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# Assessing Higher Education Learning Outcomes as a Result of Institutional and Individual Characteristics

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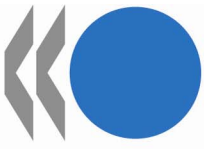
A selection of papers for the IMHE 2008 General Conference will be published in the OECD's *Higher Education Management and Policy Journal*.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

ORGANISATION DE COOPÉRATION ET DE DÉVELOPPEMENT ÉCONOMIQUES

# ASSESSING HIGHER EDUCATION LEARNING OUTCOMES AS A RESULT OF INSTITUTIONAL AND INDIVIDUAL CHARACTERISTICS

Per O. Aamodt & Elisabeth Hovdhaugen, NIFU STEP

*The move towards mass higher education is inseparably connected to the modern knowledge society. There is an increasing demand for higher education qualifications in most segments of the labour market, and a rising demand that students should develop transferable or generic skills in addition to subject-specific qualifications.*
*As a large and important sector in the society, higher education is also facing new demands to account for its contributions. Quality may not any longer entirely be defined internally by the higher education institutions and faculty members. Institutions are to a larger extent exposed to external quality assessment. Marks are the traditional way of formal assessment of students' achievement, but we will argue that marks at best measure students' qualifications in a narrow way, with grave validity problems. A broader set of criteria and indicators should be developed.*

## Background

### *Learning outcomes: an ambiguous concept*

The concept "learning outcomes" has only relatively recently entered the higher education arena in the context of the establishment of the Qualification Frameworks. Learning outcomes express what a person with specific qualifications is able to know, understand and perform. The concept of qualifications is a link between knowledge developed during education and demands from the world of work (Bergan 2007).

There are two important aspects of the concept as we see it in the Qualification Frameworks. First, the idea that higher education should develop a broader set of qualifications among students than learning the specific discipline or profession. This idea is not at all a new invention; it has always been more or less implicitly taken for granted that students develop skills and attitudes during their studies such as analytical and critical thinking, the ability to communicate, and a general scientific attitude about "true" knowledge and respect for other cultures and peoples opinions. Second, the use of this concept within the Qualification Frameworks represents a more systematic approach including both a framework of definitions and descriptors.

The concept "learning outcomes" is ambiguous since it is has two different, but still related, meanings (Aamodt et. al. 2007):

1. As a measurement of what student *actually have learnt* during their studies
2. As statements of what students are *expected to learn* during their studies

In this paper, we will focus mainly on the first of these two aspects of the learning outcomes concept. However, it cannot be separated from the developments going on internationally and within most countries related to the Qualification Frameworks.

The main goal of the Qualification Frameworks is to be an instrument for governments as well for employers, as well as national and international labour markets for increased transparency. (Bergan 2003; 2007; Adam 2007). There are still considerable confusions about how a specific study programme is related to a similar study programmes in other countries.

During recent years, national systems for quality development and quality assurance, accreditation, as well as systems for joint recognition and national transparency have been established. Furthermore, there is an increased interest concerning what students actually have learnt, as pointed out above. The initiative to develop an overarching framework of qualifications for the European higher education area (Berlin communique 2003) is an attempt to respond to these challenges, and the "Dublin descriptors" is so far the most authoritative schedule for classifying learning outcomes.

One may say that the attempts to construct and formulate higher education learning outcomes are responding to two different, yet related needs. First: to lay the ground for mobility and mutual recognition in a globalised market for education and graduates. Second: as an attempt to improve the employability of graduates (Ecclestone 1999).

***Focus on employability***

For students and for society, a core aspect of higher education is to prepare for future employment. The discussion about employability has been particularly energetic in UK in the wake of the Dearing Report (NCIHE 1997) and has recently resulted in, for instance, a number of reports from the ESECT project (Enhancing Student Employability Co-ordination Team). Research on employability has taken as the starting point that it predominantly has to do with getting a (graduate) job after completion of higher education. However, this does not take into consideration changes in the labour marked that might make it easier or more difficult to obtain a job independently of the qualifications of the candidates (Harvey 2001, Brown et al 2003, McQuaid and Lindsay 2005, Yorke 2006). In lines with these understandings, Yorke (2006, p. 10) regards employability as "a (multi-faceted) characteristic of the individual. It is, after all, the individual whose suitability for a post is appraised" and defines it as "a set of achievements – skills, understanding and personal attributes – that makes graduates more likely to gain employment and be successful in their chosen occupations, which benefits themselves, the workforce, the community and the economy." Knight and Yorke (2004, p. 37-38) suggest four main areas of competence that constitute employability: Understanding (mastery of the subject matter of a field), Skilful practices (so called "generic skill" in addition to subject-specific skills), Efficacy beliefs (trust that one can make some impact on situations and events), and Metacognition (awareness of one's own competence as well as limitations combined with an insight in how to learn more) – called the USEM model. Aamodt & Havnes (2007) tried to measure how learning outcomes are related to job mastery among candidates from professional studies in Norway.

The critique against the use of generic or key skills is based on scepticism among academics, and that it may be questioned whether it is possible to equip graduates with skills which may be valuable over a broad range of jobs and types of company. At the other hand, the traditional liberal education model found in UK is linked to a very elitist system when only a small minority went to higher education. Since the move to mass higher education, when large numbers of graduates enter the labour market, there is an increased demand for employable skills among them (Washer 2007).

**Qualifications and assessment**

The introduction of learning outcomes represents a broader set of expectations about what students should acquire from their studies. This will affect not only teaching in higher education, but also the assessment of students' learning. Assessment methods and assessment

criteria must be related to the aims of students' learning, and crucial for assessment is to decide what is to be assessed (Hager, et. al. 1994).

Furthermore, assessment does not only *measure* learning, assessment also *directs* student learning (Havnes 2004), because the assessment system defines what is worth learning. Havnes' study shows an impact of examinations on learning, but also a similar backwash effect on teaching, textbooks and other learning material. Examinations play a major role in defining what is dominant. When non-assessable activities compete with assessable activities for students' time, assessable activities win (Heywood, 1989, Biggs, 1999, as referred in Toohey 2002). Not assessing significant aspects of the course sends a particular message to students. For students, the real curriculum is what is assessed in examinations. Assessment must be about things that matter, and everything which we believe matters, should be assessed (Toohey 2002).

The broader learning attributes represented by the introduction of learning outcomes are often only statements of good intentions, and when academics are designing course units, the focus is mainly concentrated on discipline-based knowledge and technical skills. Broader attributes and general skills are at best considered as side effects of a university education. (Toohey 2002). Consequently, they tend not to be included in the assessment practice of the university. But according to Toohey (2002), there are also examples, at least within the field of health care, where universities and faculties have attempted to define graduate characteristics or graduate outcomes. The University of South Wales medical faculty has defined graduate outcomes according to three categories:

- Applied knowledge and skills
- Interactional abilities
- Personal attributes

A relevant question raised is whether personal attributes should form part of the assessment system.

Hager & Butler (1996) discuss two models of assessment: the scientific measurement model and the judgemental model. They argue that only the latter, the judgemental model, is suited for the broader aspects of learning, like educational innovation, problem-based learning etc.

Cheng (2001) refers to a recent development, at least in the USA, to incorporate students' behaviour, cognition and attitudes from collegiate experiences into outcome indicators. Kuh, Pace & Vesper (1997) state that: "For some outcomes, student reports may be the only source of useful data".

The main aim of this paper is to discuss some challenges in measuring learning outcomes, using data from a student survey as illustrations. Thus the direct focus is on the individual student's learning, but such data may also have a potential use in the assessment of the quality of study programmes and institutions. Our main research questions are:

- How do learning outcomes, measured by these instruments, vary according to type of institution, field of study and study strategies?
- Perhaps the most important question is how learning outcomes are related to grades
- What are the implications of the measurement of learning outcomes for reforming student assessment?

In this paper, we have not gone into the assessment process, and we do not have data to investigate how learning outcomes are assessed or may be assessed during study or at graduation. Our focus and methodology is similar to a study conducted by Cheng (2001) who demonstrates how an externally developed survey instrument could serve to assess student collegiate experience within a US context.

With the massification of higher education new modes of government monitoring and control have been developed. Monitoring and assessment of institutions and staff has been accompanied with an intensified assessment regime for students. There is also an increasing focus on university rankings. These rankings have so far been based mostly on the research output and research quality, but new initiatives to include also students' learning are visible. The OECD has initiated a system for the measurement of student learning outcome, parallel to PISA. In a recent evaluation of The Norwegian Agency for Quality Assurance in Education (NOKUT), it was stated that these evaluations lacked the use of output indicators. Generic skills and good teaching are indicators included in the Australian performance indicators, and data is collected through the Course Experience Questionnaire (CEQ) (Dept. of Education, Science and Training 2005).

According to Donald & Denison (1996), universities' performance has been the prime target for examination, due to governments' requirements for quality assurance. In this paper we have examined the utility of broad indicators of performance in undergraduate education: such as students' satisfaction, teaching and student life, and relevance of studies after graduation.

**The Norwegian context**

The Norwegian higher education system is in a state of rapid change, following a reform process starting in 2002, the Quality Reform. A binary system developed in Norway after 1970, but this system has been under pressure. Before the reform, the system consisted of a university sector with four traditional universities and number of relatively small specialised institutions at university level, and state university colleges. The Quality Reform provided an opportunity for specialised institutions and state colleges to be upgraded to university according to a set of criteria and an accreditation process. After that, two state college and two specialised colleges have been upgraded, but our data set was assembled before that.

We expect to find the most interesting differences in learning outcomes between fields of study, rather than type of institution. Therefore, the institutional landscape and the changes therein, is not the most important aspect. What is more relevant is the type of study programmes offered, and in this respect, the two main sectors, the universities and the state colleges still differ considerably. The universities offer the long, traditional professional programmes in medicine, law and theology as well as graduate engineering, as well as study programmes in humanities, social sciences and natural sciences. The state colleges are dominated by 3-year programmes (teaching is 4 years) aimed at work within "semi-professions" or the welfare state professions like nursing, teaching and social work. However, one also finds programmes in economics and engineering.

**Data and methodology**

This paper is based on a national survey on students' living conditions. The survey was conducted by Statistics Norway among students enrolled in Norwegian universities and colleges in 2005, and covered a wide range of themes. In this paper we draw on a set of

question about learning outcomes, or what student had gained from their studies. The selection of items was inspired by national and international research on the topic. One set of items was used in the international REFLEX-study (19 items) (Calmand, Frontini & Rostan (2007) and a similar set of questions in the Norwegian Stud.Data covering professional education (18 items) (Havnes & Aamodt 2004).

There were 12 items on types of knowledge listed in the questionnaire: useful knowledge of facts, good study habits, cultural understanding, tolerance, job-specific knowledge, written communication skills, oral communication skills, analytical skills, societal understanding, numerical skills, interpersonal skills and innovation and creativity. The respondents graded the extent to which they had achieved that specific type of knowledge in their studies, and the answers are displayed in Figure 1.

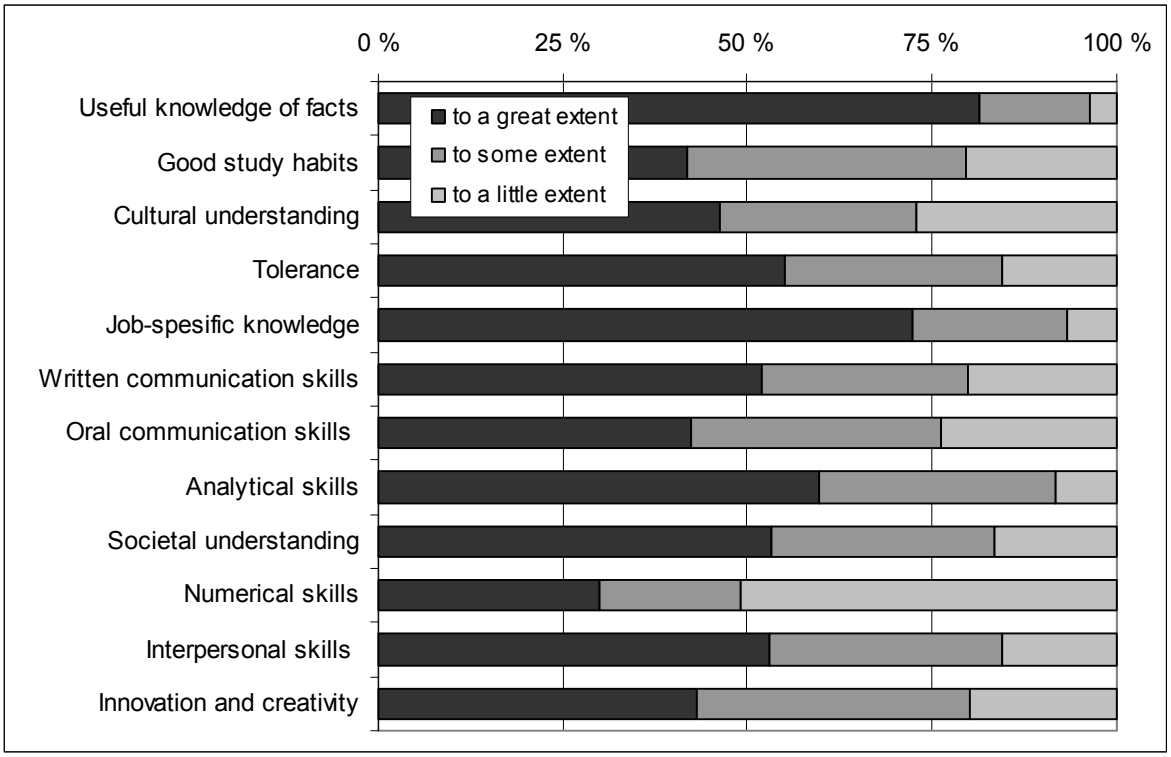



**Figure 1:** To what degree have you acquired the following types of knowledge from your studies?

Figure 1 illustrates the extent to which student acquire certain types of knowledge in higher education. Eighty per cent of the responding students acquired useful knowledge of facts, and 70 per cent gained job-specific knowledge through their studies. Over 50 per cent of the students also state that their studies to a great extent increased their tolerance, written communication skills, analytical skills, societal understanding and interpersonal skills. The least commonly acquired type of knowledge was numerical skills, but that is also closely connected to type of study: numerical skills are not a type of knowledge required in all studies.

The paper investigates if different types of students gain different levels of learning outcome from their studies. The variables controlled for are gender, type of degree, field of study, grade and weekly study time. Table 1 shows the frequency of the independent variables:

**Table 1:** Frequency of independent variables

| | | | Percentage | Total number of cases |
|---|---|---|---|---|
| **Gender** (percentage of women) | | | 59.8 | 2263 |
| **Type of degree** | | | | (2263) |
| - University, undergraduate | | | 16.1 | 365 |
| - University, graduate | | | 17.8 | 403 |
| - University college degree | | | 51.4 | 1163 |
| - Other types of degrees (not included) | | | 14.7 | 332 |
| **Field of study** | | | | (2263) |
| - Humanities | | | 13.5 | 306 |
| - Teaching/pedagogy | | | 17.3 | 391 |
| - Social science | | | 18.9 | 427 |
| - Business/administration | | | 13.7 | 309 |
| - Science/technology | | | 17.2 | 389 |
| - Medicine/health | | | 17.8 | 402 |
| - Other subjects (not included) | | | 1.7 | 39 |
| **Grades** | | | | (1853) |
| - A | | | 14.7 | 273 |
| - B | | | 36.2 | 679 |
| - C | | | 32.6 | 604 |
| - D | | | 11.4 | 212 |
| - E | | | 4.6 | 85 |
| | **Median** | **Mean** | **Std. Deviation** | **Total number of cases** |
| **Weekly study time** | 30 | 30.49 | 13,26 | 2263 |

In the survey the proportion of female students, the distribution of students in different types of degrees and in different fields of study corresponds well to the average in the population (Ugreninov & Vaage 2006). Grades are reported by the respondents, and not based on report cards. The distribution of grades is skewed, displaying a greater percentage of the grades A and B and a lower percentage of the grades D and E compared to the mean grade distribution in Norwegian higher education (Hovdhaugen & Frølich 2007). This might be an effect of the grades being self-reported. Students were asked about the grade they received in their latest exam, but many students complete several exams every semester and there could be a tendency for them to select the best one. Weekly study time is also a variable reported by respondents. They were asked about the number of hours they spend on lectures and classes, teamwork and self-study, and this taken together comprised the measurement weekly study time.

### *Data limitations*

As stated, the dependent variable, learning outcome, and two of the independent variables, grades and weekly study time, are based on students' subjective assessment, and not on objective observations and assessments. One should always be careful in drawing conclusions based on subjective data; to some extent they are relative, from the respondents' perspective. But on the other hand, this might be the most reliable data available for measuring the specific variables.

Learning outcome and competences is not something that can be directly observed (Hager et al (994), hence it has to be based on subjective data. However, according to Kuh, Pace & Vesper (1997), this is often the only feasible method for measuring learning

outcomes. In addition to this, Cassidy (2007) found that even inexperienced students are able to assess their results relatively well. Allen & van der Velden (2005) conclude that self-assessment in measuring skills is a feasible method. Furthermore, since this paper has its focus on assessment criteria, not on assessment methods, the lack of objective" data might be less problematic.

***Methods***

In this paper factor analysis has been used to systemise the pattern of different types of learning outcome. The result of the factor analysis is then used to construct an index. Factor analysis is a way of reducing many observed variables to a smaller number of hypothetical or latent variables, with the intention to make the data more easily comprehensible (Kim & Mueller 1978:9). Factor analysis is an explorative method, with the goal of finding patterns in the data. The factor analysis used is a principal component analysis and it is rotated, using Varimax rotation (orthogonal rotation). By using Varimax rotation groups of variables that correlate highly with one another and only little with other variables are identified (Ulleberg & Nordvik 2001:24). This makes the factors more independent of each other.

In the initial factor analysis, the result came out with three factors or components. However, two of the statements, interpersonal skills and innovation and creativity, did load heavily on more than one factor and where therefore cut out of the analysis. The adjusted factor analysis also came out with three factors or components. These are presented below in table 2.

**Table 2:** Results of a factor analysis on learning outcomes

| | Cultural/societal knowledge | General knowledge | Knowledge application |
|---|---|---|---|
| Cultural understanding | 0.802 | 0.153 | 0.088 |
| Tolerance | 0.764 | 0.154 | 0.195 |
| Numeric skills | -0.607 | 0.254 | 0.244 |
| Societal understanding | 0.574 | 0.367 | 0.108 |
| Written communication skills | 0.186 | 0.767 | 0.015 |
| Analytical skills | -0.084 | 0.738 | 0.153 |
| Oral communication skills | 0.224 | 0.679 | 0.150 |
| Useful knowledge of facts | 0.126 | 0.054 | 0.753 |
| Job-spesific knowledge | 0.046 | 0.028 | 0.744 |
| Good study habits | -0.036 | 0.330 | 0.557 |
| *Eigenvalue, % of Variance* | *20.4* | *19.5* | *15.9* |

Based on the results of the factor analysis we have created three indexes, displaying three different forms of learning outcome. The first form is cultural/societal knowledge, the second is general knowledge and the third form is knowledge application. The last two forms of learning outcome are more general, while the first form is more subject-specific, identifying a hard-soft disciplinary dimension.

**Different types of knowledge in different types of studies?**

The factor analysis came out with three different forms of learning outcome, which we have labeled cultural/societal knowledge, general knowledge and knowledge application. In some sense these three forms of knowledge are in line with previous research on learning outcome, but at the same time it is not. This indicates that the types of knowledge that can be

found will depend on the number and type of items the respondent is confronted with. Therefore, establishing a common reference norm for learning outcome might be valuable.

Using the index of learning outcomes that came out of the study, we will now investigate if there are differences in learning outcome based on gender, type of degree, field of study, by grade and by number of hours the student spend studying weekly.

Analyses show that there are very small gender differences in learning outcome. Women report more cultural/societal knowledge through their studies, but this is probably related to the type of subjects they are studying rather than to gender itself. Women are more strongly represented in the humanities and social sciences, and weakly represented in natural sciences and technology.

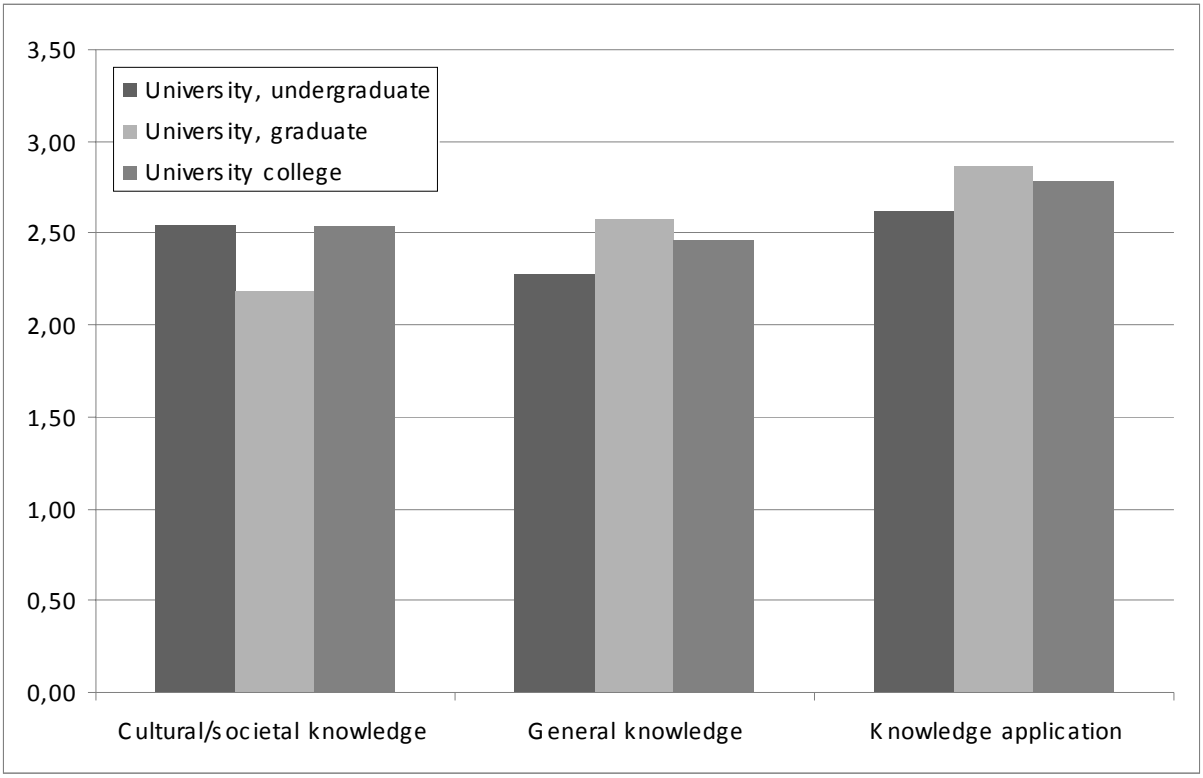



**Figure 2:** Cultural/societal knowledge, general knowledge and knowledge application by type of degree

We find relatively weak relations between type of knowledge (learning outcomes) and type of degree, and in general small differences between undergraduate university students, graduate university students and students at university colleges. University students at the graduate level report a somewhat lower level of outcome on cultural/societal knowledge then undergraduate university students and students at university colleges. This is probably partly due to the weight of different fields of study in different types of degree, for example that the majority of students in science/technology are at graduate level at the universities while the majority of students in humanities and social science at the universities are undergraduates. On both general knowledge and knowledge application, undergraduate university students score lower than graduate students and students in university colleges (professional studies).

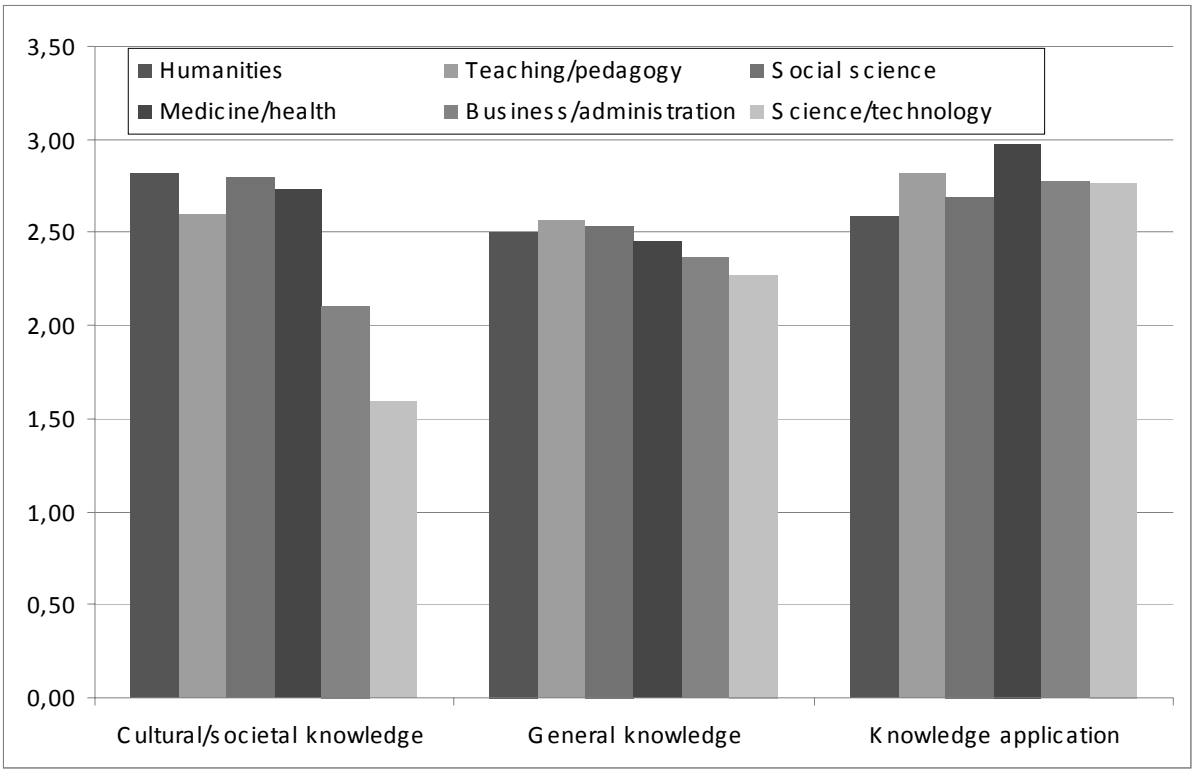



**Figure 3:** Cultural/societal knowledge, general knowledge and knowledge application by field of study

As one could expect, learning outcomes in the form of cultural/societal knowledge vary considerably according to field of study. This type of knowledge is the most subject specific, specifying the dimension "soft/hard" sciences (e.g. with a negative score from numeric skills). It is therefore understandable that students in business administration and especially science/technology report a considerable lower outcome than students in the humanities, social sciences, teaching and medicine and health related subjects do.

For the other two types of learning outcome, general knowledge and knowledge application, the differences between fields are a lot smaller. More practical oriented studies, such as teaching and medicine/health are the fields of study scoring highest on knowledge application.

One of the main aims of this paper is to study the relationship between learning outcomes and grades. A strong correlation could indicate that these two measures of results point in the same directions, while a weak correlation indicates either weaknesses in the measures or that grades and learning outcomes should be considered as being complementary measures of what students knowledge acquirements.

Figure 4 show that grades and self-reported learning outcomes are only partly related. Students that get a good grade in their exam gain a slightly higher score on general knowledge and knowledge application, while there seems to be no relationship between grades and acquiring cultural and societal knowledge. The scores on cultural/societal knowledge are significantly lower among those who got the best and the weakest grades (A and E), while there were no differences between students obtaining a B, C or D.

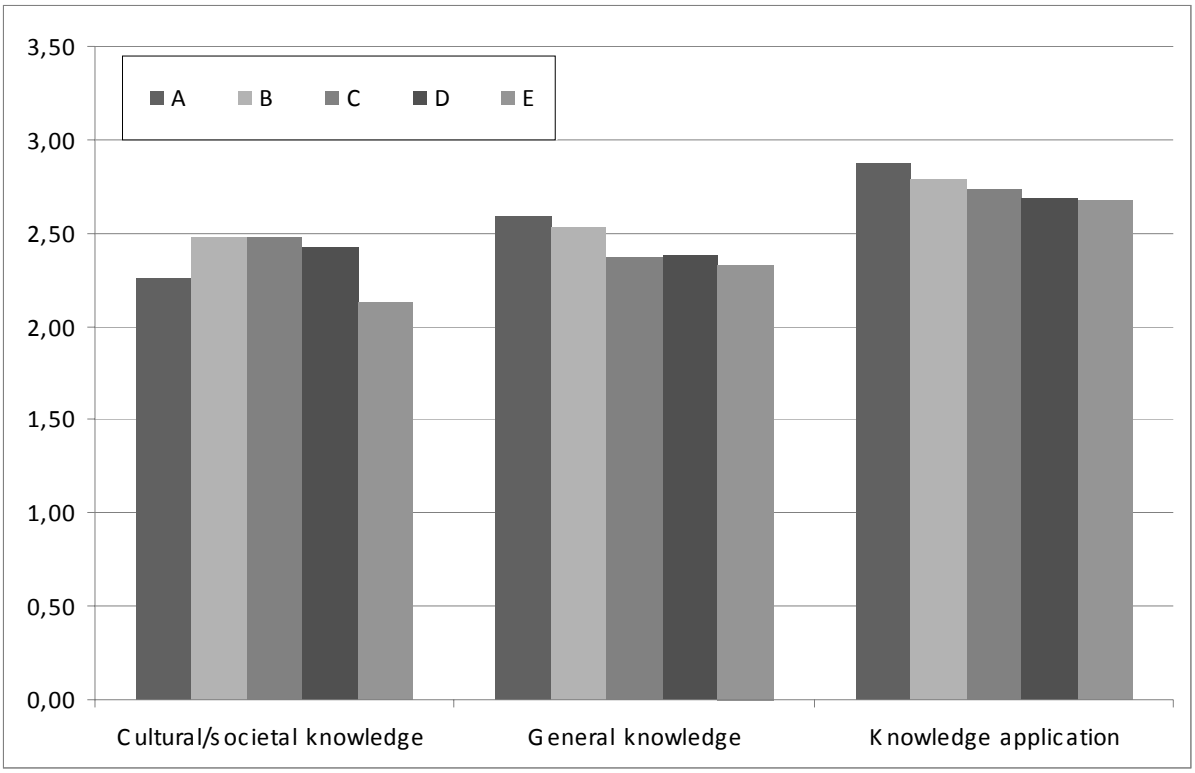



**Figure 4:** Cultural/societal knowledge, general knowledge and knowledge application by grades

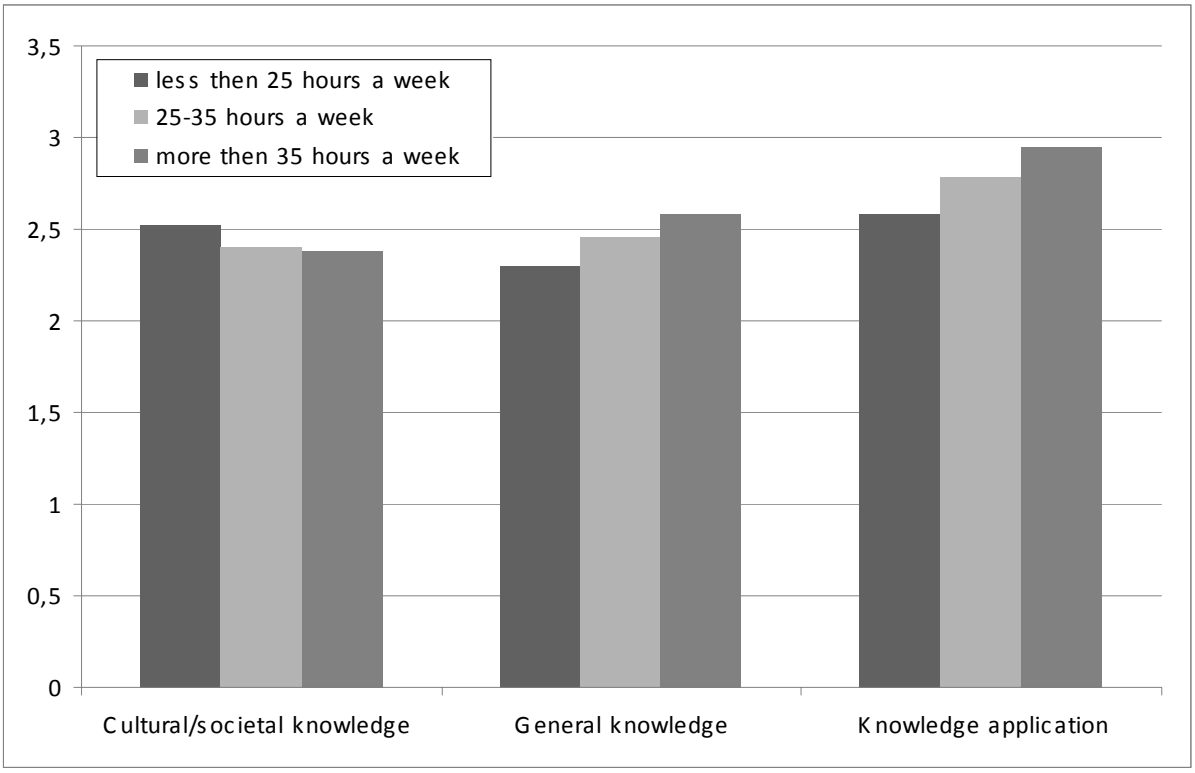



**Figure 5:** Cultural/societal knowledge, general knowledge and knowledge application by number of study hours per week

We observe the same pattern for study hours as we observed for grades. There seems to be a weak, positive relationship between hours spent studying and acquiring general knowledge and knowledge application. The more time a student spend studying, the higher are the learning outcome on these to indexes. For cultural/societal knowledge there seems to be no relationship, the level of learning outcome is basically the same for all students, regardless of the number of hours put in.

**Discussion**

Based on students' responses to a question on types of knowledge obtained during studies, we constructed three learning outcomes components based on a factor analysis: cultural/societal knowledge, general knowledge and knowledge application. We have tried to relate these learning outcomes to the ones defined within the qualification frameworks. There are many variants of these definitions, but the Dublin descriptors, which are frequently referred to, define five types of competencies: *knowledge and understanding*, *applying knowledge and understanding*, *making judgements*, *communication* and *learning skills*. It is not possible to directly translate our three components into these five, and some of the statements behind the categories are split into different categories. For example, "good study habits" is included our component "knowledge application", while it would naturally fall into "learning skills" according to the Dublin descriptors. An alternative schedule was developed by Moon (2004), defining four categories: "Development of Knowledge and understanding" (subject specific, Cognitive/Intellectual skills" (generic), "Key/transferable skills" (generic) and "Practical skills" (subject specific).

There are several reasons for the difficulties of translating our knowledge component into the schemes of the qualification frameworks. First, our items were never constructed with the aim of representing the schemes, and second, since the survey was conducted through personal interviews, the number of items had to be reduced, compared to other instruments as discussed above (Calmand, Frontini & Rostan (2007) and Havnes & Aamodt 2004).

The first research question was about how learning outcomes vary according to type of institution, field of study and study strategies. We found weak relationships between learning outcomes and type of degree and field of study, with the exception of one predominantly subject-specific component: cultural/societal knowledge. There is a tendency for students in professional studies like teacher training and studies for health and social welfare to get high scores, but this may be due to the way questions were constructed, with a certain bias towards qualifications relevant to the welfare state professions. We also found that learning outcomes, in the forms of general knowledge and knowledge application is somewhat related to study effort measured as number of study hours per week.

The second research question was about how learning outcomes are related to grades. Students with the best grades also report about higher learning outcomes (with the exception of "cultural/ societal knowledge), but the correlation is weaker than one probably would expect. This may be interpreted in several alternative ways.

- It could be due to the construction of the instruments, which might have too little reliability and validity in relation to what we want to measure, and that students are not able to assess their learning outcomes. However, previous research in the field indicates that students are able to assess their own learning outcome (Cassidy 2007).
- The weak relationship between grades and learning outcomes could be due to students assessing their learning outcomes in a relativistic way. Weak students might report

improvements in their knowledge as strong, or even stronger, than the improvement reported by good students. This does not invalidate way of regarding learning outcomes, but the links to the more "absolute" measures through grades will therefore be weakened.

- Finally, grades and learning outcomes could be regarded as complementary measures, measuring different aspects of students' learning. While grades mainly measure subject specific knowledge based on traditional academic criteria, learning outcomes to a greater extent measure transferable or generic skills.

In the context of this paper, the last point is the most interesting, indicating that our instruments for assessing learning outcomes, in spite of certain shortcomings, after all are catching a broader set of criteria than examinations and grades.

The third research question was: what are the implications of the measurement of learning outcomes for reforming student assessment? We would argue that the attempts to develop a broader scope of learning outcomes and improved employability among students make the predominant modes of assessment by traditional examinations and grades insufficient. The weak relationship between learning outcomes and grades in our study indicates that these two measures are complementary. Hence, measures of learning outcomes similar to the ones presented in this paper may be relevant tools for assessing skills that go beyond subject-specific knowledge. If one wants to strengthen students' learning of transferable skills, it is also necessary to assess their acquisition of these skills. It is not our intention in this paper to contribute to the development of new methods for organising assessment among students, but our results based on students' self-reported gains are still illustrative.

Assessment of a student's acquisition of knowledge might also serve as an indicator in institutional assessments with a stronger output-oriented focus. Student pass rate and grades cannot function as measures of the quality of institutions and study programmes, since they could be due to different ability of the incoming students, and because grading is often set on a normative basis. But students' and graduates' assessment about what competencies they have gained may be one option in constructing new criteria for quality. We see two possible ways of including such output oriented measurements. The best alternative is to develop tests in line with PISA and similar surveys, an initiative now taken by OECD. This is, however, a very time and resource consuming activity, and therefore the development of instruments like the one we have tested in this paper may be a feasible alternative.

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