

## Students' Knowledge Progression: Sustainable Learning in Higher Education

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The purpose of this phenomenographic study is to examine students' knowledge progression in a three-year Bachelor program in Business Administration. Theoretical sampling was used to select nine students from a group of 200 university students admitted to the program. The students were interviewed on three occasions: Year 1, after their Management Accounting course; Year 2, after their Financial Accounting course; and Year 3, after they had written their thesis. The interviews focused on the same financial concept presented in various ways, with increasing complexity, in each of the three years. This longitudinal study analyses the students' knowledge progress in terms of sustainable learning. The findings reveal that knowledge progression was very good by the end of the program for one-half of the students; one-third of the students did not achieve satisfactory knowledge progression. The study's research methods and its findings contribute to education and international studies on students' sustainable learning in higher education. The study suggests a model for future research in ascertaining how higher education students learn as well as in examining issues and areas for further research and development.

An issue of great concern in education at present is the widening gap between classroom teaching and classroom research. In addressing this issue, a number of researchers have offered solutions intended to bridge that gap. Nuthall (2004), for example, has called for more research linked directly to classroom realities. He points to the need to realize "that the teacher requires an explanatory theory of how different ways of managing the classroom and creating activities are related to student learning outcomes" (p. 274). Other researchers call attention to the research on didactics that focuses on engaging students and teachers at all compulsory school levels (Fensham, 2009; Holmqvist, 2006, 2011; Kullberg, 2010; Maunula, Magnusson, & Echevarria, 2011; Mårtensson, 2015; Runesson, 2006; Vikström, 2014). Still other researchers think the focus should be research on students' achievements on national tests because of the importance of international and global assessments of student learning (Jacobsson, Davidsson, Karlsson, & Oskarsson, 2013; Jerrim & Micklewright, 2014; Lundgren, 2011; OECD, 2010; Popkewitz, 2011).

This paper, in responding to Nuthall's (2004) call, deals with the research gap between higher education teachers' instruction and students' learning. At present, research that bridges this gap in higher education is rather limited. This paper reports on students' understanding of a financial concept that was taught in three accounting courses in a three-year Business Administration program at the university level in Sweden. To investigate this understanding, the research team posed the following research question: How is the student's understanding of the same financial concept sustained during a three-year program?

Lecturers in higher education typically follow course curricula and syllabi when preparing their classes. These curricula and syllabi present generally agreed-on program and course goals and may even suggest lecture structure, student

assignments, and evaluation methods. However, there is often less agreement on, as well as understanding of, students' learning progression, learning outcomes, and retention of subject content. In particular, this lack of understanding is evident in the evaluation of students in multi-year programs when different lecturers teach the various courses. It is quite rare that the same lecturer presents continuation courses in higher education programs at the Bachelor degree level. Yet few longitudinal studies exist on students' learning progression (i.e., the sustainability of their learning) in which a particular idea or concept is introduced, explored, and developed in a series of courses.

Researchers and educators increasingly refer to "Education for Sustainable Development" (ESD) to describe the movement to rethink and revitalize education programs and systems. However, "sustainability" is somewhat widely interpreted in higher education. In this paper the word is used in relation to university students' learning outcomes as they strive to develop the competencies they will need in their future occupations (Bowden & Marton, 1998).

The discourse on sustainable learning (Burns, 2013) and "effective teaching" implies that educators can effectively address well-known sociocultural and ecological problems in ways that transform and enhance learners' awareness of the need to stabilize the relationship between the society and the living world (see also Dewey, 1910/1991). Hopkinson and James (2010) recognize the importance of these sustainability skills and competences but also observe, "[...] progress within individual modules and lectures is unlikely to achieve the level or rate of embedding ESD that is frequently discussed but rarely achieved" (p. 374). While many curriculum change recommendations unfortunately thrive only at the rhetorical level, the ESD concept has relevant content and meaning for

everyday teaching in higher education (Anderberg, Nordén, & Hansson, 2009).

This study uses the theoretical framework of phenomenography and variation theory (Marton, 1981, 2015) to examine the sustainability of university students' learning when taught using qualitatively different ways of experiencing, perceiving, understanding, and conceptualizing a basic financial concept.

### **Theoretical Framework: Phenomenography and Variation Theory**

In recent years various researchers have used phenomenography and variation theory in studies of the relationship between teaching and student learning outcomes (Booth & Ingerman, 2002; Holmqvist, 2006; Ingerman, 2003; Ingerman, Berge, & Booth, 2009; Marton & Booth, 1997; Maunula et al., 2011; Mårtensson, 2015; Rovio-Johansson & Lumsden, 2012). Several studies deal with learning study practices based on variation theory (Marton, 2015). According to this theory, teachers collaboratively organize learning instances of specific phenomena in order to enhance students' learning as well as advance their own professional development (Akerlind, 2008; Kullberg, Mårtensson, & Runesson, 2015; Pang & Lo, 2012; Phan, 2014; Rovio-Johansson & Lumsden, 2012; Runesson, 2008; Tan & Nashon, 2013; Tait, 2009; Vikström, 2014).

Almost forty years ago Marton (1976) used a phenomenographic approach to study students' understanding of scientific concepts in higher education (see also Dahlgren, 1975; Johansson, Marton, & Svensson, 1985; Rovio-Johansson, 1999). Phenomenography is a qualitative, explorative research approach that aims to describe how students experience, perceive, and conceptualize a phenomenon (Marton, 1981, 1986, 1992). In the phenomenographic approach, which builds on a non-dualistic ontology, the meaning of a phenomenon derives from the relationship between the student and the phenomenon.

Phenomenographic studies on students' learning and understanding in various subjects take various approaches. Some studies focus on the qualitative differences among students' ways of conceptualizing a phenomenon (Dahlgren, 1975; Marton, 1981, 1986, 2015; Svensson, 1976; Säljö, 1975). Still other studies investigate students' approaches to learning (Marton & Säljö, 1976; Prosser & Trigwell, 1997, 1999) and teachers' approaches to teaching and learning (Phan, 2014; Trigwell & Prosser, 1991, 1996). For example, Biggs (1979) studied individual differences among students, and Entwistle (1988) investigated students' motivation and perception of teaching and the learning environment. Ramsden

(1988; 1992), Prosser, Trigwell, and Taylor (1994), and Prosser and Trigwell (1999) conceptualized academics' understanding of the science of teaching.

Variation theory, a general learning theory, has emerged from the phenomenographic research approach (Marton, 1981, 2015). Variation theory claims that learning involves an increase in the student's capability for simultaneously discerning critical aspects of the object of learning (Marton & Booth, 1997; Marton & Morris, 2002). Discernment presupposes that students experience variation in certain critical aspects of the object of learning. Learning is defined as a change in students' awareness of the object of learning (Marton & Booth, 1997).

For example, if a teacher wants students to learn certain critical aspects of the object of learning, the teacher has to vary the object of learning so that students perceive the critical aspects. It is unlikely that students can simultaneously perceive all aspects of an object of learning in focal awareness. However, those aspects that are discerned and kept in focal awareness simultaneously give meaning to the object of learning and help students decide which meaning they have experienced and ascribed to the object of learning. The lecturer plans the content of the lecture, specifies the intended object of learning, and creates variation in critical aspects of the object of learning by systematically varying one aspect at a time while other aspects are kept constant (invariant). The enacted object of learning, which the researcher observes, is the result of the classroom interaction between the students and the lecturer during the lesson (Marton & Tsui, 2004). The learning object that the student creates as a result of this learning is the lived object of learning. The learning outcomes are the qualitative differences in the focused aspects of the lived object of learning as explained by students in interviews with researchers (Marton, 2015).

In variation theory, critical aspects of the object of learning are those that students must discern in order to learn the subject content they have studied. The differences in how students experience the same object of learning depend on which aspects of the learning object they discern (Lo, 2012; Marton, 2015). Kullberg et al. (2015), Lo (2012), and Lo and Chick (2016) have investigated teachers' learning and their understanding of the inner and outer horizons of the object of learning.

This paper takes a phenomenographic and a non-dualistic approach and uses variation theory and critical aspects of a financial concept in its exploration of students' meaning making of a subject or idea (see Wittgenstein, 1953/1997). In this study, the students' meaning making (of a financial concept) may differ because they interpret, perceive, and experience it in different ways. The research team for this study investigated the qualitative changes in the students' understanding of a particular financial concept (the

phenomenon; in this case return on investment, hereafter ROI) during their three-year program (that is, their knowledge progression) as assessed in interviews at the end of each year in the program.

### **Method**

This research is part of a larger research project on student learning in higher education that was conducted from 2001 to 2004. The research team for the study consisted of the course lecturers and one researcher with a background in educational sciences and research experience in didactics and education. Subsequent reorganisation of the students' program because of national and local requirements had no effect on the research question of this study.

### **Business Administration Program**

The university students in the study were enrolled in a three-year undergraduate program (a Bachelor degree program in either Business or Economics). Two accounting courses are required in the students' first two years: a Management Accounting course in Year 1 and a Financial Accounting course in Year 2. In both courses, the concept of ROI is discussed, although framed differently. In their third year, the students write a thesis on individually selected accounting topics. At the end of each year, the students were interviewed about their understanding of ROI. They were asked to explain how they solved the examination problems on ROI in two written course examinations (in Years 1 and 2) and in a specially prepared case study and questions on ROI (in Year 3).

### **Selection of a Concept**

Among possible alternatives, the concept of ROI was selected as the learning object. In addition to formal study of ROI in the first and second years of their program, many students use the concept in their thesis research in their third year. Course lecturers (who were also involved in the study's design) recommended this concept for research. They also prepared the examination problems for Years 1 and 2 and the case study for Year 3.

### **Research Design and Participants**

Approximately 200 students are admitted to the program yearly. From this enrolment in September of 2000, a "theoretical sampling" technique (Siegel & Castellan, 1956/1988) was used to form three student groups. The students were assigned to the groups on

the basis of the lecturers' evaluations of their first accounting examination. Using the Swedish grading system, students were assigned to one of the following groups: "fail," "pass," and "high pass" (interpreted as low achieving, mid-achieving, and high achieving performance). Then students were randomly selected from each group to form the sample of nine students. Patton (1990, p. 179) states that this form of sampling in qualitative studies is called "purposeful random sampling," which means that a small sample size is chosen for an in-depth qualitative study and "does not automatically mean that the sampling strategy should not be random." The same nine students were interviewed after year of the three-year program.

### **The ROI Problems**

The students had studied ROI in their two accounting courses as they analyzed various financial issues in the "real world" of business. The course examinations in Years 1 and 2 asked students to solve a problem related to ROI. These problems, which increased in difficulty from Year 1 to Year 2, simulated complex company issues. Because students write a thesis in Year 3 and do not take an examination, they were given a case study. This problem used real world financial data from Ericsson, a large Swedish telecommunications company.

The problem in the Management Accounting examination (Year 1) presented numbers from a company's balance sheet and income statement and various key ratios/numbers such as return on total assets, profit margin, and budgeted capital expenditures. The students were asked to explain how these ratios/numbers were calculated and to describe their importance with respect to ROI.

The problem in the Financial Accounting examination (Year 2) presented similar financial statement numbers for a different company. The students were asked to explain how two alternative ways of accounting for research and development costs (expense or capitalize) would affect ROI.

Ericsson was selected for the Year 3 case study because of the company's erratic history, its interest to the financial media, and the effect its financial results have on the Swedish economy. For example, after some very profitable years, the company suddenly lost some 29.1 billion Swedish crowns in 2001 (approximately 3 billion US dollars). Students received the company's balance sheets and the income statements for the years 1999 to 2002, as well as some key figures including ROI. Students were asked four questions that required explanation of the ROI calculation and of its importance.

## Interviews

A researcher who was not involved in the course planning, instruction, examinations, or the case study conducted the 27 interviews (3 interviews each for the 9 students). A semi-structured question format was used with the students. Follow-up questions were asked as needed to clarify their responses. Each interview lasted between 40 and 90 minutes. The third year interviews were longer than the first and second year interviews because the students needed more time to read and analyze the case study. The audiotapes were subsequently transcribed verbatim (Linell, 2009).

The nine students in the sample were interviewed after their examinations in Years 1 and 2 and after they had completed their thesis in Year 3. In the first interview, after the interviewer had described the research project and its goals, the interviewer asked the students to talk freely about their experiences in their courses and various examinations in the program. The intent of this introduction was to make students feel comfortable with the interview situation (Kvale, 1996).

Alvesson (2003, p. 22) states, “Interviewees are then not seen—as in the moral storytelling metaphor—just as eager to save or improve their egos or their organization's reputation through more or less routinized and unreflective self-promoting (or organization-promoting) statements but as *politically aware and politically motivated actors* [emphasis in the original]. Actors may use interviews for their own political purposes.” Czarniawska (2007, p. 13) also concludes that interviewee responses to questions cannot be regarded as “the windows into the depth of reality.” Accordingly, the researcher must differentiate between the interviewees’ experiences, based on the collected data, and the stories they tell.

In the Year 1 interview, the researcher-interviewer used the students’ examination solutions (course: Management Accounting) to stimulate their recollection of how they understood ROI. They were shown their examination solutions and were asked to explain how they arrived at the calculation of ROI. The same procedure was followed in the Year 2 interview (course: Financial Accounting). Bloom (1953) calls this interview technique “stimulated recall.”

A different procedure was used in the Year 3 interview. The students, who were presented with a case study they had not seen before, were asked to examine the financial data in the problem and then to calculate ROI and explain its importance as an evaluation metric for companies.

## Analyzing the Interviews

The 27 interviews were transcribed, categorized, translated, and analyzed. The students’ interview

statements were compared, year-to-year, to learn if and how their statements changed in the three-year period. To identify the qualitative differences among students’ answers and the different categories of descriptions (the hierarchy), the students’ statements were iteratively compared in the analysis. In the analysis of the interviews, critical aspects are the analytical tools used to analyze the students’ understanding and the qualitative differences among their answers.

The comparison of the students’ statements required an iterative process of interpretation in which the context (the students’ learning level) shifted from year to year. The idea that words receive their meaning from their context originates with Wittgenstein’s (1953/1997) reaction to linguists’ atomistic view of “language meaning.”

Based on the differences in structure and content of the students’ interview statements, the analysis yielded three categories of description for their understanding of ROI. The interview statements in each category have the same structure and content. The categories of descriptions (Categories A, B, and C) have an ascending order of calculation complexity and content originality; that is, Category B builds on Category A, and Category C builds on Category B.

## Findings

The study shows that it is possible to detect the critical aspects of a concept, as well as the difficulties related to the conceptualization of the concept (Ingerman et al., 2009; Kullberg, 2010; Mårtensson, 2015; Pang, Linder, & Fraser, 2006; Rovio-Johansson, 1999; Runesson, 1999). This knowledge can be useful in education in areas other than accounting and related financial courses. Teachers should carefully examine the students’ discerned critical aspects of the concepts they teach because they form the basis for learning; these aspects are essential for developing the capability for learning the intended content.

In general, the results may contribute to the development of the curriculum in higher education. The analysis of the students’ qualitatively different ways of understanding the concept ROI indicates *how* they understand the concept, *which aspects* they discern, and in *what way* they use their knowledge for problem-solving. This study reveals some difficulties students have in understanding a basic accounting/financial concept.

The following excerpts from the three interviews (labelled by Category and Interview) illustrate this progression of students’ knowledge. A brief commentary on the students’ statements follows each interview group. The numbers in parentheses indicate the student number and the interview year. The interview excerpts selected for inclusion are those that are most representative of the students’ comments.

Table 1  
*Students' Interview Statements by Categories of Description*

Category of Description	Interview I	n*	Interview II	n*	Interview III	n*
A	A1	5	A2	5	A3	3
B	B1	3	B2	3	B3	4
C	C1	1	C2	1	C3	2

\*= number of students per category of description

Table 2  
*Students' Statements in Interviews in Year 1*

Category	Interview answers in Year 1
A1	The turnover rate illustrates there is a rather high return on the capital in the company for a forest company. (Student 6, I)
B1	It [ROI] depends a bit on what kind of business you're working in, if it is good or bad. Preferably you should have a rapid return of capital as high as possible ... that makes it [the capital] work all the time ...it is a measure of how well the invested capital has been working during the specific time period, what you get in return on the capital invested ... the owners want to get as high a return on total assets as possible. (Student 9, I)
C1	It [ROI] shows how well they have managed the assets to produce earnings ... a high return on capital. They have pulp mills and paper mills. Here you see how they have financed their assets. It [ROI] will be a claim from the owners... they want to get earnings from the money that they have invested in the business...[...] It [ROI] is the earnings of the whole business. You have the results before financial costs divided by total capital. You do not consider the financial part or the debt-equity ratio [...] Results, the profitability ... are affected by many factors, for instance, the market's ups and downs. (Student 5, I)

Students' knowledge between the interviews may increase or change as the result of many activities and factors outside their classroom instruction. However, phenomenographic research does not investigate external contextual factors.

Table 1 gives an overview, on group level, of the number of students in the sample (n=9) and their distribution, in vertical columns as Categories of description and horizontal the interview year, I, II and III (corresponding to year 1, 2 and 3 in the educational program). As mentioned previously, the Categories indicate students' level of knowledge, A the lowest level, C the highest level and B the intermediate level. For example, in Category A (horizontal) students' knowledge progression is shown as well as the number of students at the lowest level; in Interview I (n=5), in Interview II (n=5) and Interview III (n=3). Finally, there is, on group level, a *horizontal knowledge progression* on this level, in Category A1 and Interview I, in Category A2 and Interview II, and in Category A3 and Interview III; the same progression is observed in Category B and Category C. Accordingly, there is also, on group level, a *vertical knowledge progression* each year among the

students in the sample, which will be explained below in Table 2, Table 3, Table 4 and Table 5.

In the student statements and in the analyses of their statements, the year is indicated by a number (1, 2, or 3) and a Category of Description by letter (A, B, or C). Interview I, Interview II and Interview III indicate interviews carried out the first, the second and the third year of the students' educational program.

Table 2 shows the students' knowledge progression the first year, illustrated by their answers in each Category A, Category B and Category C. The answer A1, selected among the answers (n=5) in Category A1 in year 1, is assessed as the best representative of the Category A1 (among the five answers). The same count for the answer B1 and C1. Put together, Category A1, Category B1 and Category C1 represent and illustrate the students' knowledge progression in year 1(vertical column).

In A1, the student discerns one critical aspect of the concept ROI: the turnover rate. The company in A1 is only vaguely described as "a forest company." In B1, the student discerns three critical aspects of ROI: turnover rate, management of capital employed, and the kind of company and its market. ROI in B1 is discerned as "as rapid a return

Table 3  
*Students' Statements in Interview in Year 2*

Category	Interview answers in Year 2
A2	Return on investment refers to Retained Earnings, which are the total earnings of the company. Figure 10 is operating profit plus financial income divided by total capital, which then is on the balance sheet [...] This is a way to find out how well business operations have been managed... the quality of the management of capital employed. (Student 4, II)
B2	If you are going to look at the return on total assets, then you look at the profit before financial income and expenses. You then compare these ratios between different companies. You have to consider how they [companies] are financed. These figures show the company has high financial expenses because they have borrowed a lot, but this should not affect this ratio when you are comparing companies [...] Later you should add the financial revenues [...] financial revenues should be included and then you should divide by total capital. (Student 8, II)
C2	It ROI] depends a bit on different things ... what type of industry and the degree of risk you take. There is a high risk in this industry. Of course, with higher risk, a higher turnover rate is needed. As for the capital, it is not possible to say that there is a specific amount and that it has to be that amount. Rather it is a bit dependent on the phase the company or the business is going through. If you are just at the beginning you may not expect to have an enormously high earning capacity. Different factors affect it [ROI]. (Student (5, II)

Table 4  
*Students' Statements in Interviews in Year 3*

Category	Interview answers in Year 3
A3	They [the company] have decreased their debt so you can hope for a positive development. You probably want a return on investment that exceeds the interest cost. But I don't know how to relate it [ROI] to the profit and loss. I mean numerically. (Student 8, III)
B3	It is very difficult to say. The business has to manage without debt [...] The company wants long-term profit, but it may not succeed [...] In some years the company has had very large amounts of debt. [...] In this industry there is a high risk when investing money in such a company, so you really want to have a good return on capital. (Student 4, III)
C3	There are many different factors that have an influence [on ROI] such as industry conditions, business cycles, and management [...] The company's debt has decreased. The owners want a positive return on their investments [...]. One must compare alternative investments. You may get maybe 3.0 % or 3.5 % on bank savings, with little risk. For more risk, you should have a higher return, perhaps 6 % or 7 %, even 8 %. I don't think it is reasonable for the company's owners to expect such a return from this company. (Student 7, III)

of capital," which indicates that "rapid return" is a critical aspect of ROI. In C1, the student discerns three critical aspects of ROI: turnover rate, management of capital employed, and the kind of business and its market. In C1 the student suggests a fourth aspect of ROI (the owners' perspective on profitability) as shown by the statement, "They want to get earnings from the money that they have invested in the business."

Table 3 shows the students' knowledge progression in the second year, shown by Category A2, Category B2 and Category C2. The same principle is used to select student answers to each Category, as in Table 2 (described above). Taken together, Category A2,

Category B2 and Category C2 show the students' knowledge progression in year 2 (vertical column).

In A2, the student discerns one critical aspect of ROI: the quality of the management of capital employed. The student describes the calculation ROI and its effect. In B2, the student discerns the following critical aspects of ROI: the kind of company and its market and stage of development. The student focuses on the arithmetic calculation of ROI even if the understanding of profit (income and expenses) initially seems somewhat hesitant. After calculating ROI correctly, the student adds that financial revenues must also be considered. This is

critical because the student now understands that ROI is used to compare companies in the same industry sector. In C2, the student identifies several critical aspects of ROI: the turnover rate, the company stage (e.g., a new start-up or an established company), and the risk associated with investments. This student also comments on the many different factors that affect companies' results and their ROI.

Table 4 shows the students' knowledge progression in the third year, shown by Category A3, Category B3 and Category C3 (vertical column). The selection of students' answers is done the same way as in Table 2 and Table 3 (see above).

In A3, the student (who takes the owners' perspective) discerns three critical aspects of ROI: the company's debt level, comparative interest rates, and the size of the capital employed. In a comparison of bank interest rates with required rates of return for companies, the student indicates an awareness of the risk the company faces with its investments. In B3, the student (who focuses on profitability as an arithmetic exercise) discerns the critical aspects of the market, the risk, and the time perspective related to investments. In C3, the student recognizes that several factors influence

ROI and discerns several critical aspects of ROI: kind of industry (market), the business cycle, owners' demands, the risk of investments, and profitability (as a positive development of the company's activities).

Table 5 presents students' understanding of the critical aspects of ROI, the phenomenon experienced by the students. Each of students' statements, in Table 2, Table 3 and Table 4, is a description of a student's understanding of ROI and contains the critical aspects of ROI, discerned and experienced by the student.

In Table 5, the *horizontal knowledge progression*, in students' statements, A1 to A3, B1 to B3 and C1 to C3, is shown as a change in students' meaning making and as a change in student's knowledge of the concept ROI in each year (Interview I, to Interview II to Interview III). In Table 5, the interviews indicate a progression among the students: from being able to understand and calculate ROI; to predict ROI; and finally, to calculate achievable and favourable ROI. It can be argued, that it is a knowledge progression of the concept ROI from a less complex level to a most complex level where all critical aspects are included (from the students' perspective).

Table 5  
*Students' Qualitatively Different Ways of Understanding ROI in Interviews I, II, and III*

Ways of understanding Influential factors	Interview I To understand and calculate ROI	Interview II To predict ROI	Interview III To calculate achievable and favourable ROI
Category A: Elements used in the calculation of ROI	<ul style="list-style-type: none"> <li>turnover rate</li> </ul>	<ul style="list-style-type: none"> <li>turnover rate and company comparison</li> <li>management of capital employed</li> </ul>	<ul style="list-style-type: none"> <li>turnover rate</li> <li>cost of capital</li> <li>amount of capital employed</li> </ul>
Category B: An interpretative process of understanding business activity and ROI	<ul style="list-style-type: none"> <li>company and its industry</li> <li>company and its market</li> </ul>	<ul style="list-style-type: none"> <li>stage of the company</li> <li>type of company and its market</li> </ul>	<ul style="list-style-type: none"> <li>market</li> <li>profitability</li> <li>time perspective</li> </ul>
Category C: An extended, "real life" interpretative process of understanding business activity and ROI	<ul style="list-style-type: none"> <li>owners' demands</li> </ul>	<ul style="list-style-type: none"> <li>risk level of investment</li> <li>other factors influencing profitability</li> </ul>	<ul style="list-style-type: none"> <li>situation of the industry</li> <li>market risk</li> <li>risk of investment</li> <li>profitability and other influential factors</li> </ul>

The vertical columns, in Interview I, Interview II and Interview III, show the students' *vertical knowledge progression*. This is a knowledge progression among the students from (vertical): locating elements used in the calculation of ROI; to an interpretative process of understanding business activity and ROI; and finally, to making an extended "real life" interpretative process of understanding business activity and ROI. This vertical knowledge progression, also indicate a knowledge progression of the concept ROI from a less complex level to a most complex level where all critical aspects are included each year in Interview I, Interview II and Interview III.

These results, in particular, may provide valuable didactic knowledge for lecturers in accounting classes, such as Management Accounting and Financial Accounting, when planning or revising curricula, courses, and teaching sequences. Given that variation theory as a learning theory is used to enhance the quality of teaching and learning, these aspects are important from the students' perspective (Ingerman et al., 2009; Lo, 2012; Marton, 2015; Rovio-Johansson, 2013) on problem-solving processes (Rovio-Johansson, 1999; Rovio-Johansson & Johansson, 2006; Runesson, 1999, 2005, 2006) and for support of teachers' professional development (Holmqvist, 2011; Kullberg et al., 2015; Pang & Lo, 2012; Rovio-Johansson & Lumsden, 2012). To understand the relationship between teaching and learning outcomes are important for teachers' professional development in higher education (Allan & Clarke, 2007; Burns, 2013; Kullberg et al., 2015; Marton, 2015; Pang & Lo, 2012; Phan, 2014; Rovio-Johansson, 2013; Rovio-Johansson & Lumsden, 2012; Tait, 2009).

To establish the credibility and trustworthiness of the research, the research team paid special attention to the context: the environment in higher education as evidenced by the program and course levels and the complexity of the student ROI problems. After the analysis of the data and the creation of the three categories of description, an external coder (a colleague of the lecturers and the researcher) analyzed the students' interview statements in order to confirm the accuracy of the categorizations. Some differences were found between the coder's categorizations and the research team's categorizations, but these differences were very minor. Marton (1986, p. 35) states: "The original findings of the categories of descriptions are a form of discovery, and discoveries do not have to be replicable."

### Discussion

In the study's design, conduct, and analysis (based on intersubjective agreement by the research team of

lecturers and researcher) respect for the credibility and trustworthiness of the qualitative and phenomenographic research approach was paramount (see Kvale, 1996; Patton, 1990; Merriam, 1998). As Kvale (1996) writes, credible research generally derives from the (a) the correspondence between the results and what is known from previous research studies, (b) the likelihood of the categories, and (c) the distinctiveness and exclusiveness of the categories. Trustworthy research depends on how the data were collected and analyzed and on how the conclusions are derived from these data. The students' identities were protected in this study by adherence to generally accepted rules for ethical research (Kvale, 1996). The research was also guided by the code of *Good Research Practice* adopted by the Swedish Research Council (2011). This code requires that the Ethical Review Board approve the background information for the research project. The anonymity of the research participants must also be protected. In addition, the participation of the students in this study was voluntary; students could leave the interviews and the research project whenever they wished.

In Interview I, after the examination in Year 1, some students had a fragmented understanding of ROI while a few had a relatively good understanding. In Interview II, after the examination in Year 2, the students' statements featured the calculation of ROI, although some confusion remained about its relevance. In Interview III, when the case study was presented, about one-half of the students had achieved an understanding of ROI equal to entry-level accountants. According to the lecturers on the research team, these students were qualified to make some decisions, estimates, and evaluations in the professional financial/accounting environment. They had a fundamental understanding of ROI (its calculation, influences, and importance) that laid the foundation for further development. In brief, the students had achieved the level of sustainable learning.

The results of this study show that the critical aspects that are discerned and kept in focal awareness are of decisive importance for students' knowledge progression. More results from different subject matter areas increase the possibilities for teachers to revise and reorganize teaching, curricula, syllabi, and instruction materials so that student learning and knowledge progression in higher education are enhanced.

In order to improve the quality of student learning, students must be trained to perceive the critical aspects of the object of learning as their studies progress. In the interviews for this study, the problem-solving process was important in revealing the critical aspects of the students' knowledge. These discerned aspects were revealed in the analyses of the interviews. In the problem-solving process, the less successful students



discerned fewer critical aspects than the more successful students. Therefore, it is suggested that teachers be especially aware of the difficulties students encounter with studied concepts in the subject matter. These findings can show lecturers how to effectively reorganize teaching to enhance students' understanding of subject matter and to achieve sustainable learning.

The possibilities for generalization from this qualitative study are necessarily somewhat restricted since the study focuses on one concept taught in accounting courses and how nine students, selected by theoretical sampling, understood that concept over a time period of three years. However, while the results of this study are specific for the one phenomenon, the research approach is general. Therefore, more studies, using the approach applied in this study, are needed that can test and validate these specific results due to the scarcity of longitudinal studies on students' sustainable learning in higher education.

### Conclusions

The purpose of this study was to explore students' knowledge progression in accounting studies in a three-year university business program. How is the student's understanding of the same financial concept sustained during a three-year program? To answer the research question, a sample of nine students was followed for the three years. Their knowledge progression was studied based on analyses of their descriptions of their understanding of ROI as presented in two examination problems and a case study.

Students' knowledge progression was assessed by their understanding of the critical aspects of ROI. Using categories of description, the study finds variations in how students perceive these aspects and in their knowledge progression (Rovio-Johansson & Johansson, 2006). The study supports previous research that looks at the qualitatively different ways students experience economic concepts (Dahlgren, 1978; Marton & Pang, 2013a, b; Pang, 2002; Pang & Marton, 2005; Pong, 2000).

The study shows the capability for learning has to be sustainable (Rovio-Johansson & Johansson, 2006). Students who find employment in the fields of accounting and finance will enter a world in which accounting rules and regulations, financial and accounting instruments, and political and social structures are all in constant flux (Lo, 2012; Marton, 2015). The student who has learned how to acquire and develop scientific knowledge has the greatest chance to understand and manage this changing environment (Burns, 2013; Ingerman et al., 2009; Lo, 2012; Marton, 2015; Rovio-Johansson & Johansson, 2006; Rovio-Johansson & Lumsden, 2012; Vikström, 2014). Creating the conditions for sustainable learning in higher education is a responsibility of the highest order.

### Future research

The study confirms that the phenomenographic approach and variation theory are powerful tools that can be used to enhance students' learning outcomes in higher education (Akerlind, 2015; Ingerman, 2003; Marton, 2015; Rovio-Johansson, 2013; Tait, 2009; Wood, 2000) and at the compulsory school level (Holmqvist, 2011; Ingerman et al., 2009; Kullberg, 2010; Kullberg et al., 2015; Mårtensson, 2015; Runesson, 2008; Vikström, 2014). This study may be used as a model for other studies of student learning in various subject matter areas. Even though the subject content in this study is specific, the methodology of variation theory is applicable to other disciplines.

The relationship between teaching and learning outcomes is an issue of great importance to researchers and educators alike (Allan & Clarke, 2007; Burns, 2013; Holmqvist, 2011; Kullberg et al., 2015; Marton, 2015; Nuthall, 2004; Pang & Lo, 2012; Phan, 2014; Rovio-Johansson, 2013; Rovio-Johansson & Lumsden, 2012; Tait, 2009). However, more research is needed to improve the understanding of the relationship between teaching and students' learning and to enhance higher education teachers' professionalization. More research is also needed in different subject matter areas so that teachers have more possibilities to revise their teaching, curricula, syllabi, and other instruction materials. These revisions can help teachers advance students' knowledge progression.

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