in two occasions. All the interviews were carried out without any disturbances. Semistructured interviews were applied in the present investigation. The main questions in each of the interviews were carefully prepared in advance. The time difference between the focused lecture and the following student interview varied for the individual student up to a maximum of four days. Normally there was 1 to 2 days between lecture and interview.

The content of the first round of student interviews was related to the content of the first lecture of the present study. The first interview started with fairly general questions about the student´s studies at the secondary level and at the School of Economics and Commercial Law and the courses they had finished so far in the study programme. The students were informed that their individual answers to questions or their performances in problem solving were not going to be forwarded to the teachers nor affect their grades. If any information was forwarded to the teachers or presented in written form, the students would be guaranteed anonymity. After the introductory questions, the next questions concerned the content of

the last lecture. The student was then asked to define "the limiting factor", which was one of the concepts introduced by the teacher during the lecture. After that followed the introduction of the example of application (a specific problem), which the student has to read and then followed the student´s problem solving process. At the end of the first interview, the student was invited to ask questions about the present investigation or other matters connected to the investigation and the interviews.

The second interview followed the same pattern as the first interview. The interviewer focused on the content of the second lecture and asked the student to give a definition of "budgeting". After that an example of application (a specific problem) was offered followed by the student´s problem solving process. When the example was solved the interviewer asked the student to give his or her understanding of "knowledge" and what it meant.

The third interview followed the same pattern as the first and second. The content of the third lecture was focused and the student was asked to give a definition of "standard cost". After that, a specific example was offered, which was followed by the students problem solving process. The interviewer finished the third interview by inviting the student to put questions or reflections to the interviewer on matters connected to the course, the investigation and the interviews and finally to study programmes in Higher education.

The delimitation of selected excerpts

The excerpts of the lectures have been selected according to their subject matter content. As mentioned, the concepts of the lectures were decided on together with the teachers. The selection process consisted of identifying the concept in the lecturer's text. That was fairly simple even if the different teachers had different pedagogical strategies.

The main difficulty was to limit the excerpt. Most of the time they tended to be too long. They were scrutinised several times and

further delimitation was done. Finally they were tested in discussions with colleagues and in seminar groups.

The student excerpts have different lengths. These were the most difficult to limit because some students spent a lot of time during the problem solving process. The included excerpts are limited and the results are concentrated around the end of the problem solving phase. These excerpts have also been tested in discussions with colleagues and in seminar groups.

Drop-out

There were no drops out among the participants during the study. The study was carried out according to the design.

The analyses of data

In qualitative research methodology random sampling is seldom used and the intention is not to generalise the results from the small sample to a larger population. According to Patton (1990), well defined small samples including rich informative cases for study in depth which are selected purposefully are preferable.

> The logic and power of purposeful sampling lies in selecting *information-rich cases* for study in depth. Information-rich cases are those from which one can learn a great deal about issues of central importance to the purpose of the research, thus the term *purposeful* sampling (Patton 1990, p. 169).

The interpretation of data in the phenomenografic research tradition has relied on interpretation of transcribed texts. The interpretation has to be deeply anchored in the text. In some studies independent assessments have also been conducted. Larsson (1986; 1993) means that in such cases, a completed interpretation has been given to an independent assessor, who has to identify different conceptions out of a pool of answers. "The criterion of correspondence is established when the assessor can identify the different conceptions" (my translation; ibid., 1993, p. 208).

The process of analyses of the concepts and of the solutions has been described in chapter 4. The results of the analyses of the lectures and of the interviews have been discussed in different phases of the process of analyses with the subject matter experts. The many and the long excerpts from lectures and from interviews and the summaries of the lectures (Appendices 1 to 9) are meant to give a rich descriptions of the lectures and of the students´ problem solving processes. In the analyses of 45 solutions of examples of applications, cases diverting from the main line of problem solving have been searched. None of the solutions differed in any exceptional way. The interpretations of the students´ solutions have been scrutinised in cooperation with the subject matter expert.

Discussion of the quality of the study

Triangulation is a method often employed in research to reduce the likelihood of misinterpretations, including redundancy of data collecting (Stake 1994). The method means that different data from different data bases are used to clarify meaning and for identifying different ways the phenomenon can be experienced. The problem is that there is no one-to one relation between the experiences and the interpretations of the phenomenon. Larsson (my translation; 1993, p. 207) also points out "The problem is that behind the idea is a notion that there is an unambiguous relation between interpretation and reality, which does not fit the idea of reality as a socio cultural construction".

The concepts of validity and reliability, as used in quantitative methodology, seem unsuitable in this study, where the data and the analysis of data rely on a phenomenographic research tradition and a qualitative methodology. Therefore more suitable concepts used in studies employing a qualitative methodology have been searched for.

The pragmatic criterion seems to be a criterion, which could suit studies like the present. This is a criterion which stresses the consequences of the results. However, there are others. For instance

Ottosson (1987) argues that criteria like correctness, usefulness and non-triviality seem to be more useful in an interview study where a phenomenographic research approach has been used, and another criterion is "trustworthiness", which involves "the credibility of portrayals of constructed realities" (Kincheloe & McLaren, 1994, p. 151). This criterion is suggested to be used in assessing the trustworthiness of critical research, but it seems useful because it signifies different assumptions about the aim of the research than validity. A further criterion suggested is "richness of meaning". The "discourse criterion" can be mentioned as useful also, when a good and convincing argumentation within the scientific community is possible to fulfil. Another criterion used in interview studies is credibility, which comes close to trustworthiness and accessibility (Larsson 1993).

In the present study, the comparison between the answers from different groups of students is a possible way to analyse the credibility of the answers given in the interviews by the students. The same comparison has been done for the teachers. The summaries of the lectures have been scrutinised by the teachers, who were involved in the study. The few corrections given from them have been accounted for in the appendices 1 to 9. The "discourse criterion" has further been used in different phases of the analyses, which have been put forward to the subject matter expert and to different seminar groups for discussions. During these occasions, the entire study, the method of analysis and the results have been scrutinised by seminar groups at the department of Education and Educational research and on one occasion by a seminar group of teachers at the department of Management Accounting in the School of Economics and Commercial Law.

Ethical standpoints

The ethical principles recommended by the National Research Council of Humanities and Social Sciences have been followed in the planing and the execution of the study (Humanistiska och Samhällsvetenskapliga Forskningsrådet, 1990). The teachers have been given fictive names and that seems probably not to be a

problem. The group of teachers in the School of Economics and Commercial Law varied at that time between 140 to 175, when expert teachers[44] were included. To remember who taught in the specific course in question, during the spring semester in which the recordings were made, is probably difficult for anyone in the specific School of Economics and Commercial Law. In this study the descriptions and analyses of the lectures can be negatively apprehended by the teachers involved, but also the opposite is possible. These teachers were all appreciated teachers among their groups of students. The result of this study might help them to reflect and to examine their own activities as teachers, which can make them even more professional as university teachers in their subject matter domain.

The students have not been given fictive names but have been numbered. They were all interested in the results of this study. They were promised that the report of the investigation will be sent to their Student Union. They have finished their undergraduate studies but might still have contact, through different net works, with their student union. The thesis will be presented to the Student Union of the School of Economics and Commercial Law at Göteborg University.

Reflections on data collection

The lectures

The video recordings followed the pre established plan. As has been pointed out, on one occasion the technicians have video recorded one of the teachers when this teacher was giving the lecture the second time round. This was due to a misunderstanding of the time schedule. Except from that, there were only minor interruptions during the second round of recordings due to the repairs in the

44 Expert teachers means here the teachers which are invited lecturers once or twice a year because they are experts in different specific subject domains and can for instance represent different professions.

building. These interruptions are covered by field notes taken by the investigator, who took part in the lectures several times.

The number of students taking part in the lectures, when the investigator was there as a participant, were close to forty and therefore the presence of the investigator did not cause any noticeable attention.

The interviews

Students

The students were introduced to the aim of the study twice by the investigator, the first time prior to the first lecture and the second time at the beginning of the first interview. All the students acted positively, they supported the aim of the study and they worked and did their very best during the interviews.

The interviews were conducted as semi structured interviews. The content of each interview was planned in advance and each interview illuminated different subject matter areas related to the previous lecture. Supplementary questions related to the students studies were taken up. The same procedure was repeated in each of the interviews. As mentioned earlier the interviewer was well aware of that several factors could influence the results of the interview. The interviewer was eager to follow up questions and when necessary asked pertinent questions. The interviewer and the interviewee were not disturbed during the interviews and the relation between them can be characterised as warm and friendly. The interviewer concluded after the first round of interviews that none of the fifteen students in the interviews diverged remarkably from each other on a general level.

All examples introduced to the students were similar to the teachers´ examples and they were all picked from the course literature in cooperation with the subject matter expert. The first and the third example were picked from the English textbook and as a consequence the text was in English (Drury 1992).

After the second interview was finished two students from different lecture groups commented and regretted at the same time that they had not had time to study and be better prepared for the interview. The interviewer stressed and reminded these students the interview exercises were not supposed to be regarded as examination problems and that the results did not affect their marks and grades. All students took part in the study very seriously and there are no suspicions that they tried to distort the results and affect the study in any way.

The face validity of the answers of the questions used seemed to be satisfying with regard to the comparability of the questions and answers. During the weeks when the interviews took place, the students had to finish a "Case study", including a problem solving process performed in groups of five to six students. This case study had to be reported in an oral session before the course finished and before the examination.

The teachers

The interviews with the teachers were prepared in the same way as the interviews with the students. Areas of questions were decided in advance and they formed a framework for the interviews. Also the teachers acted supportively with respect to the aim of the study, not just during the interviews but during the entire investigation. All of them came to the seminars, which took place in September 1994, after the autumn semester had started.

The interviewer

The self-evaluation of the procedures for achieving faithful answers from the interviewees is based on the transcribed protocols. There are of course questions which could have been pressed further in order to get an even clearer answer. But there are always pros and cons in how far you can go in probing. Since the students were going to come to interviews three times, I was careful in not turning the whole interview to a pressing situation for the student. I also thought it was important to have time to joke and laugh together.

During the whole investigation, I found the students´ problem solving process very interesting and exciting. In the experts one example I got so involved in the student's problem solving and the result was that I gave "a type of good advice" to the student. This happened after the last lecture and during the third interview round. The student S8 represented group B (Chapter 8) and the event took place just after she had set up the problem correctly on paper[45].

I: Mm m... I think you're on the right track... it sounds reasonable
S 8: Yes, on the right track, I guess, but ... ha, ha ... I'm not getting anywhere [both the interviewee and the interviewer are laughing for a while] Do they mean that it's ... two times 4,500 perhaps ... and that for each tube it's ... [both laugh again]

After the second bout of laughter we both managed to keep the concentration during the rest of the interview.

Even if this occasion can be interpreted in different ways, it did not affect the finishing of the solution, the whole interview or the relation between the interviewee and the interviewer.

45 This interview was the only interview conducted in the morning (7.15 a.m.). S 8 seemed to be tired at the beginning of the interview. This passage is commented in Chapter 8.

III. RESULTS

Chapter 6

COST ACCOUNTING

Subject matter content and example

The theme of the first observed lecture was Cost Accounting[46]. The observations was made the second time during the course in which the students had met the theme, which means that they obtained an introduction to costing as an economic model. The content of the lecture deals with how costing can be used as a model to set which costs are relevant costs and to estimate the profit of manufacturing in a company[47]. Cost accounting is also used to estimate different solutions when the management has to make decisions. The management of the company has the responsibility for decisions taken and has also to decide if the company should choose to expand, discontinue or develop the manufacturing of a product. One of the most important duties of a company board is to settle the economic objectives of the company and determine if and how profits of the company should be maximised during a year. Examples of different decisions the management has to take are named special decisions[48] in the course literature.

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46 Cost Accounting is a domain of Management Accounting, in which different methods has been developed. If different estimations are made and each of them correspond to different actions for a company, then these estimations provide the ground for different actions of the management of the company.

47 "Company" and "business" as concepts are used in the text as synonyms and as general concepts tantamount to manufacturing industries.

48 "Special decisions" (see Drury 1992, p. 236) and relevant decisions are used in the text as synonyms. According to Drury "the special decisions", called "special studies for non-routine decisions", are for instance: 1. deleting a segment, a manufacturing area or a type of product from an assortment, 2. special selling price decision 2a. during full

The teachers give examples of special decisions with references to the course literature and also provide examples of application. The situation when special decisions are necessary to take illustrates different problems which can emerge in a company and which the management has to solve. In such situations it is taken for granted that the economic system of the company can provide supporting information for estimations and decisions. The objective for the management is to achieve economic goals, the maximisation of profit and to make decisions which are profitable for the company. In a situation concerning manufacturing of products, the management has to decide which costs are relevant costs[49]. Some extra information in application[50] examples which are solved by the teacher and the students in cooperation. The decisions in a company are affected by different quantitative and qualitative factors.

The problem solving process aims to train the students in reducing the problem to what is relevant for the decision in the actual case. This means that even if different resources have to be available in the manufacturing process, it is only the costs of the relevant resources, which the students have to identify and calculate. During the lecture the teachers introduce and demonstrate the special decisions[51] in a company and the complexity of economic assessments of profit in manufacturing industries. The teachers and the students discuss different foundations for decisions and different example solutions after they have solved the application example. The aim of these discussions are according to the teachers[52] is to develop the students´ understandings of the subject matter and of economic discourse as well as to develop their abilities and skills in making economic assessments and evaluations.

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capacity 2b. during free capacity, 3. decision-making and the influence of limiting factors, 4. manufacture or buy decisions and 5. decisions on replacement of equipment.

49 "Relevant costs" means in this situation actual costs, which make it possible for the management to discriminate between the different foundations for decisions.

50 Example of application and example are used as synonyms.

51 See foot note 43 and Drury (1992 p. 236 ff.).

52 From interviews with teachers. These interviews were conducted after this specific course was finished.

The applications example from the first lecture was about the existence of "a limiting factor"[53] in a manufacturing plant. This company manufactures different products by using two consecutive production lines. In all manufacturing, different resources are needed such as manpower, material and machines. A lack of a resource at any one level causes a lack of capacity and at the same time as there might be enough of other types of resources. This is what is meant by a limiting factor affecting the manufacturing process. In the example the company was manufacturing three different products. In order to maximise the profit, the company has to use the capacity of the limiting factor effectively to get the maximum contribution to profit per unit and reach the economic objective. A costing method was also introduced through the example, which can be applicable in deciding which alternative gives the optimal profit per product and item in the limiting factor. The concept "contribution to profit" had earlier been introduced in the course. This concept stands for how much each product contributes to the profit of the company. The example consists of three sub exercises. The students are asked to:

a. identify and calculate the size of the limiting factor.

b. calculate the profit if the company decides to make the products or buy the products from a supplier and also to calculate the number of products needed.

c. discuss other factors which can have an influence on the management's decision.

The three teachers solved the example in a similar way. The example was a well structured problem and the process of problem solving was expected to give the same solution in the three different groups of students. The meaning of the concept "relevant costs" and the understandings of the causes of the lack of capacity are of

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53 The company in this example has two production lines, each having a capacity of 2000 hours. The problem is that one of the production lines has a limiting factor, often causing "the bottle neck effect" (Drury 1992 p. 245), which in this case means lack of capacity.

great importance. The solution of this example demands the company to use the resources effectively. The teachers pay a great deal of attention to the lack of capacity in one of the production lines and the limiting factor in this example is machine hours. They also seek alternative solutions in order to reach a solution in which the capacity is maximally used on the one side and the profit of the company is maximised on the other hand. Finally the teachers pay attention to firstly, the effect of qualitative factors when decisions have to be taken by the management and secondly to the critical scrutinising of the solution of the problem. The three sub items (a, b and c) were discussed in all the three student groups.

The teachers´ ways of teaching cost accounting

The teachers have interpreted the curriculum and the objectives of the course in cooperation and have jointly planned and decided the content of the course and each lecture, and even which examples have to be solved in each of the three lectures observed. In the planning phase, the teachers discussed and they suggested which concepts they have given priority and would be focused in each lecture, due to their importance for the understanding of the subject matter.

However, in spite of the fact that they planned the course together, the teachers introduce, open and proceed through the lecture in different ways (appendices 1 to 9). As a consequence the actual content of the lecture will vary due to different approaches and entrances to the subject matter and different perspectives, which the teachers have chosen and applied.

Each of the three teachers have collective conversations with their students in the lectures in which all students are invited to take part. Here a differentiation between private and collective is drawn. However, teaching in higher education can be characterised as "a pedagogical communicative relation" (Burbules, 1993, p. 12). This concept stands for a broad definition of a dialogue and the conversations in this study can be characterised as dialogues

between a teacher and a student about a specific subject. They are not like other forms of conversations, where humans are arguing, negotiating, chatting etc. They talk, argue and put questions to their group of students. This form of collective talk implies a power structure in the dialogue. It is not a collective conversation on equal terms, since the teachers have the precedence of interpretations.

The teacher is discussing or pointing out something during the lecture, he is lifted up a specific subject matter content as a figure against a subject matter ground. In this case, In this case have assumed that possible backgrounds would be the demand of maximum profit and the lack of capacity. The ground is not always explicitly expressed by the teacher but indirectly the teacher and the students know that there is an assumption of maximum profit for the company in this specific problem, which has to be fulfilled. In the analyses the figure and ground relation is revealed. When the teacher does not express the ground explicitly, he or she is assumed to use the profit of the company or the lack of capacity as the grounds, which in text is is expressed as the "tacit grounds".

The core content of the lecture

The objectives of the first lecture were a) to elaborate costing as a method for cost accounting and b) to show the complexity of decision making and c) to estimate economic assessments in product manufacturing companies and finally also d) to train students skills like problem solving and making economic assessments[54]. The analyses of the content of the first lecture, the subject matter content, show the following subject matter to be the "core content" of the first lecture":

1. cost accounting as a model for estimation;
2. different cost concepts;

54 This is a summary of the objectives given by the teachers in the follow up interviews after the course had finished.

3. different specific situations when the management has to make a decision;
4. the effect of qualitative factors on economic assessments in relation to management decisions;
5. the application example[55];

The core content is shared by the teachers and it is identified in all three observed lectures. There are other parts of the lecture theme which were not shared by all the teachers.

The cost concept

The following excerpts will be focused on the introduction of the cost concept and the solution of item b in the application example.

Different basic concepts are included in the lecture theme and the teachers introduce and explain these to the students. The subject matter context of the concepts is important for the students´ understanding of the meaning of the concepts introduced. In the following example of application the maximisation of the company´s profit must be accounted for. This maximisation as well as the lack of capacity (machine hours) function as tacit grounds during the different steps in the solving process.

Adam's lecture

Adam[56] starts by giving some technical information about the schedule and directly after that he turns to the example and starts the problem solving process (Appendix 1). This means that the core content of the lecture is integrated in the problem solving process. Adam's pedagogical strategy implies that in his teaching he continuously strives to involve students in conversation, question

55 The concept "example of application" will be used in the following text as a synonym to "lecture´s example", "teacher´s/teachers´ example", "interview´s example", "the student´s/students´ example" and "problem".

56 Adam is almost forty years of age and has more than twelve years of experience of lecturing in Management accounting. His name will be abbreviated as A.

and answering[57], which means that he puts questions to the students and he gets answers from them. He is thus not a teacher who prefers a monologue but instead he invites the students to participate in a collective conversation.

In the following excerpt the example of application provides the context for the subject matter. Adam uses the example as a frame of reference inside which he integrates the theme of the lecture. When we come into the lecture he has written the costs of manufacturing three different products and the costs of having two different lines of production, on the white board in a form of a table, where he puts all information given in the example. Here we shall pay attention to how he presents the time and the costs as concepts.

Adam (A): They say that if you get a task like this, then you have to find out the actual time consumed. What could be a limiting capacity (limiting factor) is either machine time or labour time. When you get a task like this, it's just a question of finding out whether it's machine time or working time (labour hours) and finding the working time to be able to calculate the time consumed per piece in each process ... or in each department if it's that ... that type of production ... There's another example like this that you can look at. The next step is then to decide what to do. Now, we know that here there is the alternative of purchasing externally. Although not Y, but there are external suppliers of X and Z. The question is, then, which one should we purchase? ... ... We'll see what's cheapest for the company. How does one reason in such a case? ... Well, that's something we can look at. Our basic data here consists of the costing of these components. For these components, there's a division into incremental costs and general overhead costs. These first three, direct materials, direct wages and variable overhead costs. They are actually the incremental costs of these components. And we can compare the incremental costs with what it would cost to purchase these products. See what is most expensive. What is incremental cost? ... ...

57 Here the concept conversation stands for what the teacher actually does. He directs a question and he looks at the entire group and wait. This means that his question is a collective question in the sense that it is directed to the entire group. It is not a conversation on equal levels since the teacher is deciding the agenda even if the students are invited to put forward their own questions concerning the subject matter. The point here is to stress that each of the teachers develop their own way of lecturing.

Student$_1$(S_1)[58]: ..... (mumbles something inaudibly)
A: Yes.
S_2: ... unique to the product...
A: Yes, OK. It's what's unique to the product. In this case, the component. If we don't manufacture this component, do the costs disappear? ... They do. This is what actually distinguishes incremental cost, that it's something that is directly linked to the product which would disappear if we didn't produce them. On the other hand, a general overhead is not linked to the product at all, it's always there irrespective of whether you produce or not. Consequently, it's of interest to compare the incremental cost of these components with what it would cost to purchase the component (A/Lect. 1/p. 4)[59]

In this excerpt we observe that Adam points out the lack of capacity, which is time and in this case machine hours (the limiting factor). He focuses on time (machine hours) and opens it as a dimension of variation by contrasting machine hours and labour hours (wage hours). Explicitly he shows the limiting factor (which has been estimated earlier) in the example by writing on the white board -250 hours.

Adam chooses to point out that there are different types of costs involved in this example, which have to be scrutinised before the decision is taken about manufacturing or purchsing. He focuses on costs and opens it as a dimension of variation by contrasting incremental costs and general overhead costs (Adam writes the figures on the white board). After that Adam thematises incremental costs by giving examples such as the direct material costs, direct salaries costs and variable overhead costs for each component. Then he focuses on general overheads as an invariant aspect by explaining that these costs are not related to the manufacturing process of products and consequently they will remain as costs even if the manufacturing process is deleted.

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58 When several students say something, this is indicated by lowered figures.
59 The excerpts from lectures or interviews are transcribed as conversations. To facilitate the reading of these excerpts, some minor corrections have been made. For instance, repeated sentences or words have been excluded as well as different repeated words such as "then", "yes", "or" and different guttural and tonal sounds such as "uh", "ah", "mmm", etc.

Adam focuses on and lifts up[60] the machine hours or the wage hours as figures against the lack of capacity as a tacit ground. Further on he uses incremental costs as a figure and the company's profit as the tacit ground. The teaching object he and the students constituted consists of the following dimensions of variation such as time (the limiting factor), costs and incremental costs. General overhead costs is focused by the teacher as an aspect and an aspect held invariant.

Bess´ lecture

Bess pedagogical strategy for the lecture has different elements (Appendix 2). Her introduction of the subject matter puts the content of the lecture in a broader context. She[61] starts by linking the subject matter content of the lecture to the content of the previous lecture and the course literature. Bess gives examples of non-regular situations for decisions, which exists in the product producing industries, which are competing against each other under the demand of profit maximisation (Drury 1992 p. 27-33). In the following excerpt Bess[62] has been reflecting on the construction of the computerised management accounting and control system, which gives the base for decisions, which the management has to take. Notice here how Bess presents the cost and the time concepts.

> Bess (B): And in the same way, there too we have to decide on what information is needed. How do you use it to make the most correct decision possible? [...] And what is decisive in these typical situations is this business of what constitutes relevant and irrelevant costs. To clarify that – what the starting point is for determining whether a cost is relevant or irrelevant, we have a number of concepts we can use. One of these concepts is incremental costs. [...]

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60 The interpretation here is that the teacher wants to make the students aware of this specific dimension and therefore he focuses on the dimension. Then the teacher chooses to show the dimension as a figure against a ground, this is expressed as "he lifts up".

61 Bess is the same age as Adam and has almost nine years of experience as a lecturer in Management Accounting. Her name will be abbreviated as B.

62 Bess also develops a conversation in cooperation with the students in her group, a conversation which has similarities with the conversation in Adam's group, but which often consists of more than one 'turn', question followed by an answer, between her and the students.

> Another concept is sunk cost. There isn't any really good translation of this so the English term is often used in Swedish textbooks, but it could be said that "nedlagda kostnader" is alright as a translation and these costs are not only sunk but also, in a sense, lost. [...] And then we have other concepts. One of these is replacement cost. Another is alternative cost. [...] These costs are related, to just this decision-making situation, ... inherent, so to say, in just this project or order or ... what we now have to decide on. [...] So to summarise, you could say that these costs consist of the costs that are relevant or the relevant cost concepts consist of those concepts. What's also important is that the time aspect is crucial to the assessment of a project's profitability, an order's profitability. Do we estimate this in the short term or the long term? And it is also this that is important for determining which of these concepts, rather, that is relevant. So the time aspect is extremely important when it comes to decision-making (B/Lect. 1/s. 2).

The excerpt we observe, that Bess shows that there is a differentiation between relevant and irrelevant costs. Bess focuses on the costs and opens costs as a dimension of variation by contrasting relevant costs and indirectly irrelevant costs. Here, the irrelevant costs are not varied but taken for granted; i.e. invariant aspect. Then she moves to the cost concept and put costs in a broader perspective. She introduces different cost concepts by referring to the course literature (Drury 1992). She focuses on cost and opens cost as a dimension of variation by thematising the cost such as the incremental costs, the sunk costs, the replacement costs, the alternative costs and the prime costs. These are regarded, she says, as relevant costs. She points out that the estimation of a project's profit, can sometimes seem to be positive in a long term perspective but not profitable in the short time perspective. The opposite is also possible depending on the project's objectives, content and circumstances. The time dimension is thus focused and opened as a dimension of variation by contrasting a short-time perspective and a long-time perspectives. This is done in order to demonstrate that a specific project has to be estimated under existing constraints and that costs and time have a relativity. Bess points out time and cost as the figures against profit, which is the tacit ground.

To summarise, the analyses reveal that the costs, the cost concepts and the time are lifted up as the figures and the profit of the company is the tacit ground. The teaching object she and the students constitute during the lecture consists of the cost, the different cost concepts and the time as dimensions of variation and the irrelevant cost as an invariant aspect, which is taken for granted.

Carl´s lecture

Carl[63] links the content of the lecture to the course content and to the course literature (Drury 1992). At the same time Carl stresses that the lecture content is included in the course as an example of practical accounting work in business and in industries (Appendix 3). After the introduction Carl turns to the example of the lecture and starts a collective conversation with his students. Often these conversations consist of more than one turn between him and one student or several students. In the following excerpt we observe how Carl presents the cost and the time concepts.

> Carl (C): What are relevant costs, then? ... We can thus assume that it's a question of a decision to be made on some question. And then you have to find out what the different alternative relevant costs are. [...] Yes, when he [Drury] talks about relevant costs, he's actually talking much more about cash flow ... [...] But if you read it, it says that what is of interest is actually future cash flows, that is to say, future payments. So there, he makes a direct connection with payments, so they are relevant costs. ... [writes on white board] One could say, then, future payments that differ [...] That is, this business of the time horizon, that we look at future payments. That is, what's actually already been done. [...] We have a couple of alternatives to choose between. If we have to take a decision we must examine the differences from the perspective of future cash payments. This means we estimate and use different time horizons. [Here follows one of Carl´s examples] If you for instance have bought a bus card lasting for a month on the busses or the trams in the city. After two weeks you get the idea of starting to save money. You think it is expensive to go by the busses so you decide to walk or cycle instead. Then we

63 Carl is thirty years of age and has six and a half years experience of lecturing in Management accounting. His name will be abbreviated as C.

> could examine which are the differences between these alternatives. If we make the estimate for the next two weeks there are no differences. This is due to the fact that the card was paid in the beginning of the month. If we use a long term perspective there are clear differences between the alternatives. We have to remember to weed out sunk costs in different alternatives. [...] So a relevant cost always has this future perspective. Future payments that differ. [...] Because what I'm saying is that there are, of course, a lot of costs which we have in the company. And what we have to do in this decision-making situation is just to extract the relevant costs (C/Lect. 1/p. 2-3).

In this excerpt we observe, that Carl focuses on costs and opens costs as a dimension of variation by contrasting costs for alternative 1 and alternative 2. Then he gors on by contrasting relevant costs, which here is future cash payments, and cash flow. Carl chooses to present the cost concept related to an economic model, the cash flow budget. He brings in an example of his own and a variation between the examples, which means that he brings in variation through the problem of the costs for a person's travel from home to his working place. The example illustrates the costs of a monthly bus card paid in the beginning of the month, i. e. short time perspective. Then he focuses on time and opens time as a dimension of variation by contrasting costs in a long term perspective and a short term perspective. Time and cost is pointed out as figures against the tacit ground, which is the profit in his example. He goes on and focuses on relevant costs as an invariant aspect. By giving this example he introduces and demonstrates the estimation of costs related to two different time horizons. He brings in an extra variation with the bus card example and he gives the costs and the time concepts a relative character.

The teaching object he and the students constituted together includes the cost and the time as dimensions of variations. Relevant cost became a focused, which is held invariant.

The concept of the limiting factor

The concept of calculation indicates a number of methods in the domain of cost accounting. Calculation is an instrument for planning and estimating used by accountants, when there is a problem in a company to solve by calculating and estimating different possible solutions (Andersson 1997; Drury 1992).

In the following excerpts the three teachers are further on in the process of solving the application example. They have all identified and solved the first part of the problem in the example, which was to estimate the size of the lack of capacity in one of the production lines. There are two alternative solutions to calculate and evaluate in this example, namely to produce the products or to purchase them from an external supplier. They have to decide if they are going to purchase or to manufacture one out of two order products. Profit maximisation is a rule in the company, meaning that capacity in the sector with the limiting factor has to be used effectively. Drury (1992, p. 246) argues: "Where limiting factors apply, profit is maximised when the greatest possible contribution to profit is obtained each time the scare or limiting factors is used". The students are asked to solve the example in such a way that the solution gives the very best profit to the company.

Adam´s lecture

Adam and the group of students have observed that the lack of capacity is 250 hours in one (line N) of the two manufacturing lines. When we come into this excerpt Adam has identified the incremental costs for two products (X and Z) and he has written on the blackboard all figures. He starts by putting a question.

Adam (A): What should we purchase now? Should we purchase Z?...
S: (inaudible)
A: What did you say?
S: You have a certain amount of manufacturing time left here.
A: Yes. ...
S No, I've changed my mind.
A: No, don't change your mind. ... ...

S: You have to check how many ... should be purchased ... ...

A: Yes, that's enough. In any case, we can't make a decision on the basis of this information. We have to determine how many we actually need to purchase, in that case. We know that we have exceeded capacity here by 250 hours and the question here is how many components do we have to purchase from X to get 250 hours? And how many components do we have to purchase from Z to get 250 hours? And what one should look at is actually what the cost per production hour would be when purchasing from an external ... supplier. [...] What is the cost per production hour ... that is, the extra cost per production hour when purchasing from an external supplier? Well, if you look here at X, it takes 3 hours in the process for X and here it takes 1 hour [points at Z]. This means that extra costs (he counts and writes on the white board) ... extra cost per production hour in N for the component X is actually 11 divided by 3, which gives us a cost per production hour. For Z, then, it's equal to 6.50 divided by 1. It took 1 hour here, that is, the cost per production hour is 6.50 (writes on the white board) for Z and 11 divided by 3 for X which is equal to ... 3.67. What this actually tells us is which one of the components we should purchase. The one giving us the lowest extra cost per production hour when purchased externally ... 3.67 compared with 6.50 (A/Lect. 1/s. 5).

The analyses of the problem solving process show that Adam focuses on the lack of capacity, the limiting factor (LF), and opens it as a dimension of variation by contrasting the manufacturing time for X and then for Z, which is 3 and 1 hour. He lifts up the manufacturing time per product X and Z as figures against the total lack of capacity, which is 250 hours as the tacit ground. He goes on and focuses on costs as a dimension of variation by contrasting the company's manufacturing costs per product X and Z, before comparing the price the company has to pay when purchasing from an external supplier. He calculates the differences between the prices for the products and then the differences are related to the company's manufacturing time for both products X and Z, which he calls extra costs. He focuses on extra costs related to manufacturing time per product and opens it as a dimension of variation by contrasting extra costs for X and Z. This means that these extra costs are related to manufacturing time per product X and Z. The result is made explicit when he writes on the white board. We observe that Adam is mentioning extra costs which are the relevant

costs of this example. Although, he is not referring to them as relevant costs.

Here, Adam has first lifted up the manufacturing time per product X and Z as figures and the lack of capacity as the tacit ground and then the extra costs as figures for product X and Z against the same ground. The teaching object Adam has constituted in cooperation with the students is consisting of the following dimensions of variation: manufacturing time for the products, the lack of capacity expressed in machine hours and the extra costs per product.

Bess´ lecture

When we come into the following excerpt, Bess and the group are calculating incremental costs for product X and product Z and comparing it with the suppliers price for the products.

Bess (B): The variable incremental cost is all that matters. It's a good illustration of this concept of incremental cost that … just these costs that disappear if we decide to purchase instead are the ones which are of interest to compare with the price we have to pay if we purchase. So we look at our own manufacturing cost here. What is of interest then is thus the variable incremental cost. What is it for X, then? What cost did you get?

S_1: … 33

B: 33. That means that if we manufacture ourselves, we save … 11 pounds … per piece. And the equivalent for Z, then? … What variable incremental cost do we have connected with the production of a Z?

S_2: 16.50 …

B: 16.50. And that means that here we save … 6.50 if we manufacture ourselves. What should we do? Which one should we purchase? … Do we know this?

S_3: 84 X … … (inaudible) …

B: You want to purchase X … … There, we save more …

S_3: … yes, exactly

B: What did you say?

S_3: … … yes, exactly …

B: Yes, but then you're thinking about the number, right? … But is it obvious that one can draw the conclusion that one can, that we ought to purchase X here? …

S_4: No-o.

B: No-o, says Steny…
S4: No, but just like you said, we have to look at the incremental cost … and …
B: I see, well you've misunderstood it …
S4: … consider how many you're going to make … to find out, so to say … how high the cost will actually be. We have to take 84 times 11 and … 250 times 6.50 to see how much it actually costs …
B: Yes, yes but …
S3: Yes, no …
B: Well, that's one way of working it out … … Ye-es …
S4: Exactly …
B: That's one way of working it out … That's right … So in some way we have to take into account how we can best utilise this limiting factor.
S3: They're not going to take over production; all we are going to do is purchase what we were lacking and then it's the total that is important and not how much it costs per piece.
B: But you can calculate with the cost per piece in order to compare an X with a Z … But it's important to make sure that we utilise this capacity we have in the best possible way and therefore we need to determine how much we will save if we manufacture it ourselves per limiting factor. Was that completely unfamiliar? So to make the right decision here, we have to determine the savings per hour in the limiting factor. Because we need to purchase the one we … where we, so to say, save … the least. Manufacture it ourselves where we save the most. And how do we get at this for X and Z, then? … Too simple? … How much time was consumed for each one in the limiting factor N? … How many hours should I assign to these savings of 11?
S3: 3
B: 3 … And what will it be then … do you think? I make it 3.67 that we save per hour in the limiting factor if we manufacture X ourselves. If we manufacture Z ourselves, how much do we save per hour in the limiting factor, then? Yes, 6.50 divided by … it only required 1 hour. And then quite suddenly it is more, as you can see, so you can't simply compare how much we save per unit; instead, we also have to know in some way that the time needed to manufacture these two is different. And since the limiting factor here is the time, we have to determine how much we save per time unit. And then we make another decision, namely, that we will … … purchase X … (B/Lect.. 1/p. 10-11).

In this excerpt, we see that Bess focuses on costs and opens costs as a dimension of variation by contrasting the cost differences for product X and Z, which means if the products X are manufactured

by the company or by an external supplier. By doing so she lifts up the differences in costs for X and Z as figures and the profit of the company as the tacit ground. In this example she stresses the importance of variable incremental costs due to the fact that these costs disappear if the products are bought from a supplier.

Then, the student (S3) suggests, 84 X as the number the company has to buy. She uses the student´s answer as a focused invariant aspect. Then another student (S4) gives voice to his solution and argues for it. This student´s answer becomes a focused invariant aspect in the problem solving process. Bess admits that his (S4) solution is one of the possible solutions and indirectly she is saying that there are several solutions due to the factors not yet considered. After that, Bess focuses and opens savings (cost difference for products related to the manufacturing time per product) as a dimension of variation by contrasting X and Z Saving is then expressed as savings per product X and Z. The savings are lifted up as figures for the X and Z product and the tacit ground is the profit of the company. Bess is using the expression "savings", which are the relevant costs, even though she does not refer to them in this way. After that she focuses on manufacturing time and opens it as a dimension of variation by contrasting the manyfacturing time for X and Z. Here, Bess lifts up the manufacturing time for X and Z as figures and the profit of the company as the tacit ground.

The teaching object constituted by Bess and the students consists of the following dimensions of variation: cost, savings and manufacturing time per product. The students´ (S3; S4;) understandings are focused as invariant aspects.

Carl´s lecture

When we get into the following excerpt, Carl and the students are calculating and comparing the differences in costs if the company manufactures or purchases the two products, X and Z.

Carl: Now we have a choice here, we can purchase either 44 or 23. Which should we purchase, then? Which would be cheapest or least

costly to purchase, then? We will have to take a look at what it would cost us to make it [...] What do you say?

S_1: Well, we can see the difference in materials, direct costs of materials and labour and variable incremental costs.

C: Yes, exactly. That is, we should only take into account the direct costs we have here, the incremental costs of the production of these two. The fixed costs we don't include. Sometimes, it's more or less like we have certain costs in the process and we divide them by the number of hours. We'd probably have these costs whether we made any products or not. It's more or less like having to keep the machines in good shape and so on ... So you say that we ought to only look at this, then ... these two ... And then we can quickly add up here [...] That is, we have variable costs. And then we knew it was 33 here or 16.50 ... (writes)[...] Extra cost of purchasing, then, and so in this case it's 11 pounds per piece. That is, it costs 11 pounds more to purchase it than to manufacture it ourselves. And in this case, then, 23 ... 16.50. What's the difference between them, then? ...

S_2: ...6.50 ..

C: (writes) 6.50 ... And then you can actually ... Are we getting anywhere with this information? 6.50 per piece (writes). Now we know that ... ... if we purchase X products ... ... it will cost us an extra 11 pounds for each product we purchase ... ... If we purchase Z products, it will cost an extra 6.50 per piece ... Could we directly say something here, then ... "Aha, look here, it's much cheaper for us to purchase ... product Z so therefore we're going to purchase it." ... Can we make that decision directly? ...

S_3: We have different production times so we'll need ... three times as much, so to say ... Then you'll have to compare ... Check how much you'd have to produce so that it would be 11 relative to 6 ... 3 times 6 ... (murmuring)

C: And what do you base that on, that it would be three times more if you look at this, up here?

S_3: Well, it's the time it takes to ... make a ... (mumbling)

C: Ye-es. Did you agree? That it's so that in the Niklas' process (N) here ... where we have this shortfall of 250 hours, we can either choose to replace or reduce production of Z or reduce production of X and purchase instead. And then we reduce by a taking away one product, for example, a Z product, then we see here that the time consumption there was only one hour per product in the Niklas process. This means that we then still have 249 hours which we have to purchase. So how many Z products would we have to purchase to manage those 250 hours? We'd have to purchase 250 pieces of Z, but if we look at product X, we see here that the consumption there

is 3 hours. How many products would we need to purchase then?
.....

S3: 84

C: Yes ... It would be a little bit more than 83, that is, 84 pieces. Where we purchase for each product ... X product ... if we purchase, consumption in the Niklas process is reduced by 3 hours. So we only need to purchase 84 products. And how, then, can we reach a good result here? Well, we can take a look at the N process. What does each extra hour purchased cost? And how do we arrive at that figure? What does it cost us extra? What is the relevant cost of an extra hour if we replace product X and purchase it or replace product Z and purchase it? [...] We look at the bottleneck effect and the bottleneck is machine hour and it's cheapest to purchase in the case of product X. Are you with me? (C/Lect., p. 14-19).

In the excerpt we observe, that a student (S1) focuses and opens the costs as a dimension of variation by thematising the costs of the two products as the direct costs of materials, as the wage hours and finally as the variable incremental costs. Carl continues and keeps the costs open as a dimension of variation by contrasting incremental costs and fixed costs of the company. By that he points out that there are cost on different levels in the company, which have to be accounted for in the example. Then he goes on calculating the differences in costs, comparing the company´s and the external supplier's costs, for the two products. The cost is lifted up by one student and by Carl as figure against the profit of the company which is the tacit ground.

Carl is asking if they now know enough to take a decision. A student (S3) points out the difference in manufacturing time between the two components. The answer is vague and Carl asks the student to explain his answer. Carl focuses on the students answer as an invariant aspect. After that he asks the group if they understood the answer from the student. He gets no answer from the group and he drops the student's answer and he makes instead an explanation for the group. He focuses on the manufacturing time per product and opens it as a dimension of variation by contrasting the manufacturing time for the two products X and Z. Then Carl lifts up the manufacturing time per X and Z as figures against the lack of

capacity as the tacit ground. The lack of capacity is made explicit when Carl writes -250 hours on the white board.

At this point Carl focuses and opens the extra costs related to the manufacturing time per product, which he points out are the relevant costs and opens it as a dimension of variation by contrasting the two products X and Z. After that he finishes the problem solving process.

The teaching object constituted by Carl and the students in cooperation consists of the following dimensions of variation: costs, the manufacturing time per product and the relevant costs (extra costs). Student's (S3) understanding is focused invariant aspect.

Summary of the lectures on cost accounting

Each one of the three teachers presents a unique lecture. Two excerpts can not give a complete picture of the entire lecture[64], but illustrate how the teachers chose to present, handle, use and vary a specific part of the subject matter and what the students are offered to experience. There are differences between their ways of using the subject matter. Two concepts are taken from the lectures to illustrate the dimensions of variation which are varied and aspects[65], which are held invariant. It is not only important to analyse what is varied and what is not varied, but also to identify in which subject matter context the dimensions and aspects are presented. As pointed out earlier the teachers chose different entrances to the lecture theme. The teachers and the students in cooperation constitute the teaching objects (Chapter 4).

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64 The entire lecture for each teacher is summarised in appendices (1-3). All summaries of the lectures have been scrutinised and commented by the teachers. Their comments have been noted and included in the present versions.

65 Invariant aspects have earlier been introduced as focused aspects, which are not opened and varied by the teachers. These focused aspects have a potential for variation, which means that they in a new and different example or situation could be dimensions of variation.

Table 4. The cost concept

	Teachers		
Cost concept	**A**	**B**	**C**
Dimensions of variation	• time - machine hours - working hours	• cost - relevant costs - irrelevant costs	• costs - alternative 1 - alternative 2 - relevant costs - cash flow
	• costs - incremental - general overhead costs	• cost concept - incremental, - sunk, - renewal - alternative	• time - short-term perspective - long-term perspective
	• incremental cost - direct material - direct salary -variable overhead costs	• time -short-term perspective -long-term perspective	
Invariant aspects	• general overhead costs	• irrelevant costs	• relevant costs

In comparing the teachers´ ways of presenting the cost concept we observe that in Adam´s lecture that the cost concept is focused, opened and varied by contrasting incremental costs and general overhead costs. Then he tematised incremental cost and held general overhead costs as an invariant aspect, which means it is taken for granted. Bess chooses to thematise the cost concept by contrasting relevant and irrelevant costs and after that she thematised the cost concept as incremental cost, sunk cost, renewal costs and prime costs. Carl has already thematised the cost concept earlier, when we come so far in his lecture. In Carl´s lecture we observe that he focused cost as a dimension of variation, which he opened and varied by contrasting two alternatives 1 and 2 and he also contrasted future cash payments and cash flow, which means that he related the relevant costs to future cash flow according to the course literature. Here we have an example of the teachers´ different ways of presenting, handling and varying the cost concept.

If we look at the time concept and how the teachers introduced it we have clear differences between the teachers. When Adam is handling the time concept he contrasts machine hours and working hours, as possible limiting factors in examples like this one. Bess chooses to introduce the time concept as an important factor and she exemplifies by estimation of the company´s profit of a project in a short term perspective and in a long term perspective. A specific project might be profitable in a short term perspective but not profitable in a long term perspective. Not only profit but also costs seem to be relative in different time perspectives in Bess´ explanations. Different circumstances and different factors influence the results of a project. Carl chooses to bring in an example of his own. "The bus card" example also shows that the profit, is zero in a two weeks perspective due to the fact that the bus card was already paid. However , in a perspective of a year the profit is great (twelve times the monthly cost of the bus card). Also in this example different conditions exist and factors influence the result for instance the person´s decision to walk a whole year, independant of weather conditions and the time it will take, to save money. Carl´s explanations are giving the cost and the profit a character of relativity.

When the groups have reached the limiting factor, all of them are in the end of the problem solving process. In introducing the limiting factor the three teachers act in similar ways due to the fact that this introduction comes in the end of the problem solving process. The teachers´ are supposed to reach the same result and there are no degrees of freedom in the end of the problem solving process.

Special attention has been given in the analyses of the excerpts of the costs mentioned by the teachers as to whether the company should choose to buy from an external supplier or to manufacture the products. Adam calculates the extra costs per item and after that extra costs per machine hours for one unit of each product. The students are supposed to know which of the costs are the "relevant"

and "irrelevant" costs[66] since none of these concepts are mentioned by Adam. In Bess´ lecture, she talks about the "relevant" and the "irrelevant" costs and the savings as important for the profit of the company. The irrelevant costs are mentioned by her, but taken for granted. She chooses to estimate the savings per machine hours for one unit of each product. In Carl´s lecture the relevant costs of the example are expressed and explained as the extra costs per machine hour, unit and product, if the company chooses to manufacture. The "irrelevant" costs are taken for granted. Here the we see that the teachers do the same estimations but there are differences in the way they express the calculations between Adam and Carl on the one hand and Bess on the other hand.

66 According to one of the teachers´ the concept of "relevant" and "irrelevant" costs are not frequently used in the Swedish subject matter discourse, which might explain why Adam avoids these concepts and why Bess and Carl take "irrelevant costs" for granted.

Table 5. The limiting factor as a concept

	Teachers		
Limiting factor	**A**	**B**	**C**
Dimensions of variation	• lack of capacity (-250 hours) - X/250/3=84 - Z/250/1=250 • costs - X/product; 11.00 - Z/product; 6.50 • extra costs/per product - X - Z	• costs - X/product; 11.00 - Z/product; 6.50 • savings/per product - X - Z • manufacturing time per product - X - Z	• costs (opened by a student (S_1) as a dimension of variation;) • costs (C) - X/product; 11.00 - Z/product; 6.50 • manufacturing time per product - X - Z • relevant costs/ extra cost/ per - X - Z
Invariant aspects	• _____	• students´(S_3;S_4) understandings;	• student's (S_3) understanding;

The concepts are introduced in a specific subject matter context by the teachers and this content context is included in the analyses (Appendix 1, 2 and 3). The concepts are analysed in relation to the subject context, which the teacher has used in presenting the concept. Adam starts the lecture by introducing the application example. The information which is given in the example is carefully examined by him and the students. Due to Bess´ and Carl's broader introductions of the new subject matter of the lecture, the context of the concepts as well as the example become figure against a theoretical ground. Bess chooses to start her presentation by giving an overview over the total lecture and she links the content of the lecture to the previous lecture and to the chapters in the course literature. She brings in and elaborates the different situations in a company, when decisions have to be taken by the management. She exemplifies relevant costs in these situations. Carl starts by giving comments on the content of the chapters in the course

literature. Different costs has to be assigned to different alternatives presented to the management. Every alternative must contain only relevant costs. So it is possible to connect the alternatives to future cash payments and the cash flow budget.

Summarising the content of the teachers´ teaching objects is to point out the dimensions of variation and the invariant aspects and the figure and ground relations. In Adam´s lecture, his subject matter context is the application example throughout the problem solving process. As noticed earlier he integrates the lecture theme as well as the new parts of the subject matter content in this process and constitutes a teaching object from the information in the example. The teaching object, constituted through the problem solving process, consists of dimensions of variation such as costs, incremental costs, time (manufacturing time per product), extra costs per product with general overheads as a focused invariant aspect. The dimensions of variation become figures against the tacit ground, which is the lack of capacity on the one hand and the maximisation of profit on the other hand. Bess constitutes a broader approach to the concepts and they are presented as figures against a more general theoretical economic ground in her introduction. Bess´ teaching object when we come to the lecture's example consists of the dimension of costs, different cost concepts, time, savings and manufacturing time per product as dimensions of variation and relevant costs as well as students´ understandings as focused invariant aspects. These dimensions of variation are figures against the tacit ground of the lack of capacity on the one hand and the maximisation of profit on the other hand. Carl constitutes a broader subject matter frame through his introduction. His teaching object, constituted through the problem solving process, consists of the costs, the time, the manufacturing time per product and the relevant costs (extra costs) as dimensions of variation and we also observe that relevant costs and student's understanding are focused invariant aspects. Carl´s dimensions of variation are figures against the tacit ground, which was the lack of capacity on the one hand and the maximisation of profit on the other hand.

Conclusions

The main difference between the teachers can be interpreted as the differences between the content of their teaching objects, which have been pointed out in connections with the different concepts above. One level they seem to focus on for instance "the time" as a dimension of variation in similar ways, but if their ways of varying and handling this dimension is studied, then the differences between them are revealed although on another level. The content of the teaching object expresses in a way the focused subject matter including its context, which constitutes the structure of meaning of the subject matter offered to the students to experience. Adam is concentrating on the problem solving process of the example throughout the lecture. Bess and Carl have introductions to the lecture through which they constitute a background for the teaching object, which in this case also takes into account the students understandings of the concepts. The broader subject matter context of the introductions and their way of presenting and handling the lecture´s content seemed to give them the possibility to constitute the cost and the time concepts as having a relative meaning structure.

The teaching objects have been analysed from a theoretical learning perspective in which these are regarded as the learning conditions developed during the lecture by the teacher and the students in cooperation. The teachers are not compared as individuals, but their lectures´ are compared as creations of different learning conditions. These learning conditions are offered to the students to experience and these experiences are supposed to lead to learning. The awareness of the students might be structured in specific ways depending on what is brought forward and what is kept in the background in which subject matter context by the teachers. This is likely to happen because certain dimensions of variation of the subject matter content are brought forward (lifted up) by the teacher and some are presented as focused invariant aspects.

Depending on the course objectives, certain conditions for learning are developed in the lectures, which correspond more or less to the objectives. The conclusion is that one learning context can be better than another learning context. The claim is that one learning context can be better in certain respects because it corresponds more to certain objectives of the course than a different learning context. What counts as better is contingent to the objectives chosen, hence the criteria of the course objectives have to be given proper attention during the planning phase of the course.

The example on cost accounting in the first student interview

The problem given to the students to solve after the first lecture concerned the limiting factors and the allocation of scarce capacity (Drury 1992).

A company gets some problem when domestic political trouble in the country of an overseas supplier is causing concern because it is not known when further supplies of raw material will be received. The company needs raw material for manufacturing five different products (components). Due to these problems in importing, the current stock of 17.000 kilograms has to last three months. During that period the expected demand of the different products is given as well as weight per product, prime costs per product and how much each of the five products contribute to cover fixed costs and contribute to the profit.

The students are asked to show what quantity of the raw material ought to be allocated and to each product in order to maximise profit for the company during the coming three months. This means that the stock of raw material has to be regarded as the limiting factor by the students.

The following excerpts of the student solutions include only students who managed to solve the problem. One student from each group represents the group in the first two examples, even if more than one solved the example. The solutions of the third interview problem, included in the thesis, represent only two of the three

groups. The students who did not manage to solve the interview problems correctly are not included in the thesis.

The students´ problem solving

The problem solving process can be carried out in different ways, but there is only one solution of the problem, which gives the company maximum profit. The students have to realise that the 17.000 kilograms, which here means that the supply of raw material is the limiting factor to be taken into account, when the company is manufacturing products during three months. The relation between weight in kilogram and the contribution to profit per component[67] is expressed in two ways, per kilo and unit and per contribution and unit, which is related to the market demand. The students have the possibility to choose between five products. This has to be realised by the student in order to produce a correct product estimate of each component[68] and to solve the problem.

Seven out of fifteen students solved the problem of the first interview.

Student from group A

Three out of five students in group A[69] solved the problem.

When we get into this excerpt, the student S5[70] has read the example and he has also made a definition of the concept of

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67 The "contribution to profit and fixed costs" in the company can be calculated if the selling price is reduced by the variable costs per component in this specific example.

68 In this example the student is asked to produce a product estimate per component including variable cost for direct materials, direct labour and variable overheads per product. There are also budgeted fixed selling and administration costs given per annum. The variable costs as well as the selling price per product are given.

69 Student groups are A, B and C. The letter indicates which of the teachers´ lectures the students participated in.

70 The fifteen students have been given a number like this one, S 5, and not a fictive name. It is only in the conversation with the teacher during a lecture that a student can be named by the teacher, which is exceptional and in that case a fictive name appears in the text.

"contribution" for himself and the interviewer before he went further in the solving process.

S5: Yes, the limit of 17.000 kilos, of course ... and we can calculate how much ... how much is missing ... Then cut [production] of the ... product we make least money on in relation to ... the amount of material used ... ...

I: Mm, mm. ...

S5: Well, it's an idea. [...] Mmm, mm.[...] Yes. ... Units ... [...] And for each unit, a certain number of kilos of X is used ... [...] And then we know that the sum of X is 17.000 ... ...

I: Mm ...

S5: I would calculate how much ... how many kilos of material X are used ... [...] yes, it's the ratio. Because here you see that these 17.000 kilos are not enough by any means in this case.[...] The profit is related in a certain way to ... [...] the number of kilograms of raw materials used [...] Just this product 702 is interesting because there's a very large contribution but a small amount of material used there. [...] If you manufacture 7.200 units of product 702, 3,600 kilos are used ... [...] And then you earn 7.200 times 14.20... [...] We also earn a lot of money on product 822, but it requires much more raw material [...] We can calculate the profit on each product per kilogram of raw material used [...] then we see that on product 702 you earn a lot per kilo raw material....

I: Mm ...

S5: 28.40 .. and after that comes product 701, we can manufacture 8.000 units ... times 9.50... [...] then we have manufactured 9.200 kilo [...] the rest is 7.800 kilo and we could manufacture 822 as long as the raw material lasts ... [...] which gives 6.000 times 13.20 ... 85.200 [13 seconds silence] this will give a profit of £ 263.440 (S5/Int. 1/p. 4-5).

The analyses reveal that this student (S 5) focuses on raw material and opens it as a dimension of variation by contrasting the total need of raw material for five products and the 17.000 kilos available (limiting factor). Then he focuses on weight per product and opens it as a dimension of variation by contrasting the weight per product and the contribution per product for all five products. Contribution means here that the products contribute to the profit and the fixed costs of the company. He points out the weight per product as a figure against the profit of the company as the tacit ground. Then he focuses on contribution per kilo and product and opens it as a dimension of variation by thematising this relation for the five

products. Finally he ranks the five products. He uses the contribution per product and kilo as a figure and the profit of the company as the tacit ground. After that the student realises that a selection of products must be done related to the ranking of the contribution to profit. He ranks the product 702, 701 and 822 due to their contributions to profit of the company. Finally he focuses on the market demand as an invariant aspect. He comments that it is not suitable to produce more than the company can sell during the three months.

Student from group B

Two out of five students in group B solved this example.

Student S9 reads slowly through the given information and gives some comments on the information. He starts by doing a product estimate including all the products. We come into the solving process when S9 is recalculating the product estimate per product.

> S9: You know how much they cost, then you only look at the variable incremental costs and the variable selling price. A kilo ... how many kilos are used for each product [...] Then you get these different, what contribution is per kilo or what contribution they have per unit. But the limiting factor is kilos so you have to calculate the contribution per kilo and unit [...] When you've worked it out, you study them, they're all different then [points at the products in the product estimate]. Then you see which of these products provide the largest contribution per kilo and that's what is interesting since you only have 17,000 kilos. If you find that one is the highest, then first and foremost you make as many of them as you possibly can because you make the most money that way. [...] And then perhaps it's that one in second place and then you can rank them[...] It's not a matter of taking all of them, instead I take those that contribute most to the ranking until I have filled up to 17,000 (S9/Int. 9/p. 4-6).

Here in the excerpt, we observe that this student (S9) takes a teacher´s role in relation to the interviewer. He focuses on costs and opens costs as a dimension of variation by contrasting variable costs per product and the selling price per product. He points out the costs per product as figure and the profit of the company as the tacit ground. Then he identifies the limiting factor (17.000 kilo raw

material) which is related to each product and to each product´s contribution to profit. He focuses and opens contribution to profit per product as a dimension of variation by contrasting different pairs of products such as 702 to 822 and 702 to 701 [he is calculating and pointing at them]. He lifts up the contribution to profit per product as the figure against the total profit of he company as the tacit ground. He observes that the relation of the contribution per kilogram and product must be calculated before he can rank the products. He focuses on the weight per product and opens weight as a dimension of variation by contrasting weight per product, for instance for 702 to 822 and for 702 to 701. He lifts up the weight per product as figure and the profit of the company becomes the tacit ground. The ranking of the products gives the product which have the highest contribution to profit, the second highest and the third highest and he relates each of the products to the market demand. The market demand becomes a focused invariant aspect. Then he goes through the counting once again.

Student from group C

Two out of five students in group C solved the example.

Here, we are coming into an excerpt from problem solving process where the student (S 15) has already identified [in the costing estimate] the contribution to profit per product and he is commenting on the limiting factor [raw material]. He has mentioned that it is necessary to express the contribution to profit and product as a contribution to profit per kilogram and product.

> S15: "You have these contribution margins and then it's very simple to divide them by the consumption of raw material. [...] Yes, as I said, you quite simply divide the contribution margin by the consumption of kilos of raw material to find out what provides the largest return in the limiting factor, which is raw material in this case ... [...] If you look at the results of that part, then product 702 is the most effective and then 701.[...] But it's quite possible that you can't manufacture that one, probably because the demand is only 7,200 so what you have to do is, quite simply, to look at which ones are most effective as regards consumption of raw material ... [...] And maximise them in

> relation to the anticipated demand, quite simply. [...] Yes, it's product 702 so the demand is 7,200 [...] That was the one we found was the most effective, so to say, in the limiting factor [here, the student calculates]. We have then maximised the market's demand for it. And then we have used 3,600 of those 17,000 kilos. [...] And then the second most effective is 701 [...] ... and the third most effective product is 822 (S15/Int. p.4-5).

In this excerpt the student (S15) starts by scrutinising the given information and focuses on the weight and opens it as a dimension of variation by contrasting pairs of products such as 701 and 702 and also 702 and 822. He lifts up the amount of raw material per product as the figure and the profit of the company is the tacit ground. The limiting factor is focused as an invariant aspect. He focuses on contribution per product and opens contribution per product as a dimension of variation by contrasting product 702 with product 701. He finds that product 702 gives the highest contribution to profit according to his calculations. He focuses on the market demand and opens it as a dimension of variation by contrasting the market demand per product 702 and the contribution to profit per product and the same for 701. He points out how many items of product 702 has been ordered in advance and that 702 is the most effective product if it is related to the limiting factor. The contribution per product and the market demand for 702 and 701 are figures and the profit of the company is the tacit ground. He finishes by calculating the contribution of the product 822.

Summary of students´ solutions on cost accounting

A number of factors can affect the results of students´ solutions. In table 3 it has been indicated that the students come to this course with different backgrounds from upper secondary level. Six out of fifteen have taken the economic programme in upper secondary which means that they have spent three years studying economy together with other subjects. Four out of fifteen started this course in Business Administration in January the same year, by taking part in

a preparatory course in economics before the spring semester started, and they have no earlier formal training in economics.

There are great differences between the students in terms of knowledge of economics, at the start of this specific course. What happened between the lecture and the interview, which has been noticed earlier as a very short period, is not possible to control.

Group A has been linked to the example of application presented by the teacher, the calculation process and the process of solving the lecture´s example. The B group has been introduced to the subject matter from a more theoretical and general level of the subject matter and the C group has also met the subject matter in a broader frame of reference including an economic model (the cash flow budget) and examples from professional work.

There was only one or two days between the lecture and the interview, for most of the students. Some students commented that they didn't have time to prepare themselves before the interview due to the short time between the lecture and the interview. Seven students solved the interview example and three of these solutions are included as examples in this text.

The students´ solutions of the first interview example

The excerpts are taken from the end of the students´ problem solving processes. The results reveal differences between the students concerning what is expressed as dimensions of variation and invariant focused aspects and how the subject matter content is handled (table 6).

The object these students are creating during their problem solving processes is here called their "learning objects", which is later compared to the teaching object (the spaces of variation), which they took part in constituting during the lecture´s solving process.

Table 6. The students´ solutions of the limiting factor

	Groups and students		
Limiting factor	**A(S5)**	**B(S9)**	**C(S15)**
Dimensions of variation	• raw material - total need of material for five products - 17.000 kilo	• costs - variable costs - selling price	• weight[1]/product - 701[2] and 702 (0.7 and 0.5) - 702 and 822 (0.5 and 1.3)
	•weight/contribut. - 701/0.7 and 9.50 - 702/0.5 and 14.20 - 821/1,4 and 7.20 - 822/1,3 and 14.20 - 937/1,5 and 12.20	• contribution - 14.20 and 14.20 (702 and 822) - 14.20 and 9.50 (702 and 701)	• contribution - 14.20 and 9.50 (702 and 701)
	• contribution/kilo - 9.50/0.7=13.57 - 14.20/0.5=28.50 -7.20/1.4=5.14 - 14.20/1.3=10.9 - 12.20/1.5=8.13	• weight/product - 822 and 702 (1.3 and 0.5) - 702 and 701 (0.5 and 0.7)	• market demand/ contribution - 702/7.200/14.20 - 701/8.000/9.50
Invariant aspects	• market demand	• limiting factor • market demand	• limiting factor

Note 1: Weight is one (unit) product's weight expressed in kilo raw material.
Note 2: The product number are 701, 702, 821, 822 and 937.

Here we observe that the student from group A uses almost all the information which was given for all five products in the example. The students from B and C both mentioned that there is a selection of products to be done due to the relation between contribution to profit per kilo and product. The conclusion is that the dimensions "weight/product" and "contribution" varied by the students from group B and C have similarities in that they compare pairs of products and properties of these products. The student from group A takes product by product and links the properties to each product. All three presented a correct solution.

Here we observe that there are differences between the students S5, S9 and S15 concerning their ways of solving the problem. There are differences between the students, S5, S9 and S15. In table 6 we observe that all of them have "contribution" as a dimension of variation. S 9 and S 15 use the strategy of comparing different products in different combinations and the S 5 chooses to estimate the relation between contribution and weight for all five products. The conclusion is that on a more general level they seem to act in similar ways but on another level they are handling the subject matter differently.

If we relate the teaching object of the first lecture and the students "learning object" we must first identify the corresponding concepts in the problem solving processes. In the lecture's problem, we have the lack of capacity (-250 machine hours) and two products, which has to be solved so as the company gets the maximum profit. In the students´ problem, it was the 17.000 kilo raw material and five products, which has to be used so the outcome is the maximum profit to the company. A further complication in the lecture's problem was that there was a possibility to buy the two products from a supplier, so a difference has to be calculated between the company´s manufacturing price and the suppliers price. Corresponding complication in the interview's problem was that the contribution to profit was expressed in two different ways, per product and kilo and per product and unit.

The principle to solve these two specific problems seems to be:
1. identify the limiting factor; and then
2. estimate the relation of each products contribution to profit to the limiting factor;

Firstly, the students has to experience, discern and apprehend the teachers ways of handling the limiting factor. Secondly, the students have to experience, discern and apprehend that contribution to profit, which can be related to, different variables. In the lecture's problem it was a relation between extra costs per product and per manufacturing hour. In the interview's problem it was a relation between contribution per product and kilo.

The students who solved the interview problem have discerned the critical dimensions of variation in a problem concerning scarce resources and the demand to maximise the profit of the company. If the teaching object and the learning object are compared, the comparison has to be done after the corresponding dimensions have been identified as well as the principle of solution if there is one. The comparison has to be done on a more general level.

In this case it seems that the students who solved the interview's problem have discerned the critical dimensions of variation included in the teaching object (Table 5) and they where able to discern the corresponding critical dimensions of variation in the interview's problem (Table 6).

To take a different perspective

The student (S 5) from group A began the calculations immediately after he had read through the example. During the process he keeps to the information which is given in the example. This student gives no example of reflecting or taking a distance from the example or leaving the example for reflections. His calculations include almost all the figures given in the example. His approach to the example is to keep close to the figures given and to use the information.

The attitude and approach to the example of the group B student (S9) was critical. He did distance himself and reflect over the information given before he started the calculations and he also scrutinised his solution after he had finished his calculations. The student (S15) from group C showed the same approach as the student in group B. The students from group B and C seemed to be able to reflect, take a distance and take a different perspective on the example. The following examples have been chosen to verify the claim, "to take a different perspective".

This student has heard his teacher (Bess) thematising the cost concept. After having finished the problem solving process he comments.

S9: "Then there are certainly other things that have an effect too ... But this is only a small part. You could look at several things if it had been in real life ... You can't just look at the kilos ... there are other things ... but here, you should only look at just this small part ...[...] Yes, it should be viewed in its context and then if there had been ... There's certainly nothing like this in real life but it's only for practising" (S9/Int. 1/p. 6).

These comments from student S 9 are interpreted as an ability to take different perspectives and to be critical and to generalise to professional work. These comments can also be interpreted as a critical attitude to the example as one part in the education and the programme for economists.

Another student from group C, who also managed to solve the interview example, showed a different approach which can be characterised as critical and reflective to the given information in the example. She solves the example correctly. Then she gives the following comments.

S11: I would probably not have done it quite like that. I'd probably not only considered the profit right now ... I myself would have thought a little bit more from a long-term perspective ... but what we're learning isn't quite correct either (S 11/Int. 1/p. 8).

This student has listened to her teacher (Carl), who has stressed the importance of the time dimension when assessing costs as relevant costs. Her comments are interpreted as an ability to relate the example to professional management. This is interpreted as if she was able to change perspective. This student also knows that calculation in a short time perspective gives one result but in a longer perspective sometimes a different result, which she also commented on during her problem solving process. Both students have an approach to problem solving which has been interpreted as an ability to change perspectives and also to have a critical attitude to given information.

Conclusions

1. The seven students´ solutions to the interview example can be compared with the teachers´ ways of solving the limiting factor problem during the lectures. In the lecture examples the limiting factor was related to the relevant costs per product, which were named extra costs or savings per product and machine hour (in line N if produced by the company), in order to find out which one of the products was most effective in relation to the limiting factor. The students, who solved the interview's example have discerned the limiting factor and its relation to profit. Further on we can observe in table 6 that the student from group A starts to calculate the consumption of raw material for all the products. The student from group B starts by identifying the different costs given in the example. And the student from group C chooses to compare different products, two by two and the need for raw material for each one of the products.

2. The students who managed to reach a correct solution made a similar calculation to the one their teachers´ did during the lecture in the sense that they identified the corresponding dimension of variation as have been pointed out above. They varied the corresponding dimensions of variation. The claim is that the students have learnt the variation of critical dimensions of variation and their relation to the profit of the company in the lecture´s problem solving process.

3. In the beginning of the interview the students were asked to define "the limiting factor". The analyses of the students fifteen answers indicate differences between the groups of students.

One student in group A mentioned existing restrictions which create difficulties in reaching objectives and possibilities to sell more than the company could manufacture. Four out of five students related the limiting factor to the lack of machine hours or the lack of labour hours, when they were asked to give a definition of the limiting factor. One student mentioned existing restrictions which gave difficulties to reach the objectives of the company.

Four students in group B explained the limiting factor in more general terms and gave examples such as lack of resources, problems in the manufacturing process and a bad production capacity in the company. One student could not make any definition.

One student in group C mentioned as examples that the LF has effects on the total profit for the company. Three mentioned that the LF causes a slow production process and different problems in the production process may be the result of an limiting factor. One student said production problems and a decision has to be taken by the management concerning the future production or to discontinue the manufacturing process.

The students in group B and C gave more general answers and explanations than the students in group A.

On a general level, these differences seem to be as if the students in group A focus on the "sign" and the students in group B and C focus on the "signified" (the meaning) in there definitions of the limiting factor.

4. The analyses of the fifteen students approaches to the problem solving process and their way of handling the information given in the interview example signified differences between group A on the one hand and B and C on the other. The students from group A started to solve the problem directly after they had got the example and the text. They started to use the given information and to calculate and all of them kept to the information of the example during the entire problem solving process. Students in group B and C read the example, they took their time to read, reflect and to calculate. Students from group B and C gave more comments about the given information and seemed to be more able to reflect and to take different perspectives to the problem while they were working.

The analyses of the students´ strategies in the problem solving process, exemplified in the thesis (above), have shown that the student from group A used all five products in his estimation process and he counted the relation between the weight and the

contribution for the five products. The student from group B and C used a strategy where they compared pairs of products in different combinations. These comparisons were different. On a more general level the students´ solutions seemed to be similar but when analysing how they handled the subject matter the differences between the students seemed to be revealed.

Chapter 7

BUDGETING

Subject matter content and example

In the second observed lecture the theme was "budgeting", defined as planning for a fixed time period. Under ordinary circumstances, the annual planning is focused and included as one part of the strategic long term planning (Drury 1992, p. 435). The company as well as an organisation has a mission statement. This describes in general terms the purpose and the reason for the company´s or the organisation's existence, the nature of their activities and the customers they seek to serve or satisfy. The objectives[71] of the company are specific and represent desired states to be achieved with respect for instance to manufacturing volume, while "corporate objectives" relate to the organisation as a whole (Drury 1992). Probably, the company has a "strategic plan", which refers to possible future actions. According to Drury these strategic activities are called "long-range planning" or "corporate planning". The board of the company makes the decisions about of mission statements and objectives. The management of the company has to co-ordinate, execute and steer the company towards the settled objectives during the accounting period. During the budgeted year the management has to use the economic system to steer, control and evaluate the budgeted profit and loss account in order to reach the objectives.

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71 Drury (1992, p. 437) notices the expression "aim" and it is used as an alternative to "mission" and the term "goal" is synonym with "objective".

In this lecture the teachers were introducing "the masterbudget"[72], which consists of the profit and loss budget, the chash flow budget and the budgeted balance sheet[73]. The teachers explain the logical relations between the budgets and after that each of the sub budgets are exposed and every item line in each budget is focused and discussed.

The first example of the lecture concerned how a profit and loss budget and a cash flow budget has to be set up for a company. Information was given concerning the sales volume, the selling price and the incremental costs. Further information concerned raw materials in stock, goods in process and finished goods in stock. The second example consisted of another company, which is setting up budgets for the coming year. This company is selling components and information is given about component production, selling prices, variable selling expenses, and revenues and a forecast of the balance sheet of the year. The students were asked to set up a masterbudget. Both examples was taken from the course literature (Claesson, 1993). The teachers chose both examples for the lecture and they intended to finish them - if there was enough time. Due to the technical character of the lecture, it was difficult to plan in advance how much time was needed for each example and they decided to finish at least the first example[74] during the video recording.

The core content of the lecture

The subject matter content of the lecture is budgeting and how to set up a masterbudget, including the three sub budgets. The basic

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72 The masterbudget is in Swedish named "grundbudget".

73 These three budgets, the profit and loss budget, the cash flow budget and the budgeted balance sheet, will be called sub budgets, "delbudgetar" in Swedish, in the following text.

74 The teachers´ had planned to demonstrate how to set up all three budgets during the lecture. Just to remind the reader, the video recording was to be done during the first two hours. As mentioned before, the teachers were lecturing for four hours. If one of them did not manage to set up all three budgets during the first two hours, it could be done during the last two hours. In that case it was not recorded by the video camera.

and fundamental relations between the profit and loss budget, the cash flow budget and the budgeted balance sheet are explained by the teachers. The application examples are included in the core content of the lecture. By focusing the awareness of the students on the entire masterbudget, the teachers aimed to get the students to understand the parts and the relation between them.

This lecture has a technical character where the teachers demonstrate the practice of accounting. The teachers are using the examples to illustrate the relatedness between the sub budgets in the masterbudget. Adam and Carl managed to cover the budgeted balance sheet in general terms, which Bess did not manage due to a long discussions on how to count finished components and raw material in stocks. She used the following two hours to elaborate the budgeted balance sheet in the second example. The demand of accuracy in how to book is mentioned several times by the teachers.

The teachers´ teaching of budgeting

The teachers again chose different entrances to the subject matter. Briefly explained, Adam started by finishing an example from the previous lecture before continuing by solving the first example in cooperation with the students and at the same time integrating the new domain and the core content of the lecture in the problem solving process. Adam explained the concepts in each sub budget, the expense and revenue in the profit and loss budget, the cash receipts and cash payments in the cash flow budget and finally the assets, assets and liabilities and equity in the budgeted balance sheet. After that he showed carefully how these three budgets are related.

Bess started by introducing a theoretical model of an accounting system, which is picked up from an industry. Her objective was to explain and give examples of how future activities can be planned and budgeted. This example is a model of management accounting and control; i.e. how a company control actvities in order to reach

planned objectives. It illustrates planning according to several methods and on several levels in a company. Bess´ uses the model for explaining how planning can be done on the unit level, on the department level and on the corporate level. The budgeting process aims at giving the whole picture of the company's activities during the future accounting period, which is normally a year. After this introduction, Bess started to solve the example in cooperation with the students.

Carl started by giving an introduction to budgeting, the masterbudget and the sub budgets and explained the key concepts in each of the sub budgets as well as the relatedness between the sub budgets. This introduction, he explains, is a part of the course related to previous lectures, course literature and to the "applied case"[75], which is included in the course as group work. Carl related budgeting to cost accounting on a theoretical level and after that he started solving the first example.

During the problem solving process, the teachers are demonstrating or pointing out a dimension of variation as a figure and they are doing it against a ground, which also in this case is the demand of maximum profit for the company. In the analyses of this lecture the figure and the ground relation is revealed. If the teacher does not express the ground explicitly, he or she is assumed to use the maximisation of the company´s profit as a "tacit ground". In the following text it is expressed as a "tacit ground".

The concepts of expense and revenue

Adam´s lecture

Adam gave a short introduction to budgeting and then he went on with the example (Appendix 4). When we get into the following

75 It is the applied "case study" which is indicated here as a "case". The students have to solve and report their results in a written report. This practical case, where the students are asked to set up a masterbudget, is performed in groups of six or seven students. This work in groups runs parallel to the lectures.

excerpt he has introduced the profit and loss budget and the T-model[76] which is the practice of how to construct a profit and loss budget. Adam wrote information in figures on the white board, while loudly reading the entire example.

Adam /A): So sales are equal to 20,000 units times 50 Crowns, i.e. 1 million. Do we have any more income? The most common income item, apart from sales, is interest income. But there's nothing here about interest income so we can assume that this is all the income. What costs do we have then? [sound of students mumbling in the background] 20,000 times the variable incremental cost of 40 Crowns. Is that right? [sound of students mumbling in the background] You're sure of that? Well, that sounds good. It's actually the cost of goods sold. We have to calculate on the same sales volume. So it's 20,000 units times 40 Crowns and that's 800,000. What other costs do we have? This is really the cost of goods sold, valued at a variable incremental cost. This is not the only cost related to goods sold. We have a few more, what are they?

S_1: Administration and salaries …

A: Administration and salaries, and they amounted to? We can call them administration, etc. 40,000. Anything else?

S_2: Depreciation …

A: Depreciation. That's 50. That was all the depreciation. There was also depreciation on the new investments we expect to make. What else do we have?

S_3: Interest 10,000.

A: Yes. Have we included all the costs now? (A/Lect. 3/p. 3).

The analysis shows that Adam focuses on revenue and opens it as a dimension of variation by contrasting the revenue from the company´s sale of the with the interest income. The revenues from sales and from interests form the figures against the profit of the company, which is the tacit ground. By doing so he has pointed out that there might be other revenues except these from the manufacturing of products and the sale, which must be identified. Then he turns to the debit side and focuses and opens expenses as a dimension of variation. Adam chooses to thematise the expenses on

76 'T model' is known in Swedish as the "T-konto modellen", which means, in the profit budget, that you put up expense on the debit side and revenue on the credit side and you draw a vertical line between the two columns. In the following text the abbreviation 'T model" will be used.

the debit side as costs of good sold, incremental costs, costs of administration, of salaries and interests on loans. He is taking the number of products and multiplies cost per product with volume. In this example are costs estimated as cost of goods sold equal to the variable incremental costs per unit. Each item on the debit side is a figure against the profit of the company, which is the tacit ground. He focuses particularly on depreciation as an invariant aspect. The students have to be familiar with the depreciations since these are relating to the cash flow budget and the budgeted balance sheet. Adam´s questions in the excerpt seem to be rhetorical and he gets few answers. He concentrates on the line item by line item on the debit side in order to be systematic in the accountancy.

Bess´ lecture

Bess and the student started the work after they had decided to use the "T model" In the following excerpt we enter after Bess has finished her introduction and also introduced the example (Appendix 5)

Bess: 50 times 20,000 is suggested ... 1,000,000 in income and you've based that on the sales price of 50 and the sales volume of 20,000 units. Is there anybody who is unsure of this? Sales, that is? What's budgeted is the number of units we expect to sell times the budgeted sales price. Do we have any other income? No, we don't. What about the costs, then? I think we should begin with the cost of goods sold ... which is the most difficult. How do we determine that?. Any suggestions?

S_1: ..... (A student mumbles something)

Bess (continues): Variable incremental cost, yes! [...] Yes, variable incremental cost multiplied by the sales volume. The number was 20,000 units and the variable incremental cost was 40 per unit, that is, 800,000 Crowns is the cost of goods sold. What about other costs? Administration?

S_2: ... changes in stocks...

B: How do we take them into account? Should we take a look at what the stocks look like? I think that's an excellent idea.

S_3: No, but they're with...

B: Actually, they're already included, but I think we could reconstruct. But we'll let the prerequisites remain here a bit longer and we'll do this first and then look at what the stock accounts look like, I think,

... as well. Because we need to have a grasp of this. So if we look at administration, salaries, rents. Here's a more given item, 40,000. What about depreciation? It's not particularly complicated in this case, 50,000. It's given. We know that it also includes new investments. Interest 10,000, including interest on the new loan we are raising. Is there any other item that can be expected to affect the result?

S_4: ... investments ...

B: What do you mean?

S_5: ... investments are not expenses ...

B: Is there anybody with a different opinion? ... I have a different opinion about investments. Investments are not expenses, you say. What is it that describes the utilisation of investments? Depreciation describes utilisation. (B/Lect.. 2/p. 7-8).

Here, Bess focuses and opens revenue as a dimension of variation by contrasting revenue of one products with the revenue of the volume (total number of products). She counts the number of product estimated to be sold and she multiplies the total numbers by the sales price per unit. Finally, she explicitly asks for more revenues. She puts a rhetorical question: "Do we have any other revenue? No, we don't". The revenue is the figure and the profit of the company the tacit ground. This is a way of implying revenues from other activities in the company; i.e.that it might be other revenues on the credit side.

After that she turns to the debit side. She asks for the costs and focuses and opens expense as a dimension of variation by thematising the expense. She chooses to start with the costs of the goods sold and then goes on with the variable incremental costs, costs of administration, costs of salaries, rents, depreciation and finally costs of interest as a consequence of the new loans. Bess´ varies cost line item by line item on the debit side. Each item of costs is put forward as a figure and the profit is the tacit ground. Then she focuses on the stocks and the changes of the stocks as an invariant aspect. She points out that it is an important knowledge to know how to reconstruct the stocks. She asks for further items which can affect the profit an loss budget.

One student (S_4) suggests that the depreciation is a cost. Here Bess stops and asks for an explanation. The students understanding

becomes a focused aspect. Another student (S_5) objects to this student´s (S 4) suggestion, which means to regard a depreciation as a cost. Bess focuses on depreciation as an invariant aspect and explains that if the company uses an investment, then the cost of usage is identified as a depreciation in the profit and loss budget. Through this explanation Bess has relates the cash flow budget and the profit and loss budget.

Carl´s lecture

In Carl´s introduction to the lecture he has explained that the example is a practical exercise in management accounting (Appendix 6). In the following excerpt Carl has started the problem solving process[77] via the profit and loss budget. Carl is explaining "cost of goods sold" when we come into the excerpt.

> Carl: If you say cost per goods sold, we can disregard the fact that we don't actually have to have manufactured them. [...] But it could just as well be a trading company. So we purchase the goods and then we sell them [...] Then we also have a variable incremental cost. We buy milk for 2 Crowns and sell it for 7 Crowns a litre. So then we also have a variable incremental cost of 2 Crowns a litre. But OK, at least we know what it's a question of. So it's the cost we have for each unit. Irrespective of whether we manufactured it, purchased it or whatever. Incremental cost, as I said before, what we've invested in the individual unit and selling costs could be included here. There's nothing to show that this is the stock value. You should also remember what we talked about earlier ... How do we value an individual unit in stock? Well, only accrued costs, no selling costs. I see, then we'll have to talk a bit about stock values. How much raw material did we have from the beginning of the period and at the end. Work in process. If it has changed, that is to say just those products which are in the actual manufacturing process. How much was there in the stock of finished goods when the period began and at the end of the period? Then it also says here quite clearly that opening and closing stocks of finished goods are valued at the variable

77 The costs of this example are related to the costs of the manufacturing volume, as fixed and variable costs. The costs emanate from different activities and consequently different types of costs, such as indirect costs (i.e. salaries of management) and direct costs (i. e. actual costs for material). If costs are related to specific decisions in the company then the costs can be the incremental costs or the general overhead costs (Andersson 1997, p. 167).

> incremental cost per product unit. And it was 40 Crowns per unit. Then there's administration, salaries, rent, i.e. 40,000 and these are the costs we then have to classify. We use the terms general overheads, indirect costs or period costs [items on the cost side are booked]. [Carl writes on the white board]. Revenue? And how much do you think that amounts to? What do we sell?... Yes, we have 20,000 pieces at 50 Crowns ... How much is that? We bring in 1 million ... 1 million in revenue. And then we also know that this was 20,000 pieces" (C/Lect.. 2/p. 12-13).

Here, Carl focuses on expense and opens expense (in his own example) as a dimension of variation by contrasting the 2 Sw. cr. which are variable incremental costs and the 5 which are fixed overhead costs. There is a variation between the milk-example and the lecture´s example. Then he focuses on stocks as an invariant aspect. He demonstrates another variation of expense in the lecture´s example, when he thematises the expenses as costs of material in stock, incremental costs of products, costs of administration and costs of salaries and cost of rents. Here the items on the debit side are figures and the profit of the company is the tacit ground. He goes on with the thematisation of expense as general overheads, indirect costs and period[78] costs. The last type of costs were also a repetition of concepts of costs, introduced earlier.

Carl turns to the credit side and focuses and opens revenue as a dimension of variation by contrasting the revenue of one unit with the revenue of the volume (total number of products). He and the students multiply the total number of products by the sales price per product. The revenue is the figure and the profit of the company is the tacit ground. There could have been revenue from other products manufactured by the company, but this is not the case in this example.

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78 The concept "period costs" refers to costs during a specific period of time such as the accounting period, a year in this specific example.

The concepts of cash and equivalents

Adam´s lecture

When we get into Adam´s lecture he is booking the items in the cash flow budget (Appendix 4).

> Adam (A): And we always begin with OB [opening balance], not Cash but cash and equivalents[79]. And remember – always begin with cash and equivalents because then you'll always get CB [closing balance] as the balance. But if you forget this item, the balance will be changed in cash and equivalents. This is easily done. It's one of those unnecessary mistakes to make in an exam, for example. The opening balance, we don't have a whole balance sheet here but [...] It does say, in fact, that at the beginning of the period there was 25,000 in cash and equivalents and this was both Cash and what's in bank accounts, postal giro accounts and the temporary investments made using cash and equivalents; i.e. everything that can be directly converted into cash (A/Lect.. 2/p. 4).

Adam focuses and opens the opening balance (OB) as a dimension of variation by contrasting the cash resources (in hand) and the cash and equivalents. He reminds the students not to forget closing balance (CB) in the examination, which means that he focuses on CB as an invariant aspect. After that, Adam focuses on cash and equivalents and opens it as a dimension of variation and chooses to thematise, by explaining that the cash and equivalents are assets such as the cash (in hand), the bank deposits and the postal giro account as well as investments which are possible to convert to cash resources (in hand). Here Adam has pointed out the opening balance and cash and equivalents as figures against the profit of the company as the tacit ground.

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79 In this part of the problem solving process the liquid assets are focused. In discussion with the subject matter expert, if all assets are covered by a concept like 'liquid assets', he suggested a broader concept, namely 'cash and equivalents' and it is used in this example to cover the Swedish word "likvida medel".

Bess´ lecture

Bess and her students are setting up the cash flow budget. In this excerpt she explains the key concepts in the cash flow budget as the cash payments, the cash receipts and the changes of the cash and equivalents (Appendix 5).

> Bess (B): The cash-flow budget describes payments to and from the company and changes in cash and equivalents [writes on the white board]. We always start with an opening balance [OB] which increases with cash receipts to the company and decreases with cash payments from the company and we thus present a closing balance [CB]. And this is what we are going to describe. It's also important to remember here that receivables and liabilities affect this. They are the two key concepts that, so to say, change, that result in cash receipts to and cash payments from the company. You must also keep that in mind. With the exception of the cash purchases, the cash sales. So it's changes in different types of receivables that affect this. The opening balance [OB] was 25 from the beginning. And then the question is… What sort of cash receipts to the company, like those transactions or those expense and that revenue [points at the profit and loss budget on the white board] like we have here, do we get? (B/Lect.. 2/p. 11).

We observe that Bess focuses on the cash flow budget and she opens it as a dimension of variation by contrasting cash receipts and cash payments. Then she focuses on the closing balance (CB) which becomes a focused invariant aspect. To book the items of the cash flow budget´s debit side, she takes the opening balance [OB] as the starting point. She focuses and opens the opening balance as a dimension of variation by contrasting the receivables and liabilities. The opening balance is used as figure and the profit of the company as a tacit ground. Bess focuses again on the opening balance as dimension of variation by contrasting cash purchases and cash sales. She goes on by relating the expense and the revenue in the profit and loss budget to the cash flow budget by asking for cash receipts. She uses the line items on the debit side as figures and the profit of the company as the tacit ground.

Carl´s lecture

Carl and his group are setting up the cash flow budget, when we get into the lecture (Appendix 6).

Carl (C): And now we come to the cash-flow budget. What are we interested in there?
S_1: …money …
C: Money, you say. And what do you mean by money?
S_1: …cash …
C: Yes, cash and equivalents. Here, we can see what the result was but even if we can say that 'yes, there's a profit here', it doesn't necessarily mean that we have cash in hand for that reason after the end of the period. Could somebody give an example? I say […] that the profit and loss budget shows an excellent profit. We have drawn up a budget and it seems to be a really good one. We will make a certain profit for the period. But then we draw up a cash-flow budget and conclude that we don't have any cash on hand left. When could this happen? …
S_2: … give too much credit…
C: Yes. … We sell, get revenue here but we are generous with credit so we don't have any cash recipts; instead, everything is tied up in accounts receivable. This is one example. More …
S_2: You manufacture more products …
C: Yes.
S_3: … or too much …
C: Quite right… (C/Lect.. 2/p. 5)

We observe here in this excerpt that Carl points out the cash deficits of a company in an example of his own. The analysis shows that he chooses to problematise the cash and equivalents. He mentions that even if the result seems to be positive in the profit and loss budget, it does not necessarily imply cash resources; i.e. the cash forecast can be negative. Carl focuses on the cash flow budget as a dimension of variation by contrasting the forecast and the actual result. He is implying a planning perspective in his own example, and he points out that the profit and loss budget in his example includes an excellent profit although there is a shortage of cash in the cash flow budget. The opening balance becomes a focused invariant aspect. After that he focuses on deficit and opens it as a dimension of variation. He turns to the students and ask them to give examples when such a situation like that might occur. He

thematises a shortage of cash as exceeded manufacturing objectives and too many trade debtors. Here Carl points out the deficit as figure against the profit of the company as the tacit ground.

Carl has offered the group of students one variation between the lecture´s example and his own example (Carl´s example). In Carl´s own example, an occasion of cash deficit turned out to be a lack of control of objectives for the manufacturing process and too generous credits to the customers (trade debtors).

Summary of the lectures on budgeting

The analyses aim to show the conditions of learning concerning how the subject matter content is presented by the teachers and offered to the students to experience. The teaching objects, the spaces of variation, consist of dimensions of variations and of focused invariant aspects. The teachers are influencing their students´ awareness by lifting up certain dimensions of variation against specific tacit grounds, and they are keeping certain aspects invariant.

These lectures are demonstrations of the practice of booking items in the profit and loss budget and in the cash flow budget. The teachers are systematic and they cover the budgets line item by line item. The teachers´ demonstrations of expense and revenue and of cash and equivalents are demonstrations of practice; i.e. accounting records, book keeping. The teachers´ ways of teaching are to solve the lecture example in a way so that they at the same time demonstrate an application of certain rules and norms of the practice of professional accountants in the discourse of the domain of management accounting. The concepts introduced by the teachers in this lecture, are presented in table 7 and 8.

Table 7. Expense and revenue

Expense and revenue	Teachers		
	A	B	C
Dimensions of variation	• revenue - 50 x[1] 20.000 - interest	• revenue - 50 x 20.000	• expense (C´s example) - variable incremental cost - fixed costs
	• expense - costs for goods sold; 40 x 20.000; - variable incremental cost - cost of administration - salaries - depreciations - interests	• expense - 40 x 20.000 - cost of administration - stock changes - salaries - rents - depreciations - interests	• expense - costs for goods sold; 40 x 20.000; - cost of administration - salaries - rents
			• expense - general overhead - indirect costs - period costs
			• revenue - 50 x 20.000
Invariant aspects	• depreciation	• stocks • student´s (S_4) understanding; • depreciation	• stocks

Note 1. Here "x" stands for "times".

The teachers introduce the expence and the revenue in similar ways, even though Carl chooses to start by using an example of his own (the milk example) to be able to illustrate the difference between the incremental cost and fixed overhead cost. Observe that the order between expense and revenue is shifted in Carl´s lecture compared to those of Adam´s and Bess´. In Bess´ lecture we observe that she opens some part of the content so the students can take a more active part in the lecture. In this excerpt she also uses

stocks and depriciation as focused invariant aspects. Earlier in the lecture she has given an exposition of the stocks and their influence on the budgets. Adam started the lecture by a run-through of the application example. After that he and the student group started the problem solving process. In table 7 and 8 we can observe that the the focused aspects which are held as invariant aspects differ between the teachers. Carl explained depreciation and its relation to investment in his introduction, but in Adam´s lecture, depreciation is mentioned as a fucused invariant aspect; i.e. taken for granted. Bess´ takes up depreciation and explains the concept in relation to the specific problem.

We have one example where she focuses on a student´s understanding as an invariant aspect. Observe that she asks the student of an explanation but she gets a different opinion from another student. She drops the first student´s answer and instead she explains the relation between the investment and the depreciation. This situation has been interpreted as a situation when the teacher doesn´t want to follow the student´s suggestion due to different reasons, or that the student´s suggestion is wrong. In this situation Bess chose to reduce the possibilities for variation of the focused aspect, which she chooses to hold invariant. She instead takes over the lecture and gives the information, and the explanation herself.

Then we come to the presentation of the cash and equivalents, Adam chose to use the information of the application example (Table 8). Whilst Carl chose to handle the content in a quite different way. Carl presents the cash deficit and the students are offered to experience the subject matter from an unexpected perspective. The analyses shows that he points out reasons and occasions which cause cash deficit. The cash deficit can be a consequence of generous credit and the lack of control of the production objectives. The opening balance as an aspect which is held invariant by Carl in this excerpt.

Adam chose to present cash and equivalents and opening balance as dimensions of variation. Bess chose to present three pairs of key concepts which are affecting the cash flow budget. These were cash

receipts and cash payments, trade debtors and accounts payable and finally receivables and liabilities. Adam and Bess use the closing balance as an invariant aspect of the cash flow budget.

Table 8. Cash and equivalents

	Teachers		
Cash and equivalents	**A**	**B**	**C**
Dimensions of variation	• opening balance - cash in hand - cash and equivalents	• cash flow budget - cash receipts - cash payments	• cash flow budget - forecast - actual result
	• cash and equivalents - cash in hand - bank account - postal giro account - short-term investments	• opening balance - receivables - liabilities	• deficit - exceeded objectives - trade debtors
		• opening balance - cash purchase - cash sale	
Invariant aspects	• closing balance	• closing balance	• opening balance

The analyses of the expense and the revenue and the cash and equivalents reveal differences between the teachers´ teaching objects. Adam chooses revenue and expense as dimensions of variation and depreciation as an invariant aspect. Then he chooses opening balance and cash and equivalents as dimensions of variation and closing balance as invariant aspects. Bess chose the revenue and expenses as dimensions of variation and stocks, student´s understanding and depreciation as invariant aspects. After that she chose cash flow budget and opening balance as dimensions of variation and stocks and closing balance as an invariant aspect. Carl chooses to focus on expense and revenue as dimensions of variation and stocks as an invariant aspect. After that

he chose the cash flow and the deficit as dimensions of variation and opening balance as an invariant aspect.

As in the first lecture, we also have to take into account the subject matter context in which these concepts are presented. As pointed out earlier, these concepts are lifted up against a specific tacit ground. In Adam´s case the context is the application example of the lecture. He is demonstrating how to make transactions and the practice of accounting. In Bess´ lecture the introduction, consisting of a presentation of a model for management accounting and control, which constitute the context. She is linking the subject matter content to the course literature and she argues for control of the implementation of decisions. Carl is also linking the subject matter content to the course literature and he presents the practice of accounting by a demonstration of each of the sub budgets before he starts the problem solving process of the application problem.

Conclusion

The teaching objects constituted in each of the lectures have both similarities and differences. When the teachers are presenting the main concepts in the profit and loss budget, the expense and the revenue, they have the same dimensions of variation, the key concepts of this sub budget. All three lift up revenue as a figure against the profit of the company as the tacit ground. They cover the debit and credit side line item by line item and use the items as figures against the profit of the company as the tacit ground.

The analyses reveal differences and similarities in the structure of subject matter offered to the students to experience. If we take into account the subject matter context, including the introductions of the lectures given by the teachers, then the differences between the teachers are reinforced. Consequently, we see that the learning conditions offered to the students in each lecture differ in the introductions of the subject matter theme, in presentations of cash and equivalents and the constitution of the teaching object.

The example on budgeting in the second student interview

The second interview example consisted of a component manufacturing company, making the budget for the purchasing department, the manufacturing department and the sales department for the coming year. The students get the information in terms of figures and also a forecast of the balance sheet for the year. The balance sheet is a well known concept for the students. The students are asked to set up a profit and loss budget, a cash flow budget and a budgeted balance sheet for the company.

This example includes the teachers´ subject matter content of the lecture. The example is considered to be too extensive and time consuming by the subject matter expert. He gave the advise that the profit and loss budget and the cash flow budget has to be set up in advance, which the students should be asked to scrutinise and the budgeted balance sheet should be the only budget which the students should be asked to draw. This advise was followed in the second interview round.

All the students took time to review the profit and loss budget and the cash flow budget. Some of them set up their own budgets instead of examining the pre-set budgets and did the reviews as comparisons between the pre-set budgets and their budgets. The forecast of the balance sheet was thought to be an assistance to the students by the constructor of the example. This forecast of the balance sheet in this example showed the assets and the equity and liabilities of the company at the end of the year.

To manage to draw up the budgeted balance sheet and reach the correct solution the students have to know which line items are included in the budgeted balance sheet. They should also know which relationships there are between the budgeted balance sheet, the profit and loss budget and the cash flow budget. This means for this specific example that a) the operating profit and loss in the profit and loss budget has be brought to the credit side in the budgeted balance sheet, b) the closing balance in the cash flow budget is the opening balance in the budgeted balance sheet and c)

the machinery and equipments had to include investments and depreciations on the debit side of the budgeted balance sheet.

The students´ solutions

The analyses of the students´ problem solutions revealed that not all of them knew which budgets were included in a masterbudget. However, notion the key concepts of the profit and loss budget, cash flow budget and the budgeted balance sheet and the notion that estimating and drawing these budgets are a form of planning and planning instruments for businesses and companies seemed to be known by almost everyone. The students also knew that budget follow ups were used as financial controls by the businesses and the companies.

Seven out of fifteen students solved the example. The following excerpts include many technical aspects of the budgeted balance sheet. They come from the end of the different problem solving processes.

Student from group A

Two out of five students solved this example. The following student (S1) started by copying the items from the estimation of the balance sheet and put them in the budgeted balance sheet, which was set up as a T-model. He inspected the profit and loss budget and the cash flow budget without any comments. As we enter the excerpt he has transferred the closing balance from the cash flow budget and has spent several minutes on booking machinery and equipment as a line item. Now he is counting the stocks.

> Student (S1): We take the stock of finished goods which is reduced by 1.240. At the beginning, it's 2.790; there it's 1.550 (silence for 12 seconds). So accounts receivable then diminish by 300 which makes 3.500 [...] I think I'm ready now so I can work out what it'll be ... ... (silence) for 25 seconds) ... The accounts payable (silence for 13 seconds) ... Yes, for the loans one should deduct the repayments amounting to ... I had long-term loans for 5.000 minus repayments of 100 equals 4 and 9 (silence for 24 seconds) and then the equity you add to the result of this [points at equity in the information provided]

> on the profit for the year[...] So let's assume that we put it somewhere in some item via the equity, then[...] So we have 1.300 plus ... the opening balance for equity which is 3.000. It's 4 and 3 (S1/Int. 2/p. 4).

During the calculations, which he is doing rather slowly, he keeps quiet. He is doing most of the counting during the frequent pauses. This student works systematically but slowly with all the items in the budgeted balance sheet, focuses and opens the assets as a dimension of variation and then he thematises the assets by pointing out the cash, the stocks of finished goods, the stocks of raw material and the trade debtors. He lifts up each item of the assets as figures and has the profit of the company as the tacit ground. Then he moves to the credit side. He focuses and opens the liabilities as a dimension of variation by contrasting accounts payable and short- and long-term liabilities which he reduces with the repayments. After that, he goes on to identify the loans. Then he focuses on liabilities and the equity by contrasting the operating profit of the year and the equity of the company, which he sets up on the credit side. He finishes by balancing and comparing both sides of the budgeted balance sheet. By doing so he lifts up each item of the liabilities and the equity as figures and has the total profit of the company as a tacit ground.

Student from group B

Only one out of five students in group B[80] solved the example of the second interview.

This student (S10) started by checking the profit and loss budget and the cash flow budget before closely observing the items on the debit and the credit sides of the estimated balance sheet and then identifying the assets of the company. She seemed familiar with which information that can be used in the estimated balance sheet

80 Due to a long discussion concerning different techniques to accounting records the discussion started during the estimation of different stocks. The first application example was thoroughly discussed during the first two hours of the lecture during the video recording. The teacher has to start the next two hours of lecturing by introducing the example of the budgeted balance sheet.

and checked again the profit and loss budget and the cash flow budget during several minutes. She did minor calculations on the paper and kept silent during this control phase. In the excerpt she talks and explains what she is doing.

> S10: Well, first we have current assets which consist of cash and equivalents as assets, accounts receivable, stock of finished goods and stock of raw materials [...] Then there are the fixed assets which are machinery and equipment. If I begin with cash and equivalents. So it's the closing balance they've calculated[...] at the end of the year which should go in there. Accounts receivable ... Let's see. ...Which year was this for? ... Forecast balance sheet. This one's for the previous year, then ... There we have 3.800 in accounts receivable and according to the cash-flow budget there's a decrease of 300 in accounts receivable ... [...] So you get 3.500 in accounts receivable here. The stock of finished goods is said to have decreased by 1.240, which gives us 1.550 [...] The stock of raw materials has increased by 190 which gives us 400 there. Machinery and equipment; let's see, 6.000, some purchases, minus the 500. The question is what this new investment, what it is ...[...] It's extremely difficult to know. If it's machinery and equipment, it should be included with (silence for 15 seconds). We'll have to assume that it's a new investment in machinery and equipment. Then you have an opening balance of 6.000 and you make a new investment of 500. Then you have 6.500 ... and then depreciation amounts to 600 which gives you 5.900. Accounts payable increases by 500.000 and it was 3.000 there. Other current liabilities ... The remaining balance must be expected... Let's see ... Other long-term liabilities 5.000. The question now is ... It doesn't say anything about whether the new investment was made with loans or equity so we'll have to assume it was made with equity (S10/Int. 2/p. 3-4).

Here the student (S 10) starts by focusing on assets and opens assets as a dimension of variation by thematising the assets (the current assets) as the cash, the trade debtors, the stock of finished goods and the stock of raw material. By doing so she lifts up each item of the assets as the figure and she has the profit of the company as a tacit ground. Her concerns of machinery and equipments turns out to be a question about the company´s new investment. Finally she makes an assumption that the new investment has to be a new machine which is paid for through the equity.

The handling of the depreciation does not seem to cause any problems. Then she turns to the equity and the liabilities and focuses and opens equity and liabilities as a dimension of variation by thematising the liabilities as the accounts payable, the short-term loans, the cheque credit and the long-term loans. She is lifting up each item of the liabilities as figures and she has the total profit of the company as a tacit ground. She goes on and identifies the equity and the operating profit of the year, which he sets up on the credit side and finishes by balancing and comparing both sides of the budgeted balance sheet.

Student from group C

Four out of five students solved this example correctly in group C. In this group all students except one[81], used the estimated balance sheet during the problem solving process.

When we come into the excerpt the student (S14) has studied the profit and loss budget and the cash flow budgets and has just started the work with the budgeted balance sheet.

S14: So the budgeted balance sheet ... and closing balance from the cash-flow budget[...] That's what I think will be in cash and equivalents, so to say. [...] So you just have to take it from the cash-flow budget, then ... insert it into the budgeted balance sheet. [...] Yes, that's it. Mm ... it's an asset. [...] Accounts receivable are also an asset and ... it says in the question that ... ... they will diminish by 300.000 Crowns [...] If you begin from the forecast balance sheet ... [...] Then you have to reduce accounts receivable by 300.000 Crowns ... [...] If you take 3.800.000 minus 300.000 Crowns ... then ... It'll be 3.500.000 [...] And then we have the next item ... Yes, we ... The stock of finished goods there ... [...] from the budgeted balance sheet ... ... (silence for 25 seconds)[...] Yes, it says that it is reduced by... 1.240 there in ... in the question there ... [...] Make sure it tallies here. Yes, then all you have to do is to take the stock of finished goods minus that [...] Yes, exactly ... Then it will be 1.550. [...] Then we have the stock of raw materials. It will increase by 190.000 Crowns. So it will be 400 [...] Let's see [...] machinery and

81 During the second lecture, one of the students in group C was absent because she was ill.

> equipment, they ... amounted to 6.000 in the forecast balance sheet. Then you have ... then you have depreciation on them [...] Of 600.000 ... that's deducted. Then you also have a new investment of 500 ... [...] Thousand ... So then you add that. [...] That'll give us, let's see, 6.000 ... ... (silence for 10 seconds) ... 5.900 ... on machinery and equipment.[...] Then if we go over to the credit side, we had a 1 B account payable of 2.500 and ... then it says that the accounts receivable increase by 500.000 ... [...] So then you add them which gives us 3.000 Crowns ... or 3.000.000 ... perhaps [...] And other current liabilities, it doesn't say anything about them changing ... Assume that they are the same [...] expected to remain unchanged. [...] Other long-term receivables [...] they're affected by these loan repayments ... So they'll decrease by 100.000 ... [...] They haven't raised any new loans ... as far as I can see here, you just have to deduct the loan repayments from the old loans [...] That makes 4.900.000 [...] Equity was 3.000 in the forecast ...[...] And to that you have to add the profit or loss for the year and in this case, it was a profit which we take from the profit and loss budget (S14/Int. 2/p. 3-5).

The analysis reveals that this student (S14) transfers the closing balance in the cash flow budget to the budgeted balance sheet (debit side) and focuses and opens assets as a dimension of variation by thematising assets as cash, trade debtors, the stock of finished products, the stock of raw material and the machinery and equipments. He lifts up each item of the assets as figures against the profit of the company as a tacit ground. Then he focuses and opens liabilities as a dimension of variation by thematising and by pointing out the accounts payable, the short-term loans, cheque credit and the long-term loans before he puts up the equity and the operating profit for the year. The student lifts up each item of the liabilities and the equity as figures and has the total profit of the company as a tacit ground.

Summary of the students´ solutions on budgeting

The practice of accounting has to be done very systematically, which the teachers have presented and demonstrated during the

lectures. They have offered a way of handling book-keeping according to generally accepted auditing standards[82].

The students construe a learning object grounded in the previous lecture. This learning object includes the dimensions of variation and the invariant aspects discerned in the second interview example. The teachers have agreed on using the "T model" for pedagogical reasons. In each sub budget they used the two key concepts as dimensions of variation and then they thematised the line item by line item of the debit side and then on the credit side.

This is a question of practice in accounting, which means that they used the key concept on the credit side as a dimension of variation, and then they thematised this key concept by using the line item by line item on the credit side. The same procedure was repeated on the debit side. The teachers demonstrated this practice when they solved the profit and loss budget and the cash flow budget in the lecture´s problems. This is a way to solve a single sub budget, but not enough to make a master budget. The students are offered to experience how to put up sub budgets and a masterbudget and they have to understand the relation between the sub budgets and different line items in different sub budgets.

Here we have again an example, where we can not do comparisons between dimensions of variation and invariant aspects, if we want to compare the teaching object and the learning object. As was said earlier in the previous problem, we have to identify the corresponding dimensions before we can do the comparisons. In the former example corresponding dimensions were possible to identify and the same situation we have in the present example. Here it is a systematic way of the practice of accounting, which has to be identified. In each sub budget the teachers focused on the key consepts of the budget; in the profit and loss budget the key concepts were expense and revenue; in the cash flow budget the key concepts were cash receipts and cash payments. After that the teachers thematised each key concept by using the line item by line

82 In this specific case, it is referred to the Swedish auditing standards.

item. The students´ who reached the correct solution of the second interview´s problem have discerned the teacher's way of demonstrating the practice of accounting; i.e. how to book and how to set up a sub budget. These students demonstrated that they were able to focus on the key concepts as dimensions of variation; i.e. assets and liabilities and equity. They demonstrated the same systematic thematisation of line item by line item as their teachers have manifested during the lectures.

The three students, S1, S10 and S14, solved the example and applied the expected routines correctly (Table 9). The student from group A (S1) did not talk as much as the students from group B (S10) and C (S14). The group A student's process of solving the problem was hesitant in the beginning. He did most of his calculations during periods of silence. He focused on stocks for some time, before he went on to the key concept on the debit side. He focused on assets and opened assets as a dimension of variation and then he thematised the line items by line item. He used the line items as the figures against the profit of the company as the tacit ground. After that he turned to the credit side and repeated the procedure.

The teacher had demonstrated the procedure in the profit and loss budget, the cash flow budget and in the budgeted balance sheet. The student (S 10) from group B explained that assets are of two kinds, the current assets and the fixed assets. After having checked the profit and loss budget and the cash flow budget, she focused on assets and opened assets as a dimension of variation. Then she thematised line item by line item. This student also used the line items as the figures and against the profit as the tacit ground. She repeated the procedure on the credit side. The key concept was focused as a dimension of variation. The line items were lifted up as figures against the profit as the tacit ground. She used the investment as well as the payment of the investment, the equity as focused invariant aspects. It was the same procedure she used as she has seen her teacher demonstrate.

The Student from group C handled the information in a systematic way and he had also discerned the teacher's way of focusing on the key concepts as dimensions of variation. He applied the same procedure as the students from group A and B. He chose the assets and liabilities and equity as dimensions of variation and he used depreciation, investment and new loans as invariant aspects.

There were differences between the students. The students from groups B and C acted in the same way when they came to the line item of "machinery and equipment". Their question concerned how the new investment was financed and both of them finally decided to make the assumption, that the company has used the equity to pay the investment.

Table 9. The students´ solutions of the budgeted balance sheet

Balanced budgeted sheet	**Groups and students**		
	A(S1)	**B(S10)**	**C(S14)**
Dimensions of variation	• assets - stock of finished goods - trade debtors	• current assets - cash - trade debtors - stock of finished goods - stock of raw material	• assets - cash - trade debtors, stock of finished goods - stock of raw material - machinery and equipments
	• liabilities - accounts payable - loans and amortisation	• fixed assets - machinery and equipments	• equity and liabilities - accounts payable - current liabilities - check credit - long-term liabilities - amortisation - equity - profit for the year
	• equity and liabilities - profit for the year - equity	• assets - cash - trade debtors - stock of finished goods - stock of raw material - machinery and equipments • equity and liabilities - accounts payable - current liabilities - check credit - long-term liabilities	
Invariant aspects	• _____	• investment • equity or new loans	• depreciation • investment • new loans

Conclusions

1. The learning objects[83] constituted during the problem solving process has been interpreted as an object, which on a general level was constructed by the students according to the same principles their teachers had used when constituting the teaching object. The three students acted exactly as their teachers had done when they demonstrated the practice of accounting, which means that they identified the corresponding dimension of variation. The claim is that the students who solved the problem correctly seem to have taken impression of their teachers´ way to demonstrate the practice of accounting and they have experienced, discerned and apprehended the critical dimensions of variation.

2. In the beginning of the second interview all the fifteen students were asked to define "budgeting". The analyses of the answers[84] revealed some differences between the groups.

Two out of five students from group A defined the budgeting as planning for next year. Two of the students mentioned that it was a method for setting up the sub budgets and they gave the names of the sub budgets. One student mentioned the T model and the nanes of the sub budgets.

One student in group B mentioned budgeting as a steering instrument to reach results and an instrument for prognoses, for follow ups and for improvements. One of the students saw budgeting as making an annual plan, which could be set up by different methods to make prognoses of the next year's profit. Three of the students mentioned that it is a method for making plans for the next year and the masterbudget and the sub budgets were also mentioned.

One of the students in group C answered that budgeting was a method for making prognoses for the next year, to reach set

83 The seven students, who solved the example correctly are included in this analysis.
84 The fifteen students are included in this analysis.

objectives. One student mentioned a method for pre calculation of next year's expense and revenue and the names of the sub budgets and to avoid deficit. Two students answered that it was a method for planning of next years results. One student mentioned it as a method for making plans. Particularly the aim of "avoiding deficit" in connection to cash and equivalents, was discussed in the C group.

Group B and C gave answers of more general character than group A. Answers from group B and C indicated that budgeting was regarded as an instrument for management accounting.

3. Setting up a budgeted balance sheet demands a knowledge and an understanding of the relations between the three sub budgets. These students have proved their understanding through their solutions. Three criteria were used to test their understanding of the budgeted balance sheet: 1. the equity and the operating profit of the year has to be set up on the credit side in the budgeted balance sheet and that the equity and the operating profit of the year must be used to reduce the credits of the company in this specific example; 2. the closing balance in the cash flow budget has to be transferred to the debit side in the budgeted balance sheet; 3. the machinery and equipment has to be related to the investments (in the cash flow budget) and the depreciation (in the profit and loss budget). The students who solved the example proved a high level of understanding of book-keeping.

4. The student's from the different groups seemed to use similar approaches to the problem. They concentrated on the example and the text. The students from group B and C gave more comments on the information in the example and concerning their way of doing the calculations.

Chapter 8

STANDARD COSTING AND VARIANCE ANALYSIS

Subject matter content and the lecture example

In this lecture the teachers are introducing standard costing as a method for following up on manufactured components in industries and companies. Before the manufacturing of new components starts standard costing is used to make an estimate of the costs of the components. After the components have been manufactured during a specific time period of for instance a year, the estimated standard costs are compared with the actual production costs. If this comparison reveals variances these have to be explored. This type of analysis is called standard costing variance analysis. The variance analysis means that the variances are broken up in different type of costs such as material, salaries and in fixed and variable production costs. The standard cost is expressed per unit, which has to be differentiated from the budgeted costs, which are counted and expressed for the entire volume produced.

A standard means a predetermined cost. The concept of standard normally represents different meanings. A "basic standard" or "normal standard" means costs under normal production conditions. "Ideal standards" are the minimum costs under the most efficient operating conditions. "Attainable standards" are normal production conditions, which means that allowances are added for normal spoilage, machine breakdowns and lost time (Drury 1992, p. 515).

A variance analysis means that the variances between the estimate and the actual costs for the produced volume are separated in a variance analyses for different types of costs. This will be done in order to explain why actual costs diverge from standard costs and if the variances depend on changes in costs for material, salaries, fixed and variable production costs or if other factors have affected the manufacturing process. In this way if a divergence from an estimated cost is due to an error in the estimation of the consumption of material or costs for the material, this can be identified. The analyses are done in order to control the company's internal efficiency and ought to be followed by decisions of measures to improve and enhance the efficiency of the production process.

Standard costing is applied in the lecture´s example. In this specific example standard costs are the estimated costs, which are used for comparing with the actual costs of the production once they are known. Supporting information for estimating the standard costs can be picked up from different sources depending on field of activity. A producing company, which is producing components has the possibility to look up earlier manufacturing costs and to make comparisons with different manufacturing units outside the company and to use statistical figures from their field. Standard cost is an estimated cost, or "norm value"; i. e. the expected costs under normal manufacturing conditions. The "standard cost" for a specific component is defined as the standard quantity multiplied with the standard cost. The "actual cost" is defined as the actual quantity multiplied with the actual cost. The actual cost can diverge from the standard cost due to

a) the manufactured volume diverging from the estimated volume;
b) the costs for the material and manpower hours diverging from estimated costs;
c) the production being more or less efficient compared with the target objectives;

The problem solved during the lecture concerns a company which has budgeted costs for production during a year. The cost of the

manufactured products is expressed in cost per product, when they have an ordinary production volume of 10.000 units per year. The actual cost is expressed as cost for a volume of 8.000 units. Information is given for budgeted production of 10.000 units concerning direct material, direct salaries and variable and fixed production overhead for each labour hour. Besides, information is given of the actual costs for the actual volume for 8.000 units and for the consumption of direct material, direct salary and variable and fixed production overhead per labour hour.

The students are asked to a) do a thorough analysis of standard costing and b) give examples of possible causes of different divergences in the example of application.

The core content of the lecture

The subject matter content and the general theme of the lecture is management accounting and control (financial control). The subject matter content and the core content of the lecture consists of the concept of standard, standard costing and variance analyses as a method for follow up in order to control internal efficiency. There is an example of application to be solved by the teachers and the students.

The teachers are demonstrating how standard costing can be used for follow ups and cost controls. The standard cost can be grounded in extensive investigations inside the field of production and the result can be used in estimates[85] and in actual results, for making comparisons. The variance analysis can provide outcomes, which can facilitate internal economic control, accountancy and stock evaluations and even the production of interim reports. The follow ups mean that the actual costs, after the production has finished, are compared with the estimated cost. The teachers discussed with their groups of students which factors have caused the variances.

85 The standard costing method usually consists of an estimate, where standards are used, and a follow up (costing), including actual costs. The variance is the estimation between the standard cost and the actual cost.

Suggestions to the causes and the discrepancies are written on the blackboard by the teachers. These are later analysed and discussed at the end of the lecture.

In the example of application standard costs and standard quantity are used for each product in order to calculate the total costs of the production volume. This is done for direct material costs, salaries and for fixed and variable production costs. Unlike Adam and Carl, Bess uses a method of calculation which is in line with the course literature (Drury 1992). Adam´s and Carl´s method of calculation, which they called the "the fork-method", diverge slightly from the course literature. Despite the differenes in the teachers´ methods of calculation they are using similar principles in their estimations.

The standard costing is giving a total variance for the produced volume by the company, which is broken down in costs of different types, such as direct material costs, direct salaries and fixed and variable production costs. These can be further divided, which is also demonstrated by the teachers. If the total material variance is broken down the result is a variance in quantity and a variance in price. If the corresponding calculation is done for the total labour variance the result is a variance in labour efficiency and a variance in wage rate. The corresponding calculation is also done for the variable absorbed production overhead and this will give an efficiency variance and an absorbed overhead variance. To break down the total fixed absorbed production overhead variance involves further differentiation, this will give an efficiency variance and an absorbed overhead variance, where the last variance is differentiated in an employment variance and a budgeted variance. This is the teachers way to introduce the successive break down of variances. A slightly different presentation can be found of the last two variances in Drury (1992, p. 523).

The teachers´ ways of teaching standard costing and variance analysis

A brief introduction to the teachers´ ways of teaching standard costing and variance analyses is given here. A summary of each lecture can be found in appendices 7, 8 and 9. This time the teachers start the lecture by giving different introductions to the subject matter domain.

Adam finishes an example from the previous lecture. After that he gives a brief introduction to the lecture theme and example and explains the concept of standard and variance analysis. He relates the theme to a previous lecture of cost accounting. The standard as a concept is defined as an estimated cost for a given time period, for instance an average cost for a budget year. The standard costing is introduced as a method for financial control and for assessing the efficiency and the effectiveness of the company. After that Adam explains the variance analysis as a method for follow up and begins the problem solving process for the example.

Bess starts by relating to the economic model from business she had used in the introduction of the previous lecture, the lecture on budgeting. This model was used to show the cornerstones in accountancy and different subsystems for financial control such as different systems in costing, systems in budgeting and systems of cost accounting (current recording of transactions). This model also illustrates how statistical information from for instance the budget follow ups of budgets during can be aggregated and form the annual accounts of different years. She stresses that this is one of several models and not *the* model, since models like this have to be adjusted to the company's field of activity and the company as such, its need of follow ups and its estimation systems etc. Through this introduction Bess develops an integration of the course content. She turns to the standard costing, which she explains as a method for follow up where the estimate of standard costs is compared with the actual results in the manufacturing process. Differences are studied through a variance analysis, which is applied in an example.

In his introduction Carl takes up a company's system for financial control, which can be done by several methods for instance by controlling the internal efficiency. Carl points out that one of these is a way to control through stimulation of the organisation and to get the entire company to work for reaching objectives. He exemplifies methods used in financial accounting such as standard costing and variance analysis. Large industries with different production departments can use these methods to develop a system for the analysis of divergences between departments and to develop internal standards. The prerequisite is that the production process is regarded as a process involving several departments and that the departments are receiving 'semi-manufactured products' and delivering 'estimated semi-manufactured products' to the following department. Carl stresses that the standard costing is a method which can be applied in the industrial sector as well as in the service sector. He finishes by explaining the standard costing method ("the fork-method") on a general level before turning to the lecture example.

In the problem solving process, the teachers are lifting up a dimension of variation as a figure against a subject matter ground, which in the previous lectures has been called the tacitly assumed ground. In the following examples as in the previous, the ground is assumed to be the the maximum profit for the company. This means that the maximisation of the company´s profit is taken as the "the tacit ground". In the following text the ground is expressed as a "tacit ground".

The standard costing

Adam´s lecture

When we get into the following excerpt, Adam is explaining "standards" as a concept, an estimate of costs used under a specific time period (Appendix 7).

> Adam: With reference to what we're doing in costing, we could say that a standard cost is an estimated cost which is in line with the discussion

> we had about cost accounting. In actual fact, the difference is that this standard cost calculation applies for a longer period of time. An estimate, so to say, can apply until you make the next post forecast and then there will be a new estimate. The correct definition of a standard costing, i.e. calculation, is really a calculation which is an average [of costs] normally for a period of one year. This means that if you anticipate cost increases during the year for materials and that salary costs per hour increase, then you show these increases as an average so that they affect this calculation. What is important is the fact that it is static, that it doesn't change during the year. We will be using this [the standard costing] as a yardstick. This will affect, not only control production but also, as is usually said, control external effectiveness. And we could say that controlling external effectiveness is doing the right things and not controlling internal efficiency, it's which is whether we are doing things right (C/Lect. 3/p. 4).

In the excerpt, Adam focuses on cost and opens standard cost as a dimension of variation by contrasting estimated standard costs and actual costs. He focuses on standard cost once again and opens standard cost as a dimension of variation thematising standard cost as average cost, as lasting for a fixed time period and as static cost (does not change during a specific time period). Then he focuses on standard costing and opens it as a dimension of variation by contrasting estimated cost and actual cost. He lifts up standard cost and standard costing as a figures against the profit of the company as the tacit ground. Finally he presents standard costing as a follow up method used for management accounting and control of the company's efficiency (internal) and effectiveness (external). Here efficiency and effectiveness are the focused invariant aspects and they are taken for granted.

Bess´ lecture

When we come into this excerpt, Bess has just presented systems for management accounting and control as relative in the sense that you have to design them for the needs of the company (Appendix 8). Here she asks the students how to design such a control system if the management's (company's) aim is to control efficiency (internal) and effectiveness (external)?

> Bess: How do we construct these control systems? What do the current accounts look like so that a meaningful budget follow-up can be made? Control, so to say, both the unit and what it does. It's more about how to build up a system in order to get the financial or design the financial control system you feel you need [...] Do you know what a standard cost is? Although there are different types of standards, e.g. basic standard, one talks about, we talk about ideal standards and about attainable standards (Drury, 1992). The intention is thus to assign a standard value to a cost or to an income so as to have so much to compare with. Was the outcome larger or smaller than expected? And naturally, what the purposes of making a standard cost calculation are. What do we want to use this comparison for? How do we proceed when we look at what measures are necessary to take? How are these standards constructed so that it's simple to decide whether we will have to do something or take some measure or whether we have to adjust the standard (B/Lect. 3/p. 3).

Here, we observe that Bess focuses on cost and opens cost as a dimension of variation by contrasting efficiency and effectiveness. Then she focuses on a standard as a norm value and opens it as a dimension of variation by contrasting the expense and the revenue. After that Bess focuses on standard and opens standard as a dimension of variation by thematising standard as basic standards, ideal standards and attainable standard (Drury 1992, p. 515). After that she focuses on standard costing and opens it as a dimension of variation by contrasting estimated cost and actual cost. She lifts up standard cost and standard costing as the figure against the profit of the company as the tacit ground.

After that she focuses on the objective of standard costing, a follow up method, where the objective becomes a focused invariant aspect. And after that she focuses on the standard as an aspect. She focuses on standards applied and on measures to be taken as an invariant aspects. She stresses that standard costing as a follow up method must have some positive consequences for the company´s internal activities and the consequences - organisational or changes of manufacturing process - have to be implemented.

Carl´s lecture

In the following excerpt Carl has started to compare two different economic models for follow up of production, which are the costing as a model (in this case a product estimate) and the budget as a model (Appendix 9). Earlier the standard costing method had been introduced as a method for follow up and management accounting and control.

> Carl: Let's say that we have a financial model, a profit and loss account for example, of a unit. Then we draw up the budget to find out or to set up some form of goal for the unit and then we look at what the outcome was. Here, it's important to make a comparison [points to a figure on the white board], we could call it a budget follow-up. If we have budget and follow-up here, [...] what could we call another financial model? Well, an estimate. We have an estimate there instead, a product estimate. We use the product estimate as a basis. But then we don't call it budgeting, we call it estimate. And we don't call it outcome, we call it actual cost. And what we are going to work with today is this comparison. Here, it was called budget follow-up and there it's called variance analysis[86]. And this is what we're going to be doing. So there isn't that large a difference, really, if we consider that previously we were at a budget level and talked about organisational units such as a budget for a department or a budget for a division. Now, we're looking at the individual product estimate, the estimate for a chair. We believe that a certain number of different amounts of wood and time and so on will be required. And then we draw up an estimate. We can draw up the estimate with standard values while the costing is based on the actual values. We use standard values for the estimate and actual values for the actual result in the follow up (C/Lect. 3/p. 10).

In this excerpt Carl focuses on budget as a model and opens budget as a dimension of variation by contrasting the objective for the company and the actual result; i.e. outcome of the company. Then he turns to the second model. He focuses on costing and opens costing as a dimension of variation by contrasting the product estimate and the actual cost. Then he focuses on cost and opens cost as a dimension of variation by contrasting the budget model

86 Here, variance analysis and standard cost analysis are used by the teacher as synonymous.

(follow up) and the product estimate (variance analysis). Carl keeps the cost dimension open by contrasting the budget as an estimate for the entire company and the product estimate as an estimate of one unit of a product. He brings in a new variation by an example, which concerns manufacturing of a chair. This is Carl´s way of making a product estimate understandable by using a concrete example. He focuses on standard costing and opens it as a dimension of variation by contrasting the estimated stand costs and the actual cost. He puts forward standard costing as the figure and the profit of the company as a tacit ground. Carl finally focuses on variance analysis as an invariant aspect. Earlier in the lecture he had introduced standard costing as a follow up method for management accounting and the control of efficiency (internal) and effectiveness (external) of the company.

The variance analysis

Adam´s lecture

Here we get into the lecture when Adam has introduced the variance analysis, he has put up the information of the example on the white board and starts to present a special method for calculations, which he calls the "fork method" (Appendix 7). He has drawn figure 1 on the white board and he has also put the symbols on the "pins".

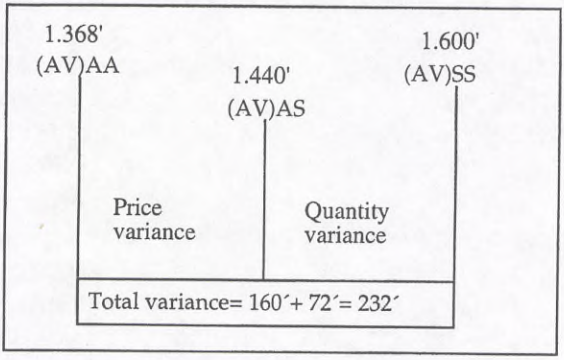

Figure 1. Variance analysis according to Adam

Adam: Then, when we carry out analyses, we should always go from the right and the left [he explains figure 1]. From the right to the left to get the right symbol for the variance. I'll begin by going through each resource. I'll begin with direct material. What is the real quantity times the real price as regards direct material? What is the real quantity? Yes, if we calculate on the basis of the individual product. But we are now going to analyse this variance of -457.000 [the total production of the company] and it was based on an actual volume of 8.000 pieces [(AV)=actual volume]. So we are now calculating on the basis of the total production. Which means that the actual quantity is 72.000 kilos [first/A=actual quantity] times 19 Crowns [second/A=actual price], that is, 1.368.000. This is what it says in the question. It is the actual material cost valued as the actual

> quantity times the actual price times the actual volume. If I now make this analysis and now it's important that I go from right to left. So I always take SS [standard quantity times standard price] minus AS [actual quantity times standard price] which gives me the quantity variance. In this case, 1.600.000 minus 1.440.000 which is equal to plus 160.000. The variance between, from right to left, AS minus AA, is equal to the price variance. It will then be 1.440.000 minus 1.368.000 which equals plus 72.000. The total variance as regards [direct] material, which is SS minus AA, is then plus 232.000 (A/Lect. 3/p. 11-12).

The analysis shows that Adam focuses on the total production process and opens it as a dimension of variation by contrasting the budgeted production and the actual production and then he calculates the total production variance [-457´]. Here he points out the actual production as a figure against the profit of the company as the tacit ground. Then he stresses that they are going to break down the variance on different resources, which are needed in the production process. After that he focuses on actual production volume [(AV)] as an invariant aspect. After that he focuses and opens quantity variance for direct material as a dimension of variation by contrasting the "standard quantity times standard price" and "actual quantity times standard price" and he also points out the actual volume (AV) which must be included. He lifts up direct material as the figure against the profit of the company as the tacit ground.

After the above Adam focuses on price variance for direct material and opens it as a dimension of variation by contrasting "actual quantity times standard price" and the "actual quantity times actual price" and he points out again the actual volume (AV). Now, he has estimated the quantity and the price variance. After this he focuses on total variance for direct material and opens it as a dimension of variation by contrasting "standard quantity times standard price" and "actual quantity times actual price" and he multiplies by the actual volume (AV). The total variance of direct material estimated. Again he lifts up direct material as the figure against the profit of the company as the tacit ground.

Bess´ lecture

When we come into the excerpt from Bess´ lecture, she and the students have counted the total divergence between the total budgeted production and the actual production (Appendix 8). The formula from the course literature will be used for assessing variances for different resources needed in the production process (Drury 1992, s. 520).

SQ: Standard Quantity
AQ: Actual Quantity
SP: Standard Price
AP: Actual Price

Quantity variance= (SQ - AQ) x SP=
(80.000 - 72.000) x 20= 160'

Price variance= (SP - AP) x AQ =
(20 - 19) x 72 = 72´

Total material usage variance =
= 160 ´+ 72´ = +232´

Figure 2. Variance analysis according to Bess.

Bess: And that means we have a negative variance of -457.000 [writes on the white board] thousand Crowns and it's a fairly large variance, almost half a million. And this is what we are going to try to analyse in order to understand. Is this something we need to do something about? And what should we do? [...] So we'll go through each of the different types of resources.[...] How much does the material represent? How much is salaries? TO variable[87] and TO fixed (writes on the white board). How do we find out how large the quantity variance was? You were about to work it out earlier? Note that now the whole variance analysis is carried out in Crowns. Is there anybody who doesn't think it's obvious that it should be in Crowns? What's the argument in favour of seeing the whole

87 TO variable and TO fixed stand for variable absorbed production overhead (TO variable) and fixed absorbed production overhead (TO fixed). In the text TO variable and TO fixed will be used.

variance in Crowns? Because you could, of course, look at the quantity variance in kilos like you did [before]. But why should we value it in Crowns?

S: ...same

B: Same unit. Yes. To be able to determine which in relation to each other, then, which we should concentrate most on – to eliminate quite simply – we should have everything in Crowns. And the quantity variance, how do we work it out in Crowns? [B then makes the calculation, writing everything on the white board] So if we set up the quantity variance as a formula: standard quantity minus real quantity times standard price [the total variance for direct material; + 232.000] and this means that we have a positive variance here of 160.000 plus [the quantity variance]. Valued in Crowns, it is this material we have used less of and we have earned 160.000 on the material side by using less. If we then look at the price variance: we do the same thing. How much have we earned there? Because we could see that we had made a profit there as well. 20 Crowns according to standard. 19 Crowns in reality [...] 20 minus 19 times the actual quantity which was [...] 72. The standard price minus the actual price. Positive variance per unit. How many kilos have we used totally? 72.000 kilos, the actual quantity [writes on the white board]. And then somebody might wonder, naturally enough, why does one have standard price here? The variance there looks exactly the same. There is the quantity variance and there is the price variance (B/Lect. 3/p. 6-7).

Bess and the students have calculated the variance between the budgeted production and the actual production and they got the total variance of the production (-457´). In the excerpt, she focuses on variance analysis and opens it as a dimension of variation by thematising the variance analysis as depending on resources like material, salaries, variable production overhead charges and fixed production overhead charges. Here she lifts up these different resources in the production process one by one against the profit of the company as the tacit ground. Then she focuses on direct material and opens it as a dimension of variation by contrasting direct material expressed in Sw. crowns and direct material expressed in kilos. A student comes in and explains that units must be comparable. Bess focuses on the student´s understanding as an invariant aspect.

After the above Bess goes on and focuses on quantity variance for direct material and opens it as a dimension of variation by contrasting "standard quantity" and "actual quantity". She points out how to apply the formula and include "standard price". Then they turn to price variance. Bess focuses on price variance for direct material and opens it as a dimension of variation by contrasting "standard price" and " actual price. This time she highlights the "actual quantity". Both quantity variance and price variance are estimated. She lifts up quantity variance and price variances as figures against the profit of the company as the tacit ground.

Carl´s lecture

Carl and the students have just finished the calculation of the divergence between the budgeted production and the actual production (Appendix 9), when we get into the excerpts.

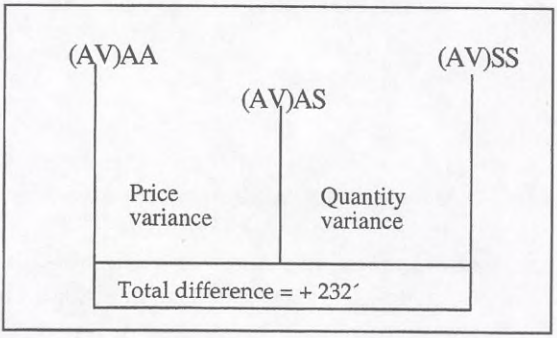

Figure 3. Variance analysis according to Carl.

C: So let's say that we analyse the -457.000 to see what it consists of. How much refers to direct material and price, direct material and quantity. And then you can also understand that our ambition level depends on what type of activity and what type of production we have. So a certain company might be satisfied with going that far. So they calculate the total variance and then they break them down into four parts. While others say that we want to have nine components (the whole hog) [...] The very point of this model is that it divides the total variance relating to direct material into two parts. Let's look at

> how this is set up. Well, it works like this, that we place the actual quantity multiplied by the actual price at this point ... And then we could call it AA, actual quantity times actual price. And out at this point at the other end we place that standard we were talking about, that is, standard quantity times standard price SS [...] We want a variance analysis which relates to the whole production and therefore I would really like to put an extra AV here. So we put an (AV) in front of that (points on the right pin) and we put an (AV) in front of that too (points on the left pin). And the AV represents production volume for the period. And then we can work that out and get a total variance of 232´ [...] We want to go a bit further so how do we do this? We weren't satisfied with stopping here at 232´, we also want to break it down and see how much is related to price and how much is related to quantity. [...] Here, we have standard quantity, standard price [SS]. Here, we had actual quantity, actual price [AA]. If we take a combination of these two, we can break this variance down into two components. And we do this by multiplying, here, actual quantity times standard price [AS] and then we multiply that [the AV] which we talked about earlier, production volume. [...] And this means that what variance appears there? The quantity variance appears there. So here we get the quantity variance while, if we compare here, we see that it is the same quantity ... at both points while actual price in comparison with standard price is there and then we get the price variance [price variance is estimeted] (C/Lect. 3/p. 19-23).

Here, we observe that Carl focuses on total variance analysis of direct material and opens it as a dimension of variation by contrasting direct material and price and direct material and quantity. He points out the price and quantity as figures against the profit of the company as the tacit ground. Then he talks about the the break down process of the variance analysis in either four part sor in nine parts. He indicates that the break down process of variance analysis depends on circumstances and the activity of the company. Carl goes on and focuses on the total production variance as a dimension of variation by contrasting "standard quantity times standard price" and "actual quantity times actual price" and he adds that an AV [Actual Volume] has to be put on infront of each. He goes on by explaining the symbols in the figure and he focuses on the middle part of the fork model as an invariant aspect, "the

combination (AS)". After that he focuses on "actual production volume (AV)" as an invariant aspect.

After the above, Carl and the students go on to the quantity and the price variances of direct material. He focuses on quantity variance of direct material and opens price as a dimension of variation by contrasting "standard quantity times standard price" and "actual quantity times standard price" and reminds the students to muliply both parts by the actual volume (AV). After that he focuses on price variance of direct material and opens it as a dimension of variation by contrasting "actual quantity times standard price" and "actual quantity and actual price", and adds both parts times actual volume (AV). So he has pointed out quantity and price as figures against the profit of the company as the tacit ground.

Summary of the lectures on standard costing and variance analysis

The teachers´ different ways of presenting and handling the standard costing and the variance analyses constitute various learning conditions, which the students are offered to experience.

The teachers are introducing the standard costing method as a method for management accounting and control of a company's objectives, profit, efficiency and effectiveness. The teachers present and demonstrate that this is a costing method and a comparison between the predetermined standard costs and the actual costs of a company´s production (Table 10).

Adam gives a presentation of standard costing as a method for comparing predetermined costs and actual costs and he gives special attention to standard cost and standard costing (Table 10) Carl and Bess choose different strategies to present the subject matter theme. Bess emphasises follow up as an aspect of the standard costing method (Table 10). She stresses that the follow up implies that the results have to be scrutinised and should lead to some positive consequences of the organisation of the company. Bess introduces standard costing as a management method for

controlling the efficiency and the effectiveness of the company. Further on she thematises standards, presents the standard costing and stresses the follow up aspect of standard costing as an invariant aspect.

Carl chooses to start with a comparison between the budget model and the costing model, which can both be used as follow up methods as well as the standard costing model (Table 10). This is his way to make the students aware that different methods give different results and that when applied they have to be applied correctly to a relevant problem. The main difference between the models is that the budget model concerns the entire organisation and something in the future, which is followed up by the annual account. The standard costing model concerns unit level and something planned which has happened, and the result is analysed by variance analysis.

Comparing the teachers teaching objects, we observe there are differences between the teachers concerning dimensions of variation and aspeccts held invariant (Table 10). Adam mentioned standard costing as a method for controlling efficiency and the effectiveness of the company and he hold these as invariant (Table 10). Adam is using standard cost, standard costing, as dimensions of variation and efficiency, effectiveness as invariant aspects. Bess uses the cost, standard/norm value, standards and standard costing as dimensions of variation and follow up as an invariant aspect (Table 10). Carl chooses the budget, the costing, the costs and the standard costing as dimensions of variations and follow up as an invariant aspect.

If we just observe dimensions of variation on a more general level,, the teaching object and the space of variation, they looks very much the same except for ordering of the dimensions. Further examination reveals differences in how those dimensions are dealt with; i.e. how the subject matter content i handled, varied and used.

Table 10. The standard costing

Standard costing	Teachers		
	A	B	C
Dimensions of variation	• standard cost - estimated standard cost - actual cost	• cost - efficiency - effectiveness	• budget - objective of the company - outcome of the company
		• norm value (standard) - cost - revenue	• costing - product estimate - actual cost
	• standard cost - average cost - static value - fixed time period	• standard - basic standard - ideal standard - attainable standard	• cost - budget model/ follow up - product estimate model/variance analysis
	• standard costing - estimated cost - actual cost	• standard costing - estimated cost - actual cost	• cost - company level/ budget - department level/ product estimate
			• standard costing - estimated cost - actual cost
Invariant aspects	• efficiency • effectiveness	• follow up - objective - standard - measures to be taken	• follow up method/variance analysis

The teachers are introducing variance analysis as a method to calculate the variance between estimated production and actual production. The estimated variance is then calculated for different resources included in the production process. In applying variance analysis there are certain differences between the teachers. Adam and Carl are using a specific version of variance analysis, which is called "the fork model" concerns mainly how the estimations are

done. Bess keeps close to the version of variance analysis introduced in the course literature. Consequently the teachers are offering the students different learning conditions to experience. In applying the variance analysis to the lecture's problem, they demonstrate a technical solution in the problem solving process. In the way the method is applied, you can say that the mathematical formula is invariant and independent of the teacher's estimation methods. The variation is brought into the estimations by differing resources such as material, labour hour, variable and fixed overhead production costs to which the formula is applied. This means that the total variance for a production is broken down in order to estimate how much of the variance can be ascribed to the various resources.

Each of the teachers are moulding a teaching object expressed in dimensions of variations and focused aspects. Adam uses total production variance, quantity, price and total variance as dimensions of variation and efficiency and actual volume of direct material as dimensions of variation and the actual volume (AV) as an invariant aspects (Table 11). Bess uses variance analysis, direct material, quantity and price variance of direct material as dimensions of variation and student understanding and standard price as invariant aspects (Table 11). Carl chooses the total variance of direct material, total production variance, quantity and price variances of direct material as dimensions of variations and the actual volume and the combination product (AS) as invariant aspects (Table 11).

Table 11. The variance analysis

Variance analysis	Teachers		
	A	**B**	**C**
Dimensions of variation	• total production variance - budgeted production - minus actual production	• variance analysis - material - salaries - variable overhead costs - fixed overhead costs	• total variance analysis of direct material - direct material and price - direct material and quantity
	• quantity variance - actual volume (AV) times standard quantity times standard price - minus AV times actual quantity times standard price	• direct material - material in Sw. crowns - material in kilo	• analysis of total production variance - budgeted production - minus actual production
	• price variance - AV times actual quantity times standard price - minus AV times actual quantity times actual price	• quantity variance; SP(SQ - AQ); - standard quantity - minus actual quantity (times standard price)	• quantity variance - actual volume (AV) times standard quantity times standard price - minus AV times actual quantity times standard price
	• total variance of direct material - standard quantity times standard price (times AV) - minus actual quantity times actual price (times AV)	• price variance; AQ(SP - AP); - standard price - minus actual price (times actual quantity)	• price variance - AV times actual quantity times standard price - minus AV times actual quantity times actual price
Invariant aspect	• actual volume (AV)	• student understanding • standard price	• actual volume (AV) • combination(AS)

The subject matter context in which these methods are presented include the introductions the teachers have given to the lecture´s subject matter theme. The short introduction given by Adam in the beginning of the lecture consisted of standard cost and variance analysis, including the symbols used when applying "the fork model". From then on he kept close to the lecture example and its information. Here the methods turn out to be figures against the tacit ground of the company´s profit. Bess used the theoretical model for management accounting and control as an introduction to standard costing and variance analysis. She presents the methods before they go on to the problem. This means that the methods are figures against the profit of the company as the tacit ground. Carl starts by presenting standard cost. He brings in a variation between the lecture´s example and his own example. He uses one of his own examples in which he demonstrates how standard costing can be used as a method for controlling the costs in a production line between departments. Then he goes on to compare two economic models, the budget and the costing models. In Carl´s case the students get varying examples concerning how the methods can be applied. The methods get a theoretical ground and their application in practice is demonstrated by Carl. The methods are figures against the profit of the company as the tacit ground.

Conclusions

The main discrepancies between the teachers concern the content of the teaching object and the subject matter context in which the teaching object is constituted. Adam gives the subject matter content a meaning structure (referential structure) through the demonstrations how to use the methods and how to apply them to the lecture´s problem. He stresses the "knowing how", the knowledge of rules, norms and of practice and how to solve the actual problem.

Bess and Carl give the subject matter content a meaning structure (referential structure) by relating theory and practice in their introductions and by demonstrating the application of methods to the lecture´s problem. Both teachers stresses on the one side

"knowing that" and on the other side the understanding of methods.

The example on standard costing and variance analyses in the third student interview

This third example comes from a company, which during the last month has produced 4.500 products, tubes containing adhesive. The students get information about the standard cost per product, the standard quantity of the different integral ingredients of the product and the cost of the wrapping of each product, which has to be added. The costs for the purchases of the last month are given and no products were in production or in stock for finished goods.

The students have to apply the standard costing and the variance analyses and do not need to estimate the total variance between the total estimated production and the total actual production in this example. This example is picked from the course literature, where several different sub answers are required for a correct solution. In the interview example, the students are asked to estimate only the quantity variance of direct material.

The students´ solutions

Three out of fifteen students manage to solve the problem correctly according to the constructor of the problem. Several students seemed to be unsure of the standard costing as a method and of the variance analysis. The text they had to read was in English but they were informed in the beginning of the interview that they could get help with the translation if there was any word unknown to them.

During the time period, when the interviews with the students were accomplished, they were preparing themselves for the written examination two weeks later.

Students in group A

None of the students in group A managed to solve the problem correctly but all of them tried very hard.

Student from group B

One student from group B goes through the information (spread on two pages) several times. This is observed by the interviewer because she is turning the pages. When the first excerpt begins she has started to write down the formula her teacher had used during the lecture. This student was tired. She seemed to know what she was asked to do in the example.

> S8: Let me see .. here ... the variance in quantity. First we have the standard price. We have the standard quantity from the beginning ... so we have to ... we have to take the standard quantity minus the actual quantity and then multiply by the standard price ... and therefore we get the quantity variance for the material (S 8/Int 3/s. 2).

Even if the student is hesitating she writes down exactly the same formula for the quantity variance of direct material as her teacher had done during the lecture. Then the student went on checking all the information once again. She commented on certain information which she did not need in order to work out the quantity variance.

> S 8: Mm.... it's the sum of powder chemicals and ... here we have... yes, other materials included ... [...] So I'll have to try ... (silence for 13 seconds) [...] Ye-es. ... (silence for 14 seconds) So much is allowance as ... two ... if it could be ... (silence for 35 seconds) ... Things aren't going quickly today ... [...] It must have something to do with ... this. That ... ... pounds ... two there ... ... (silence for 10 seconds) ... That times ... let's see here ... (silence for 43 seconds) ...
>
> I: You can think aloud if you want to.
>
> S 8: Yes, I know. But it's hard going today. So I don't have that much to say. [...] ... the standard price, in any case, so we have that ... and ... the standard quantity ... I make it two pounds and then there's the actual, how much was that, really ... If I'm thinking correctly ... [...] In any case, it must be something along those lines ... No, I don't know.

[Here, S 8 has set up the problem correctly on paper, according to the formula (Drury, 1992, p. 520)[88].]

I: Mm m... I think you're on the right track... it sounds reasonable[89]

S 8: Yes, on the right track, I guess, but ... ha, ha ... I'm not getting anywhere[both the interviewee and the interviewer are laughing for a while] Do they mean that it's ... two times 4.500 perhaps ... and that for each tube it's ... [both laugh again] But what I mean is whether it costs or whether ... ... (sighs) ... ... for a tube like this ... whether it's equivalent to two pounds of powder ... so if there is 4.500, it ought to be 9.000 ...

I: Mm .....

S 8: And then one could take issue as to whether I understand it correctly ... It's what's really been manufactured [used] ... that is, 9.800 .....

I: Mm .....

M: There will be a variance of 800 there ... I'll go with that. ... ... We'll see what we get. [...] We take that ... Then it will be – 800 times 0.75 ... No, let's see ... Yes ... So it will be like this – 600 ... (S 8/Int. 3/p. 3-4))

[After she had finished, she had the following comment.].

S8: Well, probably I am not right ... the right answer .. but in theory ... in theory I understand...[...] As usual, I have not had the time to be prepared ... (S 8/Int 3/p. 4).

The excerpt shows that the student focuses on the price of direct material and opens price as a dimension of variation by contrasting standard price and actual price. After that she focuses on quantity [powder in this case is direct material] and opens it as a dimension of variation by contrasting the standard quantity and the actual quantity. Then she focuses on quantity variance of direct material and opens it as a dimension of variation by contrasting "standard

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88 S 8 seemed to be tired at the beginning of the interview. She was easy to talk with during the two previous interviews and she has a happy disposition and gives a positive impression. On previous occasions, she had worked quickly through the practice questions. She has also shown an interest in the study by asking many questions. At this point, the interviewer can see that everything S 8 has written and said so far is correct and will lead to the correct solution. Here, the interviewer deliberately says something supportive to prevent S 8 from interrupting her calculations. – S 8 becomes more alert as the interview proceeds. The interview finishes in a positive atmosphere. Before she goes, S 8 tells the interviewer that she has just found out that she has been accepted for a much sought after summer job in competition with other applicants.

89 This statement from the interviewer has been commented on in chapter 5.

quantity times standard price" and "actual quantity times standard price". While she is working, she looks at the formula she has written down. She lifts up price and quantity as figures against the profit of the company as the tacit ground.

Students from group C

Two students from group C gave correct solutions. The one whose interview is exemplified in the excerpts was S 12. This student had during the first interview told the interviewer that she had problems studying English texts. She takes her time reading the text. When we get into the excerpt she has just drawn a picture of the "fork with the pins", which her teacher had used during the lecture. She put the symbols on the top of the pins and she wrote from left to right.

S 12: Producing ... Producing and it's about quantity variance [...] It's about direct material. [...] And then we should have actual volume ... in relation to ... actual quantity and standard price ... ... 100% actual quantity ... ... (silence for 15 seconds) ... Real quantity of the direct material [...] for powder ... [...] Issues, is it closing stocks? ...

I: ... it's what has been used ... ...

S 12: So it's consumption ... [...] Then it's 9.800 ... But then it's one I can change so I can change them ... 9.800 ... times standard price ... [...] Price per lb and it was used, that's how it must be ... 0.75 ... [...] SS ... 4.500 ... [...] Tubes ... Now let's have a look here ... the standard quantity is that 1.50 should be used ...[...] That's the price. There it's not the ... 2 lbs of powder for each ... Then it will be times 2 and 1.50 per tube ... (silence for 15 seconds) ... It doesn't seem right or it's me who's writing wrong ... times ... (mumbles) is 2 ... standard for each tube ... 4.500 tubes ... 2 lbs per tube are consumed ... Then it should be times 2 ... then it's 9.000 in relation to 9.800 there ...

I: Mm.

S 12: And ... 0.75 per lb ... price per lb is £ 0.75 ... And here it's 1.50 lb per tube ... Aha, then standard price, standard quantity, must be ... So we have to ... mm ... Exactly ... (mumbles) ... (silence for 40 seconds) ... Standard price, S price ... S price ... is the same ... and ... 4.500, 4.500 is the same ... ... and differs from the quantity then they are different ... (silence for 20 seconds) ... [...] -600 ...

I: Mm ... And what sort is it?

S 12: Unit ... Uh ... Dollars ... Here ... or, what's it called, pound [...] Yes, we've had ... They went through it during a lecture earlier.

I: I see.

S 12: So that means you recognise it when it comes up again. Then it'll be sort of, well. ... But it's like this, at least you know the background. I knew it was that AA ... or, well, AA ... AS ... SS ... You sort of knew that before ... (S 12/Int. 3/p. 3-5).

We observe that the student immediately identifies the symbol on top of the middle pin of the fork. She focuses on quantity of direct material and opens quantity as a dimension of variation by contrasting the standard quantity and actual quantity. While she is calculating she comments on what and why she is doing specific calculations. Then she focuses on price and opens it as a dimension of variation by contrasting standard price and actual price. Here she lifts up quantity and price as figures against the profit of the company as the tacit ground.

She focuses on quantity variance of direct material and opens it as a dimension of variation by contrasting "the actual volume times the standard quantity and standard price" and "the actual volume times actual quantity times the standard price". She reaches the correct result. She tries the figures twice and finishes. She comments that this has been demonstrated by the teacher a couple of times and that she has learnt the symbols of the pins in the "fork model". Her comments are interpreted as an explanation why she started by drawing the "fork model" before she made her estimations.

The second successful group C student (S14) started by looking after the values of the stocks and when we get into the excerpt he has drawn "the fork model" and written the symbols on the pins. He puts his model in front of him.

S 14: What you have to count on is the quantity ...use the quantity so to say [...] Yes, of course the rest is put in the stock .. and effects the next period [...] Yes, exactly 4.500 was the actual quantity you got ...[...] Oh, yes, it is 1.50 £ for each tube [...] yes, then I need 0.75 and I mean I have to change this one ... 9.000...[...]then I have to multiply .. noo I mean divide by .. I will count per tube.[...] exactly .. it will be the same ... 4 and 500 ...I have to pay ... and the total variance will be 800 .. I mean the material ...and I have to split it in price and

quantity... what is depending on what [silence in 55 sec] so the actual consumption of powder[...] this is the actual consumption of powder[...] each tube or it is 2.178 lb in each tube ... the actual result [...] I have counted actual consumption .. actual material per product and actual price

I: mm....

S 14: ... then I relate this to the actual manufacturing of products ... multiply by ... estimated consumption[...] that is the standard consumption multiplied by the standard price [...]

I: mm...

S 14: and then I get a total variance ... 6.750 minus .. and [silence in 10 sec; he writes 6.860.70-6.750.00] well it is minus there ... minus 110.7 ....

I: mm....

S14 I get [...] this is the standard cost .. which you have to check against the actual [...] you have to relate them.. you have to compare the actual quantity [...]now I have counted 4.500 multiplied by 2.178 multiplied by 0.7[...] then I have to relate them to the standardised ... [silence in 17 sec] is this correct? no, wait a second no, it must be 0.75...[...] now it is correct and this one... if you look at that one and compare with this one [points at price and quantity variances] so this one is the quantity variance ... [points at £ -600.75] (S 14/Int. 3/p. 7-9).

In the excerpt we observe that this student first focuses on actual volume (AV) as an invariant aspect. Then he (S 14) focuses on quantity of direct material and opens it as a dimension of variation by contrasting the estimated consumption of powder per tube [2.0 lb per tube] with the actual consumption of powder [2.178 lb per tube]. Then he starts to do the calculation of the total variance of direct material. He focuses on total variance of direct material and opens it as a dimension of variation by contrasting "actual volume times standard quantity times standard price" and actual volume times actual quantity times actual price". Then checks his calculations of the total variance [which is -110.7].

After completing the above the student focuses on quantity variance of direct material and opens it as a dimension of variation by contrasting the "actual volume times standard quantity times standard price" and the "actual volume times actual quantity times standard price". Then he can finish his calculations. To be sure he

gets the correct result, he also calculates the price variance and then he adds quantity and price variances and ends up with the sum identical with the total variance for direct material [-110.7]. He lifts up quantity variance and price variance as figures against the profit of the company as the tacit ground.

Summary of the students´ solutions on standard costing and variance analysis

Three students out of fifteen solved the third interview example correctly. The example is similar to the example used by the teachers in the lectures. The entire example consisted of a full variance analysis of a company's production, including direct material, salaries and variable and fixed overheads for the manufacturing process. The students´ example was limited[90] to only one part of the variance analysis, the quantity variance of direct material. The aim was to reveal the different learning conditions the students are offered to experience in the three groups. The students who solved the example have discerned the dimensions varied by their teachers during the lectures, when the teachers were demonstrating the calculation of quantity variance of direct material.

The "fork model", used for pedagogical reasons by Adam and Carl was supposed to facilitate the understanding of variance analyses. However, it seems to have been difficult for most of the students to separate between quantity variance and price variances. The formula used by Bess was also supposed to facilitate the meaning of variance analysis. But it seems to have been difficult for the students to use the formula for separating between quantity and price variances.

The student (S8) from group B used the formula introduced during the lecture. She focused costs and opened costs as a dimension of

90 This limitation of the example was necessary due to the time restrictions, which meant that the interviews have to be restricted to a maximum of 2 hours.

variation. Then she used quantity per tube (direct material) as a dimension of variation. During the lecture the teacher had demonstrated and varied both cost and quantity (direct material), when she compared the estimate and the actual cost. This student has discerned the dimensions and these were critical dimensions.

Table 12. The students´ solutions of the quantity variance

Quantity variance	Groups and students		
	B(S8)	**C(S12)**	**C(S14)**
Dimensions of variation	• cost - standard price - actual price	• quantity - standard quantity - actual quantity	• quantity - estimated quantity - actual quantity
	• quantity - standard quantity - actual quantity	• cost - standard price - actual price	• total variance for direct material - standard price times standard quantity (times actual volume) - minus actual price times actual quantity (times actual volume)
	• quantity variance - standard price times (standard quantity - minus actual quantity); SP(SQ - AQ)= (2x4.500 - 9.800)x0.75=.... £ -600;	• quantity variance for direct material - 4.500x[1]2x 0.75 - minus 9.800 times 0.75=..... £ -600;	• quantity variance for direct material - 4.500x2x0.75 - minus 4.500 x 2.178 x 0.75= 6750.00 - 7350.75= £ -600,75;
Invariant aspects	• _____	• _____	• actual volume (AV)

Note 1. Here "x" stands for "times".

The two students from group C (S12 and S14) used quantity and cost as dimensions of variation. The student S14 started by calculating the total variance for direct material. Having done that

he then had to split the total variance into the quantity variance and the price variance. He demonstrated clearly that he knew that if these variances were added, the sum must be equal to the total variance for direct material. He checked this knowledge in his last calculations. Both students had seen these calculations done by the teacher. The female student (S12) also commented on this, when she finished her calculations. Their learning object was constructed by the dimension of variation, which in this case was the costs and the weight; i.e. consumed direct material.

The three students have discerned the critical dimensions during the lectures and they have varied the dimensions correctly. If we compare the teachers´ dimensions, when they estimated the quantity variance analysis (Table 11) and the students´ dimensions when they did the same (Table 12), we observe that they acted in the same way as their teachers. The claim is that the students used exactly the same dimensions as their teachers have done during the lectures, because here we have identified the corresponding dimensions. For the student from group B, the dimensions were standard price, standard quantity and actual quantity applied to the formula. The students in the C group used the dimensions actual volume, standard quantity, standard price and actual quantity applied according to the "fork model". One student (S14) from C group had also focused the same invariant aspect as his teacher.

After the first and second interview, when a comparison was made between the teaching object and the learning object, I stressed that it was necessary to identify the corresponding dimensions of variation, before the comparison. This was due to the fact that on a general level the lecture problem and the interview problem were the same.

As pointed out earlier, here we make the comparisons on a more general level, when we use dimensions of variations applied to specific procedures of estimations of the variance analysis. The conclusion is that the students have experienced, discerned and learnt how to vary the critical dimensions of variation.

Conclusions

1. The students who managed to solve the problem used the same dimensions as their teachers used during the lecture and varied them in exactly the same way as the teacher has done. They have discerned the critical dimensions. This means that they identified the corresponding dimensions of variation in the interview example. Even the only student from group B who managed to solve the problem used exactly the same method and the same formula which the teacher had used. The two students from group C applied the "fork model" exactly the same way they had seen their teacher do it during the lecture. The students´learning objects were similar with their teachers´ teaching objects. The claim is that the students, who managed to solve the problem, have experienced and discerned the critical dimensions of variation during their lectures.

2. In the beginning of the third interview the fifteen students were asked to define standard costing. Two out of five students in group A defined standard costing as a method for estimating cost and controlling cost. Two students mentioned standards, such as fixed costs for a year, which facilitated calculations. One student added that it was a method for controlling the efficiency and effectiveness of the company. Unfortunately the meaning of efficiency and effectiveness were not understood.

One student from group B answered that standard costing was a method for prognoses and follow up, where the variances between the estimated costs and standard costs have to be calculated and analysed. Particularly three students stressed in their answers, that the variances must be analysed and measures taken, which give consequences for the company. One student stressed that the result from the variance analysis has to be analysed and that there are formulas for estimations. This was also particularly noticed by the teacher during the lecture.

One student in group C defined standard costing as a method for costing an average cost for a business cycle and for avoiding increase of prices during recession. One student mentioned it as a

method for internal distribution of costs between departments and a method to analyse a department's estimated costs with their actual costs. Three students defined it as a method for analysis of the variance between estimated cost and actual costs and where the reasons for the variances are analysed. Making calculations of costs and standard costs between departments was mentioned by the teacher as an example in his introduction of the lecture´s subject matter content.

The students from group B and C gave more answers of general character than the students from group A.

3. One student from group B and two from group C managed to solve the interview problem and there were no differences between these students´ approaches to the problem solving process.

IV. DISCUSSION

Chapter 9

GENERAL DISCUSSION

The first aim of the study was to investigate and analyse how three teachers present, handle, use and vary the subject matter content of three specific lectures in Management Accounting. The second aim was to investigate and analyse how their students experienced, apprehended and understood the specific subject matter content of these lectures and how they applied the content in a problem solving process. The third aim was to develop a model of description suitable for observing, describing and analysing teaching.

Theory and method

This study is in line with the development of the phenomenographic research approach which has emerged in recent years. In the study teaching has been investigated and analysed from a theoretical learning perspective (Chapter 1). The results vary between the three teachers and the three student groups. During their lectures the teachers have constituted different learning conditions in cooperation with their students and the students have experienced these differing learning environments accordingly. The teachers have also presented, introduced and varied different lecture themes, which the students have been offered to experience.

The theory of variation has been applied in the analysis of lectures and student problem solving processes (Chapter 4). In this theory the most important concepts are variation, discernment, simultaneity

and space of variation[91] (Chapter 4).The theory of variation has been described as an embryo of a new approach to learning, which has emerged out of the phenomenographic research tradition (Bowden & Marton (1998). Teaching has been analysed from a theoretical learning perspective and the theory of variation has been applied in the analysis of the empirical material.

The subject matter content of lectures

According to Riahi-Belkaoui (1996) and Jönsson (1995, 1999) different ontologies exist in the subject matter domain of Accounting. Both authors maintain that "Accounting" has once been considered as an intruder into Academia but has since "grown into a full-fledged social science and field of inquiry, dominated by the fierce competition among different paradigms" (Riahi-Belkaoui (1996, p. I). As a subject matter in practice, it has to serve the wide range of different views of realities and aims, which different industrial societies, clients, owners and employers are asserting (Chapter 5). In this subject matter domain different paradigms exist, implying that actors in the field have different interests and opinions of reality. These different aims and demands have an impact on the education of accountants on different levels in the educational system. Differences are mirrored in the curricula, in the discourse of teaching, in the textbooks of Management Accounting in general and in the economic course literature in Higher Education.

The contents of the lectures which have been investigated have dealt with the broad field of Management Accounting. The first lecture covered the need for economic information and economic information systems in a company in order to be able to accomplish a decision-making process and to take correct decisions; i.e. provision of financial information. This lecture also included how

91 These key words are the cornerstones of the analyses (chapter 4). These key terms were presented and introduced by Ference Marton during Phenomenographic seminars 1997 and the spring semester 1998 at the Department of Education and Educational Research at Göteborg university (see also Bowden & Marton, 1998; Marton & Booth, 1997).

costs and benefits should be measured for non-routine short-term decisions. The second lecture covered how to plan and control decisions in companies; i. e. the master budget and the budgeting process. And the third lecture covered the methods and the control systems that enable deviations from the budget to be analysed. These are the follow up methods of implemented decisions; i.e. standard costing and variance analysis.

The main results

Summary

This study indicates that

1. there are differences between the teachers ways of presenting, handling, using and varying a specific subject matter, which has been expressed in subject matter terms and that there are thus different learning conditions in the three groups of students.

2. there is a subject matter relation between the three teachers and their groups of students. This relation has been expressed as a relation between the teachers´ teaching objects and the students´ learning objects.

3. from the analyses of teaching from a theoretical learning perspective has been developed a model for describing and analysing and teaching;

The subject matter content of this study is Management Accounting. Some aspects of the study findings are not possible to generalise to other subject matter domains in many senses. In other senses they are.

One result which is possible to generalise is the model for describing, studying and analysing teaching from a theoretical learning perspective. This model can be applied to other subject areas because there are similarities in the ways subjects are

organised for communications purposes and transmitted in education systems (Bernstein 1990).

The teaching objects

The teachers mould different teaching objects during a lecture. These objects are specific for the teacher, the participating students and the subject matter. A theoretical learning perspective has been used to investigate the teachers´ teaching objects. The results indicate, that the teachers move between several objects during a lecture and different teaching objects are used to explain different subject matter concepts in this study.

In accordance with the theory of variation, the critical aspects of the subject matter which the teachers have chosen to use in their presentations and in their handling and varying of the specific subject matter have been identified. Some dimensions in this handling of the subject matter are lifted up and focused by the teacher and are offered to the students to experience. Simultaneously other aspects are focused but are held invariant by the teacher. Dimensions of variation of the subject matter are exposed by the teachers and as have been shown, it is also possible that a student lifts up a dimension of variation. This signifies that the students are exposed to different meaning structures of the content, which are constituted by the exposed dimensions and the invariant aspects.

This is the way the teachers in this study chose to build a teaching object during their lectures. These teaching objects have been named spaces of variation (Chapter 4) offered by the teachers to the students to experience. The results indicate that the student groups have been offered different learning conditions including different meaning structures of the subject matter content.

Bowden and Marton (1998) noticed that there are two different relations to be observed. The figure consists of parts and there is a relation between the parts and the figure's wholeness. There is another relation as well. This is the relation between the figure and

a specific subject matter ground. These relations give the subject content its meaning structure. Experiencing an object is always an experience from a specific personal position. The experience of an object (phenomenon) constitutes how the object is delimited from and related to the context on the one hand and how parts of the objects are delimited and related to the whole one the other. "As far as the time aspect is concerned, our awareness is at every moment a reflection of what we have experienced earlier" (ibid., p. 38). This implies that our earlier experiences have impact on new experiences.

> The personal context springs from our earlier experiences, but also from our aims and from the future which we expect and want to encounter. The way in which a particular experience relates the personal context and the way in which the personal context is making certain aspects of the particular situation appear more important than others, making them come to he fore, while others remain in the background defines the *relevance structure* of the situation (ibid., p.38).

The relevance structure has been interpreted as relying on what is already known about an object and that this knowledge is present and structuring our awareness at the same time as we experience a new object. The point here is, that the way the subject matter content is structured seems to have impact on the students´ awareness. The teacher focuses on the figure against a subject matter ground and the students experience this structuring at the same time. According to the theory of variation the teacher manages in this way to structure the students´ awareness related to the specific subjects matter content. These dimensions of variations and invariant aspects are not consciously expressed by the teachers, but they are revealed in the analyses of the teachers´ verbal actions.

The learning objects

The ways the students solve the examples offered in the interviews, have also been analysed from the theoretical learning perspective according to the theory of variation. These analyses indicate that the students construe a learning object grounded in the subject matter content of the lecture. The analyses of the content of the students learning objects indicate similarities with the actual teaching object

construed by the teacher and the students in cooperation in lectures and what was available to the students to experience. These learning objects have been expressed in dimensions of variation and in terms of invariant aspects.

Differences in learning conditions

The teachers are not compared as individuals, but their ways of teaching have been. The results have shown differences in their ways of teaching and differences in their students ways of experiencing, apprehending and understanding the focused objects. The results indicate that different learning conditions have been constituted during the lectures and that these have influenced the students´ awareness and their experiences of the subject matter content. The teachers´ way of presenting, handling and varying the subject matter content structures the awareness of the students in specific ways depending on what is brought forward and what is held in the ground and in which subject matter context this is happening according to the study. However, it has been beyond the scope of this study to explore the students´ pre knowledge of the subject matter as well as their preparations before the interviews.

In the *first lecture* clear differences are shown between the teachers in tables 4 and 5 (Chapter 6). When the first teacher is handling the time concept he contrasts machine hours and working hours, as possible limiting factors in examples similar to the one they just solved during the lecture. Whilst the second teacher chooses to introduce a different time concept as an important factor, in which a distinction is made between the short and the long term perspective. A specific project might be profitable in a short term perspective but not profitable in a long term perspective. In this way, not only costs but also profit seem to be relative in different time perspectives. Different circumstances and different factors are influencing the results of a project.

The third teacher chooses to bring in an example of his own. "The bus card" example. He shows that the profit is zero if it is estimated in a two week perspective in this specific example but that if a long

term perspective is used, for instance a year, the estimation of the profit is positive (twelve times the monthly cost of one bus card). Also in this example different conditions and factors exist and influence the result and have to be accounted for. This bus card example illustrates the relative character of the cost and the profit. The second and the third teacher constitute teaching objects which take into account the students understandings of the concepts. They also manage to establish a perspective on the cost concept and the time concept as having a relative meaning structure. Together with the students the teachers are creating different learning conditions in the lectures.

In the *second lecture* on budgeting, the differences between the teachers are in the presentation of the cash and equivalents whilst similarities appear when the teachers introduce the cost and the revenue income (tables 7 and 8; Chapter 7). The first teacher chooses to present the cash and equivalents and the opening balance as related concepts concerning the first line item on the debit side of the cash flow budget. This teacher stresses that the opening balance of the company must include cash in hand, in the bank accounts, in the postal giro and also in short term investments. The second teacher chooses to introduce and vary three pairs of concepts related to the cash flow budget, such as cash receipts - cash payments, claim - debt and cash purchase - cash sales. The concepts of each of the pairs are related and each pair can effect the cash flow. The third teacher chooses to handle the content in a quite different way and presents an example of the cash deficit. The students are able to experience the subject matter varied from an unexpected perspective. The analysis shows that he lifts up reasons and occasions which may cause cash deficits such as the consequences of generous credits and the lack of control of the production objectives. If the entire content of the lectures is taken into account, including the introductions of the lectures, and the subject matter context in which the concepts are introduced, then the differences between the teachers are reinforced. Consequently, the learning conditions available to the students are different in each of the lectures.

The *third lecture* concerns the standard costing and variance analysis. The analyses revealed differences between the teachers in their way of presenting standard costing (Table 10; Chapter 8) and applying variance analysis (Table 11; Chapter 8). The first teacher varied the standard cost in his introduction and presented standard costing as a follow up method for comparing pre determined costs and actual costs for a production of the product in a company. The second teacher emphasised and varied standard costing as a follow up method and as a management method for controlling the efficiency and the effectiveness of a company. The method implies that the result has to be scrutinised and should have some improvement impact on company organisation. The third teacher chooses to start with a comparison between two economic models, the budget model and the costing model. These models are used and varied to illustrate follow up activities on different levels in a company. All models are introduced as follow up methods of different character. When the teachers applied the variance analysis, the main difference between them was revealed in their way of doing the estimations of variances. The first and the third teacher used a slightly different technique than the second teacher, who applied the method of variance analysis as it is presented in the course literature (Figure 1, 2 and 3; Chapter 8).

When taking into account the entire lecture, i.e. the subject matter context, including the introductions of the lectures, then the differences between the teachers are reinforced. Consequently, the claim is that the learning conditions available to the students in each lecture are different.

Pedagogical strategies and implications

Different perspectives can be applied to student learning as have been pointed out in chapter 2. I would like to exemplify two perspectives, which can be mirrored in teacher´s pedagogical strategy.

In the first learning perspective, learning is looked upon as "apprenticeship", which here means that the expert leads the

student and shows how to be skilled in an area, who wants the students to "knowing how to do" problem solving. The main interest seems to be to bring the students to one form of understanding through transmitting a skill which is fostered through repeated exercise. The student has to exercise in order to succeed. In this case, the differences between "knowing *how* to do (procedural knowledge)" is important as well as the facts, rules and principles, which have been called "knowing *that* (propositional knowledge)" (Bruner 1996, p. 53).

This pedagogical strategy relies on knowledge to be transmitted by experts, lecturers in subject matter domains and expert teachers of specific sub domains. The knowledge offered to the students to experience is both descriptive and prescriptive. Which weaknesses are attributed to this pedagogical strategy? The main answer is that it presumes that knowledge is "true knowledge" because it is shared by a community of experts.

To exemplify another learning perspective, in which learning is looked upon as an ability to acquire new knowledge, what the student thinks, understands and how the student arrives at an opinion and how he or she is arguing. The students are encouraged to take part in the collective communication going on during the lecture and also in the constitution of the teaching object. The teaching object is then construed by the teacher and the students in cooperation. A student´s answer or understanding of a concept is questioned and the student must be able to explain and argue in favour of his or her opinion, if the teacher is to approve the answer. In this case, the teachers demonstrate that the group of students could learn from a fellow student´s explanation of an opinion or the mere discussion between the student and the teacher concerning possible solutions. This pedagogical strategy accepts that the students are able to do something, to give arguments, to have ideas and are able to reflect on their own thinking and the teacher´s thinking. The knowledge offered to the students to experience is both relative and non absolute. This form of education is what Bruner calls "mutualist and dialectical, more concerned with

interpretation and understanding than with the achievement of factual knowledge and skilled performance" (Bruner 1996, p. 57).

Which weaknesses are attributed to this kind of pedagogical strategy? According to Bruner "Some say that the weakness of this approach is that it tolerates an unacceptable degree of relativity in what is taken as "knowledge" (ibid., p. 59). To accept something as "knowledge" we formulate criteria. If knowledge is accepted as "knowledge", it has to be proved by philosophical or scientific arguments and reasoning.

If the aim is to assess a pedagogical strategy then it has to be related to the objectives for the education or for the course. In this study teachers way of handling and varying the subject matter, i.e. their pedagogical strategies, has been compared but not been related to the objectives of the specific course.

Relation between the teaching object and the learning object

The relation between the teachers and the students has been investigated. The teachers´ teaching objects and the students´ learning objects have shown remarkable similarities.

The students who solved the problems of the interviews have in each solution shown that they have discerned the corresponding dimensions of variations and the invariant aspects, which have been demonstrated by their teachers. The results have been interpreted as indicating that the students have identified the corresponding dimension of variation in a new example and a new context. Several examples have illustrated how they varied the corresponding dimension of variation. The claim is that the students have experienced and discerned the critical dimensions of variation of the concepts and of the methods presented by the teachers. On a general level, the students seem to have taken impressions from their teachers, which they have been able to demonstrate in the problem solving processes.

Differences between student groups
Problem solving

The differences between the student groups have been investigated. This has been done as part of an analysis of the content of their learning objects, as analyses of their definitions of concepts, and, finally, as analyses of their approaches to problem solving.

The differences between the learning objects of the students, represented in the thesis, have been analysed and commented on after each interview. The excerpts are from the end of their problem solving processes. Since all of them demonstrated a correct solution, there are few if any degrees of freedom left to vary the remaining part of the problem solving process and how to reach the correct result. There seem to be similarities between the students´ learning objects on one a more general level, but it the analysis is engrossed and how they handled the subject matter is studied, then the differences are revealed.

I will give you one example. If we go to table 6 (the first student interview). In that example the students were asked to solve a problem of a limiting factor (which was the supply of raw material)[92]). It seems as if there were no differences between the students from A, B, and C group, if we look at the dimensions of variation. These are for the first student: raw material, weight/contribution per product and contribution/weight per product. For the second student the dimensions are: costs, contribution and weight/product. The third student chose weight/product, contribution and market demand/contribution as dimensions of variation. Now, they all seem more or less to be same. If we go further and look at each of dimensions they used, we can see that there are differences. Let us take contribution/weight, which is a dimension of variation which all of them have used. The

92 In this example there were five products and 17.000 kilo raw material (the limiting factor), which have to be used to manufacture products during a fixed time period and at the same time maximise the profit for the company. Information was given about the contribution per product expressed as a) contribution per product and unit; b) contribution per product and weight (kilo). There were weight differences between the five products.

first students strategy is to find out the relation for all five products. The second student chooses to compare the contribution and the weight for pairs of product and estimates a ranking of products grounded in the contribution per product and unit. The third student also makes comparisons, but his ranking is grounded in the contribution per product and kilo.

Definitions of concepts

In the first interview students were asked to define and explain a limiting factor. Students in group A answered that a limiting factor could be the lack of machine hours or labour hours in a manufacturing process. Four out of five students related the limiting factor to the lack of machine hours or the lack of labour hours. Students in group B defined the limiting factor in more general terms and gave examples such as lack of resources, problems in the manufacturing process and a bad production capacity in the company. In group C the students mentioned examples of the limiting factor such as something that causes a slow production process or different problems in the production process and due to that how it affected the total profit for the company.

In the second interview they were asked to define budgeting. Group B and C gave several answers of more general character than group A. Answers from group B and C indicated that budgeting was regarded as an instrument for management planing and one student mentioned particularly "to avoid deficit", which was discussed in group C in connection to cash and equivalents. Group A´s answers indicated budgeting as a method for planning "what will happen next year" and concepts from the sub budgets were mentioned.

In the third interview the students were asked to define standard cost. Two out of five students in group A defined standard cost as a method for estimating cost and controlling cost. Two students mentioned standards, such as fixed costs for a year, which facilitated calculations. One student from group B answered that it was a method for prognoses and follow up, where the variances between the estimated costs and standard cost have to be calculated

and analysed. Three students stressed in their answers that the variances must be analysed and measures must be taken which have positive consequences for the company. One student in group C defined standard costing as a method for costing an average cost for a business cycle and for avoiding price increases during recession. One student defined it as a method for internal distribution of costs between departments in a company and a method for estimating a department's standard costs and their actual costs. Three students defined it as a method for analysis of the variance between the estimated cost and the actual costs and where the reasons of the variances are analysed. The students from group B and C gave more answers of general character than the students from group A did.

To summarise, the analysis of the students´ definitions of concepts revealed differences which signified that students from group A gave mostly concrete definitions linked to the example solved during the lecture. Students from group B and C gave definitions of a more general character.

Observations, including all fifteen students, during the first interview of the students´ approaches to problem solving, indicated differences between the groups. There were differences between the students from group A and students in group B and C. The students from group A started to solve the problem directly after they had got the example. They started to use the given information and to calculate and seemed to be completely occupied with the information of the example during the entire solving process. Students in group B and C took their time to read, reflect and to estimate, and they seemed to be able to take different perspectives to the examples while they were working. The observations rely on their comments, because they gave more comments about the given information and the problem solving than the students from group A.

Approaches to problem solving

In the analyses of students approaches to problem solving all fifteen students are included. On a more general level, differences were found between the students. In the included excerpts for the students from group A, there are differences which are interpreted as signifying an "expedient constructual approach"[93], which in this case means that they almost immediately identified a relation between two variables which had a steering effect on their estimations. The students from group B and C applied an "interpretative structural approach", which in this case means that a structural relation between variables was discerned and applied in the estimations (Booth 1992).

Results of examination

The students marks and results from the examination is listed in table 3. We can observe that three students in group A and B passed, whilst two out of three students in group B "passed with distinction". All students in group C passed the examination and two of them "passed with distinction". These last mentioned students have all of them finished the upper secondary programme in economics (Table 2).

These are observations which can not be generalised, in the traditional sense, to other groups or other learning conditions due to the sample size.

Model for describing and analysing teaching

This investigation may seem to be an investigation of differences between the teachers´ ways of teaching a subject content. However, the focus has not been on these teachers´ personal abilities or

93 "Constructual approach" and "interpretative structural approach" are concepts used by Booth (1992) to describe a differentiated surface approach and a differentiated deep approach applied by students learning programming.

teaching skills but on the learning conditions they constitute together with their students.

1. A starting point of the analysis is to identify the object, the part of the subject matter content, which is focused by the teacher. Then the subject matter context of the object is identified.

2. A focused concept is presented by the teacher. The variation is the most important part, because then a dimension of variations is revealed, opened and varied and at the same time offered to the students to experience. There are aspects, which the teacher chooses to focus on, but which are not opened and varied and these are called invariant aspects; i.e. taken for granted.

3. Having illuminated the dimension of variation and the invariant aspects, then the figure - ground relation is revealed by the teacher. In the text it is expressed as "the teacher is lifting up a dimension" and at the same time it is shown against a specific subject matter background. The dimensions of variation and the focused invariant aspects are presented by the teacher in a specific subject matter context.

4. The analyses reveal the dimensions of variation and focused invariant aspects as the results of the teacher´s presentation of the subject matter concept. The result of the analyses is presented as a teaching object, space of variation (Chapter 4), which is constituted jointly by the teacher and the students during the lecture.

Some implications for Higher Education

Teaching and the pedagogical dimension, which here signifies the investigation of teaching and how teaching can be carried out in a subject matter area, has to be regarded as an important activity for teachers of the universities (Bowden & Marton 1998). If a project is aiming at improving the quality of student learning, then the learning outcomes are likely to be related to the teachers´ way of teaching and their subject matter knowledge. If the aim is to improve the quality of teaching, then the teaching are likely to be

related to the teachers´ way of teaching, the subject matter, the teachers´ knowledge of the subject matter and the teaching tradition of the department.

Johnston (1998) analyses the evolution of the modern universities in the perspective of Boyer´s four scholarships introduced in chapter 1. The conclusion was that the scholarships are still the necessary core of the university but can only survive if its role is defined and defended as "that which is duplicated by no other institution in the society" (ibid., p. 270). Boyer (1996) put forward teaching as one of the new scholarships. What does this imply in a theoretical learning perspective and in the perspective of the results from this study? In my view it implies that research on teaching in a subject matter domain leads to new knowledge about teaching and learning in that domain and will give rise to a learning paradigm sympathetic to improving the conditions of learning. It will also imply important implications for how to bring about learning This would mean a shift to the learning paradigm from the existing instructional paradigm, where teaching is the figure and learning is the ground.

Teaching and teaching skills

The model for describing and analysing teaching is a way of finding out how a teacher is presenting, handling, varying and using a subject matter in a specific subject domain, which means the teachers pedagogical strategy.

As was pointed out in the first chapter, "teaching skills" have over the years been assessed in many different ways (chapters 1 and 2). The main point is, however, that most of the examples revealed assessment methods, which were not related to the subject matter nor to the teachers way of teaching. The assessment of teachers´ teaching skills are likely to be related to the teachers, the teachers´ way of teaching and indirectly also to the teachers´ knowledge of the subject matter.

The claim is that "being good at teaching" has to concern how the teachers present, handle and vary the subject matter content, i.e. the

teacher´s pedagogical strategy. Teaching can be studied from a learning perspective, which has been done in this study. A structured subject matter content has been chosen. The teachers way of teaching has been studied and also when they demonstrate how to solve examples of application, i.e. in contexts where it could be assumed that teachers´ ways of teaching ought to have minor effects. Three lectures on different topics have been analysed. In each lecture and qualitative differences have been found despite the fact that the teachers are teaching about the same example or the same concept after an agreed upon plan. Moreover general differences crossing over the three topics have been revealed. These results imply different pedagogical strategies, which are the teachers´ specific ways of teaching (discussed above).

Learning

The students in this study are offered different learning conditions. These seem to have impact on their awareness of certain dimensions and aspects of the specific subject matter. This impact seems to be on the students´ awareness of focused dimensions and focused aspects, which the teacher has used during the lecture. The relation between the teacher´s teaching object and the student´s learning object has been shown in several examples. In this sense it has been illustrated that the students´ knowledge formation (expressed as the students´ learning object) has in the case investigated been grounded in the subject matter content of the lectures to a very great extent. If a university wishes to improve student learning, it has to support teachers giving more attention to undergraduate and post graduate teaching; i.e. the way different subject matters are taught to the students of the university.

Subject matter and curriculum implications

How different teaching strategies constitute different conditions for learning have been shown in this study. The claim is that one learning context is better than another because it corresponds better to the objectives of the course. Consequently, the criteria of the

objectives for courses have to be formed during the planning phase of the course, followed up during it and finally settled after its evaluation.

The teaching and the pedagogical dimension, how teaching is fulfilled, in different subject matter domains has to be put forward as a legitimate research area. Research on the historical dimension of a subject matter (i.e. the scientific development of a subject matter) is a highly accepted research area. It seems reasonable to claim that research on teaching and learning in Higher Education should be areas of comparable dignity.

Model for describing and analysing teaching

The model for studying and analysing teaching introduced above can be used in different subject matters to make teacher´s aware of the way they teach and the way their teaching has an effect on the students´ learning and knowledge formation. In this specific study certain concepts have been studied which were experienced by the teachers to be of importance for the students understanding of the subject matter area.

It is not enough to choose important subject areas for improving teaching and student learning. These areas has to be presented, handled, varied and used in specific ways as have been shown in this study. The teaching principle must be, a principle of variation, but variation of critical dimensions and aspects of selected subject matter domains. This variation must take place in a subject matter context, which supports teaching, learning and the specific objectives of the course.

At last

The thesis deals with three university lecturers´ different ways of using the subject matter content and their students different ways of experiencing and apprehending the content of the lecture.

1. Teaching, "teaching skills" and pedagogical strategies have been regarded as related to how the content is structured, presented, handled, used, varied, lifted up and angled by the teachers.

2. Methodologically I have minimised the likelihood of finding these kind of differences by choosing a highly structured content agreed upon and technical concepts and procedures.

3. Still such differences have been found throughout the three lectures examined. It is thus highly probable that similar differences can be found in other cases with greater degrees of freedom.

4. Furthermore, the students seemed to have been affected by these differences in so far that they have experienced and they are able to demonstrate their experiences of which dimensions of variation were focused and varied in the subject matter of the lectures.

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APPENDICES

Appendix 1

Lecture 1, Adam

The teacher Adam (A) starts the lecture by giving the students information on a change in the timetable. The introduction to the lecture itself consists of a short presentation of the exercise to be completed. He then introduces the example which deals with purchasing and production when a company's capacity is limited, i.e. when there is a problem in some part of the production process. The example, which is a so-called "standard exercise" taken from the course book, consists of three different sub questions. A describes an application example involving a company which manufactures three components in two different but consecutive processes, M and N. A says that the first sub problem concerns the demand. The fixed production costs are spread over the machine hours in each process. The first sub problem consists of identifying the point in the production process where the company has insufficient capacity. In the second sub problem, a decision must be made as to what is cheapest for the company, i.e. either to purchase one of two components or to rely on its own production. In the third sub task, the students have to determine what other factors affect an assessment of a possible external purchase, i.e. from a subcontractor. After this introduction of the sub problems, A solves the first sub problem (which the teachers have decided should be solved during the lesson). A uses the whiteboard to show all the important steps in the solution of the sub problems. - In the first sub problem, A relates the amount of time consumed per component and processes M and N to the total production time expressed in machine hours.- A then moves on to production volumes, i.e. the market's demand for different components. He calculates the machine time required per component and manufacturing volume as well as process and points out that this "means that with this mix of components in process M we can satisfy the requirement", i.e. the demand on the market. Process M is not a "limiting factor". The calculation is repeated for process N and A notes that the process requires more capacity and 250 additional machine hours. Process N contains a limiting factor. A summarises by adding up the different figures, showing that process M has a capacity surplus of 125 hours while process N has a deficit of 250 hours. A emphasises the importance of knowing, when faced with this type of problem,

that the lack of capacity usually takes the form of insufficient machine time or working hours and that the cost should be calculated per machine hour or working hour in order to identify the "limiting factor". Ultimately, it is company's board that has make decisions and agree on different proposals and place these in relation to the demand and, ultimately, the company's targets and profit. - The company's profitability and the demand on the market are crucial to whether the company will itself produce or, instead, purchase from a subcontractor (the second sub problem). A new restriction complicates the problem, namely, that only two of three components can be purchased externally. A introduces the concepts of incremental costs and general overheads and emphasises that the students must be able to distinguish between these two concepts in order to be able to correctly work out the standard exercise. The production price of the components – when the company manufactures them itself – is compared with the subcontractors' prices, i.e. what the company would have to pay if it purchased externally. A comparison shows the price differences. The limiting factor in production process N resulted in a shortage of capacity which is now related to the price difference between the company's own production price and the purchase price of the two components and the number of machines hours required per component. This clearly shows which of the components should be purchased externally. A finishes by pointing out that the solution in this case is to purchase the component with the lowest cost per production hour. - A then goes over to the third sub problem. Here, other factors, which could be of importance in a company before deciding whether to purchase from an external subcontractor, must be taken into consideration. A asks whether a solution of the limiting factor is what the students have decided on. A asks for other possible solutions. - A is active as a teacher and questioner and directs his questions at individual students and tries in different ways to elicit answers to his questions. His first question to the students is "How should we go about solving this – Does anybody know?" A creates a pleasant atmosphere during the lecture by joking with students who arrive late.

Appendix 2

Lecture 1, Bess

The teacher Bess (B) begins by referring back to the previous lecture and tells the students that the section concerning the importance of costing in stock valuation has now been completed. B then comments on the content of the next part of the course which will deal with "information and decision making". B briefly reviews the subject of today's lecture and the relevant chapter in the set book. She begins by discussing the chapter as a

whole. This chapter deals with a number of "standard decisions" to be made by e.g. a company board and these are illustrated by a number of written exercises, "standard exercises". B describes these "standard decisions" and then places the content of the day's lecture and the application example in the theoretical context of the subject and the content of the course. B emphasises that the form of a accounting system determines what information can be acquired from the system. She mentions the importance of "qualitative factors" and then describes the three standard exercises in the written example.- B then goes through the concepts of "relevant and irrelevant costs" and how a cost is determined to be relevant or not. The "relevant costs in conjunction with decisions" are clarified by means of different cost concepts. Crucial to a company's profitability is the choice of time perspective used to assess different projects in conjunction with decision-making situations facing company boards. B emphasises that it is also the time aspect that determines which cost concept will be relevant in conjunction with decision making. B also points out that "qualitative factors" can have a large influence on decisions. In the teaching, these economic assessments take the form of discussions and B says that perhaps too little time is assigned to these discussions in the teaching.

The first standard exercise concerns a company which is preparing its production budget for the next year. The company manufactures three different components and there is a limiting factor in its production process. - In practice, this means that a certain cost per machine hour is charged to the subprocesses. The production targets are given in the task and B begins by relating capacity utilisation to these targets. The time consumed per component and process is calculated. In response to a question, one of the students gives a somewhat fumbling answer. B says that he (the student) is referring to how much overhead and fixed joint costs have been added to each process. The time per process and component is calculated by B and the student (in the form of a dialogue), i.e. the production time for components in the two processes. The total time for all the components in each process is then calculated in order to be able to determine which process contains the limiting factor. 2,000 machine hours are available for each process. The calculation for process M gives a capacity surplus of 125 machine hours. B says that process M is not a limiting factor "since in process M we are able to manufacture all the units we want". Process N is calculated in the same way and the calculation shows a capacity shortfall of 250 machine hours. Process N is the limiting factor in the production process, which means that we must decide whether we should purchase one of two components from subcontractors or manufacture ourselves in order to reach the production targets, says B (the second standard exercise). B notes that the choice of which of the two components to purchase is not arbitrary. A student gives the answer to

this standard exercise in a stage whisper, but B asks the group "Is it arbitrary?" Nobody answers the question so B turns to the student who gave the "correct answer" and asks her to explain how she arrived at the answer. B follows up the calculation and a discussion begins since this calculation is based on the size of the capacity shortfall and does not allow for the fact that the components go through both the processes. - The subcontractor's price is compared with the company's own production cost. B points out the importance to each component of the company's variable incremental cost and subtracts it from the supplier's selling price for the two components. The savings per component and machine hour in process N are calculated. B says that it is important to utilise the limiting factor in the best possible way, which means that one has to decide how much is saved if one manufactures oneself or purchases from a subcontractor. For this reason, the savings per machine hour are calculated.

Appendix 3

Lecture 1, Carl

The lecture hall is almost filled with students when the teacher, Carl (C), arrives. Clearly, the students come and listen to more than one teacher if the section of the course is difficult. C starts off by going directly to chapter 10 in the set book and explains the main contents of the chapter, namely, that they deal with what should be considered relevant costs when decisions are made by e.g. company boards. C feels that the concept of "costs" should probably not be regarded as a difficult problem and says that the basic idea behind the concept is that, as a business economist, one should be able to relate different costs to different alternative decisions. The profitability aspect is also present, which is made clear in the application example to be worked out during the lecture. C quotes the author of the set book who holds the view that the board should take into account not only quantitative factors but also qualitative factors when making decisions. To exemplify qualitative factors, he then presents an example from the public debate. C then goes through the contents of the chapter in the set book to be discussed during the lecture. He begins by relating the concept of "relevant costs" to the "cash flow concept" which refers to future cash flows, i.e. future payments. C describes the connection between payments and relevant costs as "future payments that differ depending on the decision". He analyses how the author of the set book writes about the "cash flow" concept and emphasises that it is partly a question of different time horizons and partly one of it representing "what has already been done". C brings up several economic concepts and discusses in detail the concept of "relevant costs" in connection with the existence of

several decision alternatives.Together with the students, C discusses what could constitute "qualitative factors". - In the first example, C describes the components and the two different production processes involved. C also discusses market demand and says that it must be known to be able to calculate the limited capacity the company may have. In this case, the capacity in both the processes is 2,000 hours. The fixed overhead costs are noted and distributed over the machine hours. The cost of materials and wage costs as well as variable overhead costs are written on the whiteboard. The total number of production hours for each process is worked out. Access to production capacity is related to demand on the market. This shows that process M has an overcapacity of 125 hours while process N has an undercapacity of 250 hours. C notes that the limiting factor is in process N. Accordingly, he has identified the location and size of the capacity limitation. - In the second standard example, customer demand must be met in the cheapest possible way for the company. C discusses this with the students. Two of three components can be purchased externally. The incremental costs of the two components are used together with the cost of materials, wage costs and variable overhead costs to calculate the company's production cost. This is then compared with the subcontractor's price. - C points out that the "bottleneck" is machine hours in process N. The company's undercapacity is related to the production time for each component. The "savings per production hour", if any, in process N, when the company produces the components, is calculated. The result is analysed and discussed. C says that purchasing component X will be cheapest for the company, after which the number of components to be purchased externally is calculated. - The third standard exercise involves other "soft" factors that could affect decisions by the board. - He finishes by discussing costing in terms of a pricing instrument and says that because the market guides today's pricing, the function of costing has changed. Times change and C says that many old assumptions and theories were based on "traditional products" which had life spans of about 20 years. The importance of costing as a pricing instrument is no longer self-evident. Today, it is more a question of management accounting and control, stock valuation and cost control (efficiency assessments). The standard exercises are worked out during a continuous dialogue between C and the students.

Appendix 4

Lecture 2, Adam

The teacher, Adam (A), introduces the theme for the day, "budgeting", and briefly summarises the exercises which are part of this relatively large section of the course.

Today's theme includes two different application examples which, among other things, require the students to draw up different budgets, i.e. a profit and loss budget, a cash flow budget and an estimated balance sheet. The budgeting section also includes variations of these budgets, monthly budgets and cash budgets. - A gives detailed information on the day's first application example. The company in the example produces 20,000 products and he gives details of variable incremental costs, sales volume and sales price. A emphasises that variable incremental costs are costs that are directly related to the products and that these costs would disappear if the company did not produce these products. He says that it is important to remember this. The example includes valuations of the different stocks and it is stated that the opening and closing stock of finished goods is valued at the variable incremental cost per product unit. In the application example, the students must draw up a) a profit and loss budget and show the profit/loss before tax for the budget year; b) a cash flow budget and show the closing liquid assets. Work on the profit and loss budget begins and the T model is used. –"To be able to draw up a profit and loss budget ... to know how to solve this it's important to know whether we have expenses or costs in this example" (A/Lect. 2/p. 2). A asks the students for the revenues on the credit side. One student gives the answer, 20,000 products multiplied by the selling price which was SEK 50 per product. After having established that all the revenues were included, A goes over to the debit side. – "What costs do we have?" (A/Lect. 2/p. 3). The question interests the students and one of them suggests "20,000 times the variable incremental cost". A says that the cost of goods sold is estimated as the variable incremental cost but that administrative and selling costs must be added. A wonders whether they are all convinced that this is correct, but nobody answers so he verifies that the answer is correct. The cash flow budget is set up on the whiteboard and A proposes that the T model should be used here too. The cash flow budget should reflect cash flow, i.e. the company's receipts and payments. A points out that this should be based on the costs. These costs must be periodised, which means that the items in the profit and loss budget affecting liquidity are included in the profit and loss budget and you have to go from costs to expenses and then convert the expenses into receipts and payments. A says that a gross accounting model is used in this example and takes up the first item which is the opening balance in cash in hand (OB Cash: "... we always begin with OB ... not cash but cash and equivalents [...] ... remember, always begin with cash and equivalents ... because then you'll always get as the balance ... CB [closing balance] ... But if you forget this item, this OB item ... then the balance will be the change in cash and equivalents ... It's easily done ... It's one of those unnecessary mistakes ... for example, in an exam" (A/Lect. 2/p. 4). In addition, A defines cash and equivalents as not only cash but also funds in bank and postal giro accounts as well as investments made

with cash and equivalents, i.e. everything that can be easily converted into cash. This is followed by a discussion about which items affect liquidity. - A draws a time axis on the whiteboard and explains that invoices sent out by the company in December, year 1, will not be paid [become receipts] until January, year 2, if the terms of payment are 30 days. This is repeated in the same way for invoices sent out in December, year 2, that they will not be paid until January, year 3. This, says A, is the reason why we must always take the changes in accounts receivable into account. A asks a rhetorical question about what expenses the company has. None of the students answer. The expenses are generated by the purchases made and A emphasises that the cost of good sold must be regarded as an "accounting thing" because it is purchases, administrative costs, wages and other overheads that generate expenses and result in payments. – A asks the group: "How large are the expenses for these costs?" (A/Lect. 2/p. 6). – None of the students gives an acceptable answer. A then draws a flow chart of the stocks on the whiteboard and the flow between the stocks is discussed. – "Where in this flow … do we measure the costs of goods sold [SEK 800,000; 20,000 units]?" (A/Lect. 2/p. 6). A student answers "the stock of finished goods". A says that here it is useful to reconstruct the flow of receipts and payments in the cash flow budget and consequently it is important to understand how the flow between the stocks functions. A notes that in the application example there is a decrease in the stock of raw materials and an increase in the stock of finished goods and that products in progress can be assumed to be unchanged since no other information is given. – "You can now say that you have converted your costs into expenses by taking the change in stocks into account. …What we have to do now is to convert these expenses into payments …" (A/Lect. 2/p. 8). The new investment of SEK 100,000 is then taken up and half of it is paid during the budget year and the other half is taken on credit for a further year. Here, A firmly recommends using the gross accounting method: "Because .. otherwise you risk increasing, when you draw up the estimated balance sheet, the fixed assets, by 50 … … instead of by 100 and in addition … increasing current liabilities … by 50 […] If you do this, you know that … the fixed assets in the estimated balance sheet will increase by 100 and current liabilities by 50 … Then you get the balance sheet total here …" (A/Lect. 2/p. 9). – The cash flow budget is completed and A gives the balance as SEK 1,100,000. A student says that it should be SEK 1,150,000. A alters his figure to 1,150,000, checks in his papers and says: "We're not going to do like it says in the key […] instead, we'll always use gross" (A/Lect. 2/p. 10). The closing balance for cash and equivalents are SEK 85,000 and the balance on the credit side tallies with the balance on the debit side.

Appendix 5

Lecture 2, Bess

The teacher, Bess (B), begins by saying that today's theme is budgeting and that it is based on chapters 16 and 17 in the set book (Drury, 1992) and the budgeting compendium "Budgetering" (Claesson, 1993). B refers to a model for management accounting systems (from the Volvo Truck Corporation) which B has used earlier. The model is in the form of a pyramid with the corners of its base illustrating the corner-stones in a management accounting system, i.e. current accounting (starting point), costing and budget followed by current accounting. B emphasises that the pyramid illustrates different stages in management accounting from current accounting to general ledger and finally to the balancing of the books. These corner-stones form the basis of today's section, budgeting, which was preceded by the costing section and these two sections affect each other. B refers to the set book's description of two different budget approaches. One of these is the traditional approach, which the book calls 'incremental' which means that a certain percentage is added, e.g. since inflation is taken into account. The other approach is called zero-base budgeting which means that every activity is queried as are the costs of each activity which are charged to the budget. There are also other approaches such as activity-based costing which, in fact, is based on another type of costing and analysis of the budget process (the actual design based on existing prerequisites, the work, procedures and who is involved, etc.) as such. – The budget approach, budget process and different sub budgets result in a basic operating budget. There are also different types of budgets, says B, such as function budgets and department budgets. In both cases, these budgets concern different parts of an organisation which are subjected to a special study. These result in the 'basic operating budget' or 'total budget'. B then emphasises the importance of understanding the relations between profit and loss budgets, cash-flow budgets and budgeted balanced sheets. You have to start with a profit and loss budget (costs and revenues) to be able to draw up a cash-flow budget (receipts and payments) and, finally, a budgeted balanced sheet (assets and liabilities). The point of a profit and loss budget is that the costs show the utilisation of resources and revenues describe performance. In the cash-flow budget, the payments reflect the resources we have acquired and the receipts reflect the services or products we have sold. The assets and liabilities in the budgeted balanced sheet may seem to be simpler, says B, because we (at this level) do not have to determine what assets and liabilities a company has since they are given in the examples we are working on. On the other hand, she emphasises the differences between the profit and loss budget and the

cash-flow budget which determine where individual budget items should be entered. Together, these three budgets constitute the so-called basic operating budget.

Two methods are given for describing the individual concepts in the profit and loss budget and the cash-flow budget. The first method is the so-called 'account method', where the ways in which different accounts affect the profit and loss budget and the cash-flow budget are studied. The account sheet is followed when entering items in different accounts. When the different budgets are drawn up, a reconstruction can be made, when necessary, of how different accounts have been affected, changed and whether they have affected liquidity. The second method, the so-called 'change items method', involves analysing how different items have been changed. B says that if you are inexperienced, the account method is preferable, at least in application examples where changes in stocks are analysed. There are three types of stocks, namely, stock of raw materials, products in progress and stock of finished goods. - Today's application example is introduced in the form of a review of the information given about the company in the application example. The example involves drawing up a profit and loss budget and a cash-flow budget for this company, which produces 20,000 products with a selling price of SEK 50 per piece. The variable incremental cost per product is estimated at SEK 40. B begins on the profit and loss budget by saying that the T model will be used. Revenues are shown as SEK 10,000. The students and B agree that there are no other revenues. B then goes over to the debit side and the costs and points out that it is appropriate to begin with the cost of goods sold, which is an item that affects liquidity. The variable incremental cost per product is multiplied by the sales volume which gives a figure of SEK 800,000. B includes SEK 40,000 in other sales costs, i.e. administration, rents and wages. Depreciation and interest costs are entered and the profit is calculated at SEK 100,000. – The cash-flow budget describes the cash flow which is why it is important to reconstruct the stocks, says B. The stocks are written up on the whiteboard and opening and closing items (the net changes) shown for the company are entered into the appropriate stock. Here, a discussion begins.

Appendix 6

Lecture 2, Carl

In his introduction to the budget section, the teacher, Carl (C), refers both to the case study the students are working on and the lecture on theory held the previous week as well as a previous course section (financial accounting). Today's budget examples will be less comprehensive than the case study and they are purely practical examples, says C.

The examples consist of drawing up a complete budget for the company or the activity being studied. Drury uses the term 'master budget' for a complete budget (Drury, 1992, pp. 446-447). C starts by saying that he wants to structure the budget section.There are two ways of drawing up a master budget. The T model is used in the case study. In external management accounting, the Staffel method is used (in accordance with the Accounting Act) when drawing up a profit and loss account. This means that revenues minus sundry expenses are entered and this enables a profit/loss to be shown. C says that both methods are acceptable although he feels that it is easier to arrive at the correct profit/loss when using the T model, with revenues and costs.

C goes over to discussing the profit and loss budget. What you must be able to do is to match revenues and costs for the period in question. Matching means that we do not include any costs not related to the revenues which are generated during the period. This applies with certain exceptions which will be discussed later on in the course. What this means in practice is that budgeted revenues must have their equivalent in the "cost of goods sold" on the cost side. C emphasises that it is important to remember that the cost of goods sold is not the only cost and that there are also various overheads on the cost side such as administrative, wage and sales costs, etc. – "But what are the concepts we use in costing for these different types of costs? What did we call these types of costs? ..." (C/Lect. 2, p. 4). – The students offer the following suggestions: "business overheads, general overheads, overhead costs and fixed costs". – "Good. Now you've realised that this is not a structured subject in that way ..." (C/Lect. 2, p. 4). C comments on the students' suggestions. In the cash-flow budget, we are interested in the company's cash and equivalents and its cash flow which is why all the receipts on the debit side and payments on the credit side for the period are included. C exemplifies 'empty cash' (no cash and equivalents) by noting that the company could be too generous with its accounts receivable, it could invest and it could produce in order to build up its stocks, i.e. no money flows into Cash even though it sells its products. This means that even if a good profit is budgeted, which can be seen in the profit and loss budget, there is no cash and equivalents in Cash. C says that expansive companies can, while they are in growing, fall into the so-called liquidity trap. This, he says, is an example where one should distinguish between profit and loss budget and cash-flow budget. In the cash-flow budget, you have a 'cash perspective' and you start by entering the opening balance for cash in hand (OB Cash) and then you add the receipts and payments for the period. C refers back to the financial analysis [which was discussed in financial management] and says that the basic principle is the same there, i.e. you look at the cash flows and any changes during the period. However, what is most important is to be able to distinguish between which revenues are also receipts and which costs are also payments.Finally, C

turns to the budgeted balanced sheet where the company's assets and liabilities are described. A budgeted balanced sheet is drawn up for the last day of the period. This is actually a collocation of the asset side and the liability side based on the profit and loss budget and the cash-flow budget, i.e. we calculate the closing balance for the last day of the period. You can quickly get a grasp of the changes during the period by looking at the profit/loss and liquidity. – C says that "practical budgeting is 95% logic" and the logical part is based on the students learning to distinguish between the following concepts, which C writes up on the whiteboard: Cost – Expense – Payment [top line] and Revenue – Income – Receipt [line below; the words on the bottom line are aligned with the words on the top line]. – "If you can always distinguish a cost, a revenue from an expense, and income and payment, respectively ... Then you will have solved this quite simply ..." (C/Lect. 2, p. 8). – C gives a detailed explanation of the concepts after which a discussion begins. In other words, the work on the profit and loss budget involves, says C, "transforming payments and receipts, expenses and income so that some of them become costs and revenues..." (C/Lect. 2, p. 9). Finally, C goes through the part of management called periodisation, e.g. when you go from expense and income to costs and revenues. C starts with the first application example, which involves drawing up a profit and loss budget and a cash-flow budget. The company in this example will sell 20,000 products at SEK 50 per product and the students have to value the stocks. C points out that a product in a stock should be valued at only at its sunk cost and not the sales costs to be added. Further, the closing and opening stock of finished goods must be valued at the variable incremental cost per product unit. C goes through all the information given. – "If we continue in the same way here as we did ... in a profit and loss account, ... what do you think we should go to? ... What could be taken up now?" (C/Lect. 2, p. 14). The profit for the year is balanced at SEK 100,000. C then goes over to the cash-flow budget. – "The profit shows that the company will survive ... but all the same it's not definite that we'll survive ..." (C/Lect. 2, p. 15). Here, the students must find the items that affect liquidity. C turns to the students with questions which, unfortunately, could not be heard.

Appendix 7

Lecture 3, Adam

The teacher, Adam (A), begins the lecture by giving information on a few changes in the timetable. After this, an application example from the previous lecture is completed and then A turns to the theme for the day "standard costs and variance analyses".

A introduces the theme by referring back to the lecture on theory during which standard costs and variance analyses, among other things, were discussed. A chooses to define "standard cost" as it was defined in the lecture, i.e. as an estimated cost of a product or service applying during a specified period of time. A refers to the previous section on costing and points out that the difference between standard costing and costing is really that costing applies for a longer period of time until we perform the next actual costing. A particularly emphasises that the estimated standard cost does not change during a specified period of time and can thus be regarded as an average cost during the period. This means that one applies uniform principles, i.e. for example, you can have the same material cost and wage cost during the specified period of time. In practice, the standard cost is used as a comparative figure during the period when you try to work out whether the costs are higher or lower than the average costs during that period. The standard cost is used as a tool to control both external and internal effectiveness. A defines external effectiveness as "doing the right things", i.e. having the right profitability for the right product and segment. In the same way, "internal efficiency" is "doing things right", i.e. supplying a customer with a product or service as efficiently as possible. A says that the standard cost can usually be used to control production for periods of more than a year, e.g. in certain types of contracting companies where the time horizon might have to be up to three years. The standard cost analysis is a tool used in management accounting and control.

In a standard cost analysis, the standard quantity and standard price of a product at the beginning of a period are compared with what was sold and what it cost at the end of the period, i.e. the actual quantity and price. A goes through concepts used when calculating the standard cost variance of a product or a service. In manufacturing companies, for example, factors include material, salary and different types of overheads and for these, a standard quantity and standard price is calculated. These are then compared with the actual quantity and price at the end of the period. If you link this to management accounting and control, says A, it means that the company wants to obtain basic data to be able to control internal efficiency and it wants to be able to control production. A says that "what it really means is to control the whole organisation, i.e. the internal organisation".

In today's application example, the standard cost is an aid partly for controlling the external effectiveness in a company's production process but mainly for controlling the company's internal organisation. The example involves carrying out a detailed variance analysis, i.e. calculating the actual costs of the company's production process and comparing them with estimated standard costs. In addition, conceivable reasons for the

different variances should be given. A illustrates how to plan standard costing in the company in the example with a figure on the whiteboard. This means that a number of resources are consumed in the production process in order to produce a product. "What we really want to do here ... is to value this [the product] ...[...] to compare it [the valuation] with what we have invested in resources to produce this product " (A/Lect. 3, p.5).

In a variance analysis (the application example), estimated standard costs are compared with actual costs. In the application example, the costs in the budgeted production process are shown both as a total cost per unit, i.e. SEK 768 per unit, and divided into resource type (direct materials, direct salary, variable and fixed manufacturing overheads). In the actual production process, the costs are shown partly as a total for the whole production of 8,000 units and partly by resource type (direct material, direct salary, variable and fixed manufacturing overheads). The principle is thus that the standard cost tells us what the product ought to have actually cost to produce and we compare the "ought-to value" with what the product cost in reality. When we do this, we could get a positive or a negative variance which is then broken down into different variances such as variances relating to salary, material or overheads used in the production of the products. - "So there's more than a reconciliation here. Indirectly, we also get a reconciliation with the costing. We get the data for the actual results ... [...] But it's also a very important part of the actual control of production ... And we'll do this by ... working out in different ways the variance ... a total variance and then we'll try to break it down and analyse it, look at the reason, and also discuss the measures we ought to take ..." (A/Lect. 3, p.6).

A then turns to the calculations in the application example. He uses the information in the application example and says: "It says direct material ... ... 10 kilos at SEK 20 ... A total of ... so it's equal to SEK 200 ... in material costs. ... This is the quantity [10 kg]... and this is the price [SEK 20 per kg]. Quantity times price ... I always reason ... in terms of quantity times price, never the reverse. ... ... Only quantity times price ... ... And that's the first thing you have to learn." (A/Lect. 3, p.6). – The total variance can also be expressed as SS - AA, i.e. standard quantity times standard price minus actual quantity times actual price. A quantity variance consists of standard quantity times standard price minus actual quantity times standard price [SS - AS]. The price variance is actual quantity times standard price minus actual quantity times actual price [AS - AA]. The conclusion is that the total variance can be broken down into a quantity variance and a price variance for a product.In the variance analysis, first a total variance for the whole production process is calculated and then the total variance is broken down into variances per resource type,

as mentioned earlier, such as direct material, salary and variable and fixed manufacturing overheads. What we are interested in, says A, is, of course, comparing the estimated standard cost per resource type with the actual cost.In the application example, a careful variance analysis must be performed and the reasons for the variances explained. – To work out the example, A suggests that they begin by calculating the total variance, i.e. for planned and actual production. – "With this fork method, we avoid having to use formulas ... particularly the formulas described in the literature. ... All we really need to use is these concepts AA ... AS and SS. [...] Then, when we make analyses ... we must always go from [...] right to left to ... get ... the right ... sign for the variance" (A/Lect. 3, p.11). A begins with direct material and reminds the students that the actual volume was 8,000 units. Here, A draws a "fork" on the whiteboard and writes the calculations that follow in the "fork". First, what should be shown in the top left area of the "fork" is calculated. Here, says A, we calculate the actual material cost, actual volume times actual quantity times actual standard price. Actual volume is the number of units produced and is represented by an extra (A). Actual volume times actual quantity times standard price [(A)AS] is calculated and written in the middle of the "fork". Then actual volume times the standard quantity times the standard price [(A) SS] is calculated and written in the area furthest to the right in the "fork". The figure now has these symbols on the three 'pins' of the fork. – A now calculates the total variance for direct material, i.e. (A)SS minus (A)AA. This results in a positive total variance (+232,000).

This total variance is then broken down into a quantity and a price variance. The quantity variance is calculated as (A)SS minus (A)AS which results in a positive quantity variance (+160,000). The price variance is (A) AS minus (A)AA which gives a positive result (+72,000). A initiates a discussion about what could have caused the quantity and price variations. The students suggest reasons for the price variance such as quantity discounts in the case of large purchases of materials and someone says that the company had purchased lower quality materials which would make them cheaper. A points out that if you purchase lower quality materials, the risk of wastage increases, that more material would then be consumed and that the quality of the product would be lower which, in turn, could lead to other consequences. One student suggests exchange rates and another suggests a new supplier as a reason for the price variance. Finally, a new supplier and new negotiations with the supplier are mentioned as possible reasons. The quantity variance, on the other hand, can be affected by factors such as better machines, which is suggested by one of the students. A says that first of all one should perhaps bear in mind the fact that the variance was caused by maintenance of machines. In addition, wastage can be reduced by preventive maintenance of machines (a quality aspect). Other suggestions from the students involve the quality of the tools, maintenance of tools, the

competence (knowledge) of the personnel, production planning, etc. A emphasises the importance of these factors and says that they constitute important control information for the company.

Appendix 8

Lecture 3, Bess

The teacher, Bess (B), shows the plan of the course, they have now reached exercise 29-30 [shows overhead]. Next to 'Exercises 29 – 30' it says "Management accounting and control in manufacturing companies". After giving some directions about what to read in the set book and references to the 'Compendium material', B takes "The picture of a pyramid", which is actually an illustration of how management accounting and control. It is important, she says, to understand the connections between the different sections in management accounting and control. B explains that the picture shows how costing is built up, e.g. based on an individual product. She points to the pyramid's base and one of the corners of the rhomb where the word 'estimate' is written. The estimated fixed joint costs are compared with the actual outcome and this then makes it possible to determine whether one had underabsorption or overabsorption of the costs. Depending on the outcome, you make adjustments in the accounting taking into consideration the over- or underabsorption. The connection with the annual accounts [points at the top of the pyramid where the words 'General ledger', 'Budget documents' 'Annual Accounts' are written] is via the valuation of the stock. "Budgeting" is written in the previous corner [if you move counter-clockwise around the base] and B emphasises that 'budget' means a plan of the financial outcome for the whole company, i.e. in the budget, budgets for functions, departments, etc. are aggregated [this means that you go from product level upwards in the company to department level, division level and board level]. The budgets for these departments, etc. affect costing in exactly the same way as costing affects guides the budget in terms of being able to determine the total costs of production. There is a mutuality, the future, Ex-Ante and afterwards Ex-Post, and we can then establish with the help of "accounting" that the outcome is not always the same as costing or as forecast. What we are doing today is a sort of follow-up which is specific to the manufacturing companies, i.e. and analysis of the absorbed overhead variance [points to one of sides of the rhomb] and we compare the standard with the actual outcome at the cost estimate level. At the company level, we make a more aggregated comparison which is called budgetary control. Before leaving the picture, B emphasises that the words used

in the picture were chosen and adapted for just this company which means that it would be possible to use other words.

B then turns to standard costing, i.e. chapter 18 in the set book (Drury, 1992). This chapter deals with concepts which are central to the understanding of standard costing. B exemplifies with the concepts of base standard, ideal standard and attainable standard. Standard cost thus means that a standard value has been set for a cost or a revenue which is later used as a comparison. Standard costing, which is a form of budget follow-up, could have the aim of determining whether the outcome was larger or smaller than anticipated. In such a case, a variance analysis is performed. Several different methods can be used to perform this analysis. - In this method, a total variance is calculated in step 1 which, in step 2, is broken down into resource type depending on what costing looks like, e.g. direct material, direct salary, and fixed and variable absorbed production overheads. The resources can, in turn, be broken down into a quantity variance and a price variance. – B draws a picture on the whiteboard which shows how the 'total variance' is broken down into resource types and, finally, what symbols are assigned to each resource type. In step 1, "total variance" is shown, in step 2, direct material, direct salary and variable and fixed absorbed production overheads. In step 3, level two is broken down into a quantity variance and a price variance: a 'quantity variance' (kg) and a 'price variance' (SEK) for direct material, and a 'labour efficiency variance' (time) and a 'wage rate variance' (SEK) for direct salary. Variable absorbed production overheads are broken down into an 'efficiency variance' (time) and an 'absorbed overhead variance' (SEK) and fixed absorbed production overheads are broken down into the same concepts. The 'absorbed overhead variance' in the fixed absorbed production overheads can, in turn, be broken down into a fourth step. namely, a 'budget variance' and an 'employment variance'. This, says B, is a symbolic illustration of the "fork method" since it has been possible to break down the levels into subordinate levels. B then turns to today's application example.

B presents the company in the application example. All the information given is described in detail. From the company's product estimate, it can be seen that a normal annual production volume is 10,000 units, but during a period, 8,000 units were produced at the actual costs [which are given in the application example]. The example involves carrying out a detailed variance analysis and exemplifying possible reasons for the different variances, i.e. the variances between budgeted production cost and actual production cost. – The next step is to calculate the total variance. This means, says B, from the standard manufacturing cost per unit you subtract the actual cost per unit and then multiply by the actual production volume, i.e. 8,000 units produced. This gives the total

variance, i.e. the costing variance of SEK -457,000. B points out in particular that the whole variance analysis is in SEK. – The total variance is then broken down into difference resource types, i.e. for direct material, direct salary, variable absorbed production overheads and fixed absorbed production overheads.B asks the students how the quantity variance for direct material should be calculated. One of the students has estimated the quantity variance in kilos and B asks why SEK is chosen instead. A student says 'same unit', meaning in all the comparisons. B replies: "Same unit, yes. To be able to determine which ... which resource type we should invest most in to eliminate quite simply [existing problems] we should have everything in SEK ..." (B/Lect. 2, p. 6). – To work out the size of the quantity variance, B introduces a formula [(SQ - AQ) x SP]. This means that the standard quantity minus actual quantity times standard price results in a positive quantity variance, SEK + 160,000. The price variance is calculated in the same way and with the equivalent formula [(SP - AP) x AQ], this results in SEK 232,000. – B turns to the students: "Why do we have a standard price here? The variance there looks exactly the same ... That's the quantity variance and that's the price variance, the difference between standard and actual. But why do we multiply it by the standard price and by the actual quantity? ... Can anyone work it out? ... [None of the students answers]. Actually, the fact is that we should have a combination of these in both [quantity and price] ...[...] but this combination component which is this, we relate it then ... we pull it apart in this way ... by having this go to standard price and this to actual quantity ... So really, this division is somewhat uneven ... It should have looked the same in both places – And actually we should have first of all compared only this difference [...] disparity there ... is thus due to the combination component" (B/Lect. 2, p. 7). – The students now have to determine how much of the quality or price variance for direct material (Dm) is accounted for by the total variance for production, which was SEK -457,000. B says that direct material does not explain the total variance at all since it is positive, other than possibly that, due to it being positive, the total variance has not grown even larger.

Appendix 9

Lecture 3, Carl

The teacher, Carl (C), starts by announcing that the exam is the following week and emphasising the importance of the remaining lectures. He urges the students to attend these lectures since the content of today's theme, for example, will be dealt with during the rest of the week. He also urges the students to ask during the week any questions

they may have so as not to run the risk of having nobody to ask just before the exam. C introduces today's theme, "standard costing and variance analysis", which is discussed in chapters 18 and 19 – mainly chapter 18 – in the set book (Drury, 1992), i.e. using standard costs. This is part of practical management accounting and control and is the subject of the rest of the week's teaching. C says that management accounting and control can be regarded as "a way of using financial measurements to produce the desired behaviour in, for example, a company". This behaviour, argues Drury, is a behaviour which leads to a financial surplus, i.e. a profit for the company. Ultimately, says C, it means that the company should invest in the products that are most profitable or the markets which are most profitable for the company. Throughout the set book, Drury (1992) emphasises that the profit motive is the "motor" in the company's activities. Different activities in the company strive to achieve the greatest possible profitability in their respective areas of activity.

The company's "external effectiveness" means that it has a market for its products, i.e. its customers both want and purchase what it produces. "Internal efficiency" means that the company manufactures its products with the best possible quality. In other words, it is a question of a comparison between what is needed in the form of resources for materials, salaries, etc. to make the products and making the products in the best possible way. – C illustrates this with an example from a Swedish car manufacturer. – He says that when you calculate standard costs for an area of activity, it actually means that you are trying to create a management accounting and control instrument with the purpose of improving the internal efficiency of the company's activities. - The product is not ready for sale until it leaves the last department, which presents a problem when calculating the standard cost. The opening value in the process and the closing value, when the product has been completed, is relatively simple to calculate. The problem is that the sales revenues are not generated until the product is completely finished, while the costs are distributed over several departments. – In order to solve this problem, a standard is introduced for different parts of the production process. This means that the standard product is assigned a value before it continues to the next department. The further the standard product advances in the production chain, the more its value increases. – Here, C emphasises that it is not the actual revenue but something that corresponds to a standard value agreed on. This can be done for each department, he says. If you then look at the products moving through the chain of departments, you could say that they are standard-valued semi-finished products which become more and more finished the further they advance in the chain. In this model, the departments are seen as companies "within the company" and this means that it is possible to determine the opening value of the products in the department and their closing value when they leave the department. –

"And this means that we can measure ... the efficiency, really ... of all these departments. Complicated and controversial, it's true ... [...] They should sort of function like individual companies where you have costs in and get back a certain amount of compensation ... [...] And that's really the point of using standards" (C/Lect. 3, p.6). - C emphasises that since it is a question of analysing internal efficiency, it is important that the different departments agree on the standards (so-called "norm values") which are assigned to the company's products, between different departments. In all the departments, costs are charged to the products, and these costs must be reasonable in relation to the department's revenues and production. When the products leave the department, they are given a new standard price, i.e. the semi-finished product is more refined which means that its value has increased. – C says that standards can be regarded as a "pre-determined value of a certain sacrifice or service/product which is an 'norm value' and is intended to apply during a certain period". There are different types of standards and we talk about certain so-called base standards. For material, it is a question of price standard and quantity standard. Wage-rate standards and labour efficiency standards are used for salaries.C turns to 'economic models' which are used in budgeting to determine the outcome. In this case, we use a profit and loss account, which can show one sort of target for the company, and then read off the outcome.

There are several different techniques that can be used to carry out a standard costing and variance analysis. In computerised accounting systems, for example, the variance analysis is a special report concerning the statements of accounts. Today's application example requires the students to carry out a variance analysis without any technical aids in order to improve their understanding of how variance analyses are performed. In the example, an estimate has been made of material consumption, salaries and variable and fixed absorbed production overheads. The cost unit is labour hours. C wonders whether some other cost unit is possible and the students suggest per product, per machine hour, per kilo and SEK. – There is some advantage in using SEK, says C. – C points out that today's application example involves calculating the variances for direct material, direct salary, and variable and fixed absorbed production overheads. In the case of a complete variance analysis, the accounting system must be able to specify the costs of these components, which have been calculated in advance, i.e. they must be in the accounting system used for management accounting and control. C emphasises that the calculations in the variance analysis are based on standards which are known (and are included in the estimate) and that you have to know what the actual outcome is. Standards for direct material can be divided into a price and a quantity variance; for direct salary, they can be divided into a wage-rate and a labour efficiency variance; and for variable absorbed production overheads, into an absorbed overhead variance and an efficiency variance.

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