# Learning goals in PhD education: How can their usefulness be improved?

A. Månberger

*Abstract*— **The Swedish higher education ordinance define ten learning goals that all Swedish PhD students must fulfil to graduate. This study analyse what students at one department within the technical faculty (LTH) have reported for the different learning goals in their individual study plans and how the department works with the goals.**

**This study finds that the learning goals are currently used more as a summative evaluation framework for documentation in retrospect rather than as a formative tool for stimulating learning and progression.**

**The most common activities reported by students are related to course work and their thesis. Existing examination already takes place for these activities. Activities not part of formal examination receives less attention. It is unclear if and how students should prioritise such tasks and what support their supervisors should offer.**

**Points raised in this study can be useful to include in the mid-term evaluation that is nowadays mandatory at LTH. LTH could facilitate this process by developing guidelines and spreading examples of how to work with, and evaluate, learning goal progression.**

*Index Terms*—**Assessment, Evaluation, Learning goals, PhD education**

## I. Introduction

THE Swedish higher ordinance define ten learning goals that all PhD students must accomplish before they obtain their doctorate degree [1]. The goals are organised into three groups: knowledge and understanding (two goals), competence and skills (six goals) and judgement and approach (two goals). A list of the goals can be found in the appendix.

At the technical faculty (LTH) at Lund university, PhD students report "Activities (carried out or planned) to achieve the learning outcomes" in their respective individual study plan. A mid-term evaluation that focus on the learning goals progression and plans for the reminder part of the study period is mandatory for students admitted after January 1st 2019. This study analyse what PhD students at one department at LTH have reported for the various learning goals and reflect upon some of the challenges of integrating the goals in the PhD education. Finally, suggestions and possibilities for integrating the learning goals are discussed.

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A. Månberger, Lund University, Department of technology and society, Box 124, SE-22100 Lund, Sweden (phone: +46(0)46-46224130; e-mail: andre.manberger@miljo.lth.se).

## II. The role of the learning goals in the Swedish PhD education system

The PhD degree is in its design individual and decision that influence the student's knowledge, skills and judgement are taken *during* the studies rather than *before*. It is possible to complete the course work and defend a thesis without mastering all of the goals. In fact, if that would have been the case the explicit goal assessment would have been redundant. This compares to first and second cycle studies, i.e. bachelor and master programs, that also have defined learning goals but then it is the educational program that should be designed in such a way that the existing examination guarantees that every student fulfils every goal.

Many of the goals are closely related to (subject) knowledge and good research practice or "doctoralness", see e.g. [2-3]. To some extent, these goals are covered by the examination that is part of the thesis defence and the completed course work, similar to the situation for undergraduate students. Not only are these goals partly examined, students also receive relevant training. In general, it can thus be assumed that students at the time for graduation will perform satisfactory for these goals regardless of how their studies have explicitly aimed to integrate the goals in their education or not. Goals that are not fully covered by the formal examination of courses or thesis work are more problematic as they may require other strategies for becoming an integrated part in the education.

## III. Method

The main source of information used in this study is the individual study plans at the Department of technology and society. The department includes three divisions and have about 35 PhD students enrolled in four subjects. The study plans are public documents. However, this study do not point out any individual student but rather strive to summarise the general picture of what is documented in the individual study plans and how the learning goals are used in the education, by the department as well as how it is mandated to be used by LTH.

Learning activities where coded in 15 categories (course, thesis, seminar, conference, network, article, manuscript, report, teaching, supervision, learning goal, mid-term, application, referee, outreach). All of these categories include several synonyms and/or translations (English and Swedish), e.g. "referee" also include "opponent". Activities were counted once per learning goal and student, even when mentioned several times.

## IV. Activities reported by students

### A. The most common activities reported

The five most common learning activities together make up 85% of all activities, see table 1. The most common category ("course") make up slightly more than 20% of the total. These categories share several characteristics: they are tangible and closely related to research and/or course activities. However, they are to a large extent already examined as part of the course work and/or thesis work.

TABLE I
Occurrence of different codes

| Code | Most frequent mentioned for learning goal No. | Share of occurrences | Cum. share[a] |
|---|---|---|---|
| Course | 2 | 20% | 20% |
| Article | 3 | 19% | 39% |
| Seminar | 6 | 18% | 57% |
| Conference | 6 | 15% | 72% |
| Thesis | 1 | 12% | 84% |
| Report | 1 | 4% | 88% |
| Teaching | 8 | 3% | 91% |
| Supervision (students) | 8 | 2% | 93% |
| Referee | 3 & 4 | 2% | 95% |
| Network | 1 | 1% | 96% |
| Learning goal | 8 | 1% | 97% |
| Application | 7 | 1% | 98% |
| Mid-term | 5, 7 & 10 | 0.3% | 98.3% |
| Manuscript | 4 & 10 | 0.2% | 98.5% |
| Outreach | 8 & 10 | 0.2% | 98.7% |

[a] The total cumulative share is not 100% due to rounding error.

Successful fulfilment of learning goals from the second group ("skills and abilities") and the third group ("judgement and approach") may require a different type of learning activities than the first category. Reference [4] made the analogy that the first group can be learned from theoretical studies and self-reflection alone but the second is similar to learning to play an instrument and the third to code of conduct. There is therefore a greater need for practice and role models to master learning goals from these categories. However, the same learning activities reported for the first goals dominated the later ones too, see table 2.

TABLE 2
Most common code per learning goal

| Goal | Group | Most frequent code mentioned |
|---|---|---|
| 1 | Knowledge and understanding | Seminar |
| 2 | | Course |
| 3 | Skills and abilities | Article |
| 4 | | Article |
| 5 | | Thesis |
| 6 | | Conference |
| 7 | | Article |
| 8 | | Course |
| 9 | Judgement and approach | Course |
| 10 | | Article |

### B. The least common activities reported

Examples of some of the least common activities reported are: societal engagement (outreach), writing applications (funding, summer schools, research visits), undergraduate teaching and referee assignments/opponent at seminars. This is a surprising finding for several reasons. These are rather common and concreate activities that are not part of the formal examination but can be highly relevant for several of the goals in the "skills and abilities" and "judgment and approach" categories. Some activities are probably underreported, i.e. many PhD students do not report these activities although they could. One example is (undergraduate) teaching that most PhD students do to some extent but for some reason they do not report it as a learning activity although it can be highly relevant, e.g. goal eight. Why there is underreporting, and how big it is, is beyond the scope of this study but it could be explored in further studies. Underreporting can be problematic for assessing and developing the research environment as it makes is difficult to identify strengths and room for improvement.

### C. Using the goals to plan and/or document progress

For all but one goal (No. five), the description of learning activities that have been carried out are lengthier than the plan forward. This seems to be the case for both PhD students newly admitted and those close to graduation. This could indicate that in its present form, the learning goals are used as a summative framework to document what has been done, rather than as a formative tool stimulating learning and progression. Retrospective linking of learning outcomes has been suggested for accreditation of prior learning, see [5]. It can thus be a useful approach prior to promotion or similar but that is a different context compared to planning.

There can be several reasons that explain why the learning goals are mainly used for documentation. First, it can be unclear what needs to be done to meet the goals (both concerning linking learning activities and goals but also what is "good enough"). Second, some activities are not possible to plan, such as being invited to present for the public or referee assignments. Third, some students are reluctant to document an ambitious plan in the ISP-system. Lastly, it is unclear if early stage PhD students have the necessary experience and competence to do this planning themselves. Further investigations could explore the need for support for the students and their supervisors.

### D. The level of complexity

In addition to listing various learning activities, PhD students are also encouraged to reflect upon how the various activities contribute to fulfilling each goal [6]. It was beyond the scope of this study to assess how this was done but a wide variety in depth and complexity was observed. The structure used in many courses was uncommon, e.g. constructive alignment of content, goals and examination, see [7]. This is hardly surprising as the different activities are not decided in advance, unlike courses and undergraduate programs as mentioned above. However, it raises concerns of the possibility to integrate the learning goals in a similar useful way as is done for courses and undergraduate education programs.

## V. Concluding discussion points

The finding in this study suggests that the learning goals have, so far, have limited implications for the planning and design of the PhD education at the studied department. This is likely to be the case for more research education environments as underlying explanation(s) for this situation is not unique for the studied sample. Below follows a list of suggestions and areas that would benefit from additional investigations to enhance learning goals' integration in the education.

- Learning outcomes are connected to goals in hindsight and the goals seems to have limited influence when PhD students plan their work. Reasons for this are unclear, several potential explanations have been suggested herein.
- While it is the responsibility of the students to meet the goals, it is the responsibility of the educational program to provide an environment that makes this possible. It is unclear if sufficient support is provided for PhD students and who is best suited to provide such support. Furthermore, for research programs and LTH it can be necessary to assess other research environments qualifications for enabling goal fulfilment, e.g. before setting up double degree programs and enrolling industrial PhD students. How to do this is presently unclear.
- The role of the learning goals in the examination is unclear. In particular, how should learning activities that do not provide course credits or are part of the thesis be prioritised? One option is to have a more "generous policy" for awarding course credits. However, this partly go against the present trend, to reduce the number of course credits and apply more strict rules for what counts as a course. Another option, similar to undergraduate programs' design, is to develop "mandatory modules" or define combinations of learning activities that corresponds to each goal. This may facilitate planning and students that have successfully completed such activities would then not have to be assessed for that goal, saving time for students and assessors.
- There is room for interpreting the meaning of the different goals but also the learning outcome threshold required to pass. For example, is it enough to pass a course on research ethics to fulfil goal(s) nine and/or ten? The lack of guidelines opens up for wide variety of interpretations regarding what is acceptable. Spreading guidelines and examples between programs may facilitate integration, acceptance and institutionalisation of the learning goals.

## Appendix

Learning goals from [1] and numbering used in this study. Goals 1 & 2 are part of "Knowledge and understanding", goals 3-8 "Skills and abilities" and goals 9 & 10 "Judgement and approach".

1. Demonstrate broad knowledge and systematic understanding of the research field as well as advanced and up-to-date specialised knowledge in a limited area of this field.
2. Demonstrate familiarity with research methodology in general and the methods of the specific field of research in particular.
3. Demonstrate the capacity for scholarly analysis and synthesis as well as to review and assess new and complex phenomena, issues and situations autonomously and critically.
4. Demonstrate the ability to identify and formulate issues with scholarly precision critically, autonomously and creatively, and to plan and use appropriate methods to undertake research and other qualified tasks within predetermined time frames and to review and evaluate such work.
5. Demonstrate through a dissertation the ability to make a significant contribution to the formation of knowledge through his or her own research.
6. Demonstrate the ability in both national and international contexts to present and discuss research and research findings authoritatively in speech and writing and in dialogue with the academic community and society in general.
7. Demonstrate the ability to identify the need for further knowledge.
8. Demonstrate the capacity to contribute to social development and support the learning of others both through research and education and in some other qualified professional capacity.
9. Demonstrate intellectual autonomy and disciplinary rectitude as well as the ability to make assessments of research ethics.
10. Demonstrate specialised insight into the possibilities and limitations of research, its role in society and the responsibility of the individual for how it is used.

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## References

[1] Higher Education Ordinance (SFS 1993:100) Appendix 2.
[2] C. Turner and M. Sandahl, Learning objectives for a degree of Doctor – Activities and assessment, LTHs 9:e Pedagogiska Inspirationskonferens, 2016.
[3] V. Trafford and S. Leshem, Stepping stones to achieving your doctorate, Open University Press, 2008.
[4] Rådet för Forskarutbildning, Vägledning för formulering av individuella lärandemål för att nå examensmål, Swedish Univeristy of Agricultural Sciences, 2019.
[5] J. Moon, The module and programme development handbook: A practical guide to linking levels, outcomes and assessment criteria, Routledge, 2002.
[6] LTH, Anvisningar för individuella studieplaner inom utbildning på forskarnivå vid Lunds Tekniska Högskola, U 2019/504. 2020.
[7] J. Biggs, Teaching for quality learning at university : what the student does (4th ed). McGraw-Hill/Society for Research into Higher Education/Open University Press, 2011.