Manual for Program Evaluation

FACULTY OF ENGINEERING (LTH), LUND UNIVERSITY | 2017 | 1ST EDITION

Preface

ABOUT THIS MANUAL

The purpose of this manual is to describe LTH's program evaluation system, and to provide guidance on how the program management can provide material for program quality assessment.

The manual has been developed by a working group within LTH, and connects with the decisions regarding quality work undertaken by the Lund University Education Board, the Board of LTH and the Faculty Education Board at LTH (LG GU).

The manual consists of two parts.

Part 1 describes the background, division of responsibilities, evaluation process, annual cycle and the support that different stakeholders have access to in their work within the system.

Part 2 provides guidance on how program managers can organize their work to produce input to the evaluation processes. The section describes a methodology for developing a target section of the program portfolio for the first time. The working methodology has been developed for existing programs, but can also be adapted for new development. It also follows the structure of the workshops that LTH's Academic Development Unit (Genombrottet) offers to the program managements and to the departments.

WORKING GROUP

The program evaluation system and this handbook have been developed by the following working group at LTH (in alphabetical order): Senior Lecturer Christin Lindholm, Associate Professor Torgny Roxå, Associate Professor Ingrid Svensson, Professor Per Warfvinge and Dr. Christina Åkerman. The working group acknowledges the contribution of the student representatives.

VERSION

This version is current as of 2017-12-01.

On behalf of the working group

Christina Åkerman, quality assurance officer LTH
christina.akerman@lth.lu.se

Ref: Åkerman, C., Lindholm, C., Roxå, T., Svensson, I. and Warfvinge, P. (2017). *Manual for Program Evaluation, 1st edition.* Lund: Faculty of Engineering (LTH), Lund University.

Cover photo: View from Studiecentrum, LTH (Per Warfvinge)

Part 1 – System's Description

BACKGROUND

Within the Swedish higher education system, system, individual higher education institutions are responsible for the quality of education, which means that the institutions must have an internal system for systematic quality assurance. At the national level, the Swedish Higher Education Authority (UKÄ) is responsible for ensuring that higher education institutions meet requirements by examining how quality assurance is conducted and what it leads to. UKÄ also conducts other types of quality audits.

At Lund University (LU) responsibility for quality assurance has been delegated to the faculties, who have been given great freedom to design their own quality system based on certain common requirements at LU.

LTH has designed an internal quality system that complies with the requirements of the UKÄ and LU; it consists of three parts:

▸ Management and organization.
▸ Environment, resources and area.
▸ Design, implementation and results – program evaluation.

This manual describes the structure of LTH's internal quality assurance system for program evaluation, which includes the design, implementation, and outcome of individual programs at LTH.

The manual provides guidelines and advice on how to conduct program evaluation in practice. The focus is on what the program directors need to provide as a basis for the program evaluation process.

LTH'S SYSTEM FOR PROGRAM EVALUATION

LTH's program evaluation system is designed to support development. In an annual quality cycle, the various actors contribute in various ways (see Figure 1):

▸ Planning and designing of the education program.
▸ Implementing the education.
▸ Assessing students' study results.
▸ Analyzing the education program in terms of design, implementation and results.
▸ Assessing the education program as a whole, including program management activities.

The entire quality assurance cycle is carried out annually, but during a development phase that lasts until 2022, a given year covers only selected parts of the quality objectives set for the program. After the development phase, work on program evaluation will be based on the development needs that have emerged from the different programs.
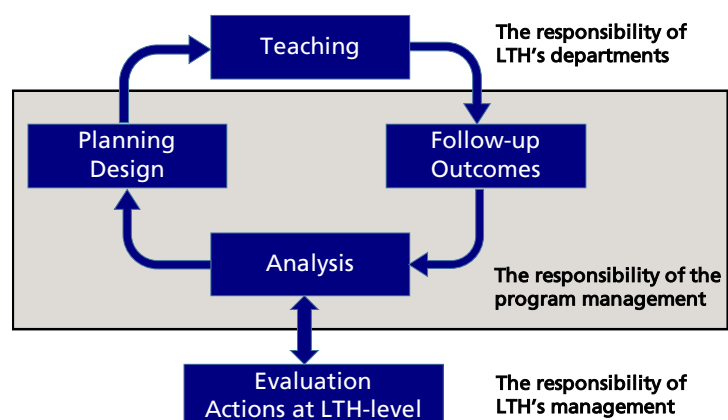

Figure 1. The annual quality cycle.

QUALITY OBJECTIVES FOR LTH'S EDUCATION PROGRAMS

In this context, quality means that a number of established objectives, set in the program syllabus, are met. The overall aim of the program evaluation is thus to ensure the achievement of these objectives. The quality objectives fall into three categories:

‣ Degree outcomes.
‣ Program specific outcomes.
‣ LTH objectives.

Degree outcomes have been decided by the government and are listed in Annex 2 of the Higher Education Ordinance. The degree outcomes define what the students who have obtained a degree can master, and therefore constitute the core of LTH's program evaluation. LTH issues ten different degrees, and each grade is between five and thirteen degrees. These are divided into three categories:

‣ Knowledge and understanding.
‣ Competence and skills.
‣ Judgement and approach.

The degree outcomes are broad and general in their nature and need to be interpreted and concretized for each program. In support of this, LTH will provide instructions with various aspects that are considered relevant for each degree outcome.

Program specific outcomes include learning objectives that the program management and/or faculty (e.g. the Faculty Education Board, LG GU) decides to introduce into the curriculum, in addition to the degree outcomes for the specific degree (BSc in Engineering, Master of Science, etcetera). Program specific outcomes can be set to give the education a specific profile by supplementing the degree outcomes. At LTH, some educational plans currently contain such outcomes. A program specific outcome should be assessed as rigorously as a degree outcome.

LTH objectives are quality objectives that are not learning outcomes, but are considered so important that they should be quantified and followed up systematically. LTH objectives are decided by the Faculty (e.g. LG GU), reflecting that universities have a broad mission, in addition to individual students' learning. Examples of such aspects are internationalization (mobility and intercultural skills), gender equality and equal treatment, widening participation (recruitment, retention and student completion rate), as well as the demands of employers and working life. Some of these aspects are beyond the control of the program directors, and the follow-up and evaluation of LTH objectives are not currently included in this manual.

RESPONSIBILITIES WITHIN LTH

The Faculty Board of LTH (SLTH) decides on the main structure of LTH's quality system.

Faculty Education Board (LG GU) decides on how the program evaluation system is designed, what the evaluation process is, and how the evaluation team is appointed, and assesses the resources that should be assigned to the purpose. LG GU is also responsible for the overall versatility of the program evaluation system.

The program managements are responsible for planning and designing the education programs and for creating the basis for the assessment process. This basis has the form of a program portfolio. The program managements are recipients of the assessment group's reports, and should take into account the views of the assessment group in its ongoing work, for example through changes in course syllabi and the program syllabus.

The departments are responsible for delivering education in accordance with the course syllabi, and to follow up on the learning outcomes. It is also the responsibility of the departments to ensure that the courses are based on scholarship or artistic practice and on proven experience, that is, teachers have the necessary subject and educational skills, and that the courses are characterized by a critical approach. At the departmental level, the head, the study director and the

teachers responsible for the courses play important roles.

LTH's Dean and Deputy Dean are responsible for ensuring that the organization is appropriate and that all actors are aware of their responsibilities. The Dean and the Deputy Dean, as well as the program directors, are the recipients of the evaluation reports and conclusions and are accountable to the Faculty Board to make appropriate decisions and actions as a result of the evaluations.

The evaluation team is responsible for the assessment being conducted, reported and for experiences documented and passed on.

LTH's Faculty Office and LTH's Academic Development Unit, Centre for Engineering Education, provides support to various actors.

The student union, TLTH, participates in all of LTH's decision-making boards and committees and has thus influence on all parts of the program evaluation.

INTERNAL QUALITY ASSESSMENT – THE EVALUATION PROCESS

Each program, including the program management, is reviews annually on a selection of quality objectives. The assessment is done per objective by an internal evaluation team, and is presented in two quality dimensions:

‣ How well the program and its courses are planned, designed, implemented and analyzed in order to allow the learning outcomes (degree outcomes and program specific outcomes) to be met.
‣ The students' documented ability, that is, to what extent there is evidence that the learning outcomes are met.

The evaluation team should be composed of academics with a broad range of expertice, among whom can be subject experts, representatives of professional life, and other relevant experts. The evaluators are pedagogical experts and have a very good insight into LTH's education as well as quality issues in general within higher education.

For each quality objective, the evaluation team summarizes its conclusions by placing their assessment for the objective in an assessment matrix (Figure 2) on the two dimensions.

This assessment matrix makes it possible for evaluators to separate program design and implementation from student achievement, and thus draw accurate conclusions about quality issues within a given program.

The term "exemplary" signifies that the program serves as best practice.

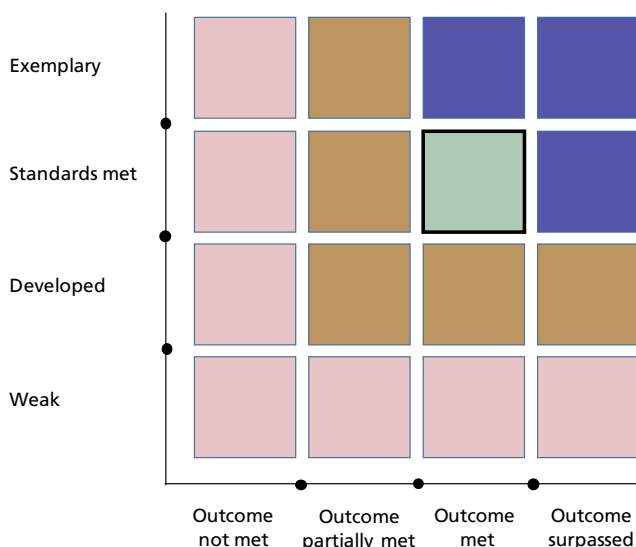**PROGRAM DESIGN AND IMPLEMENTATION**

Figure 2: The assessment matrix used by the evaluation team summarizes its conclusions

STUDENTS' ACHIEVEMENT

PROGRAM PORTFOLIO – ANALYSIS, ARGUMENTATION AND EVIDENCE

The evaluation is based on a program portfolio developed by the program management. The program portfolio must have an introduction followed by objectives sections that correspond to the different program objectives.

The **introduction** is directed from the program management to the evaluation team, and may contain material that the evaluation team needs in order to understand the objectives sections. This may include the structure of the program, the role of the specializations, or special characteristics of the degree project.

Each **objectives section** in the portfolio should contain four elements:

1. Follow-up, which describes significant changes since the previous year, and which may form the basis for a revised assessment. This section will be applicable from year 2.

2. Reflection, including:
    ‣ A description of what the objective means for the current education, and how the program has been designed to achieve the objectives.
    ‣ An argumentative analysis and evaluation of the objective fulfillment, where the arguments should be substantiated by evidence.
    ‣ A set of follow-up actions that need to be addressed.

3. Evidence supporting claims about the design and planning of the program.

4. Evidence showing that the program fulfills the quality objectives.

The assessment group should not be required to draw conclusions based on source material used as evidence. For example, the assessment group should not read a lot of written exams tasks, syllabuses or degree project reports to find evidence that a objective has been achieved.

The assessors' task is rather to critically review the program's reflective texts, and evaluate the strength of the evidence presented in support of the argumentation.

In other words, the evaluators are reviewers, not co-authors!

A good reflective text will link the program design to the students' learning and progression, and will identify any weaknesses and needs for development that may exist.

The evidence, especially relating to students' learning, should preferably be developed together with the teachers who meet the students in the classroom.

The evidence highlighted in the program portfolio is not expected to be scientifically waterproof, especially at the beginning of the process of building up the program portfolio. But a stated ambition is that the evidence should become stronger over time.

Templates will be available to programs to help them construct their objectives sections.

PROGRAM DESIGN – PROGRESSION CHART

A required piece of evidence in each program portfolio is a progression chart for the learning outcomes, both the degree outcomes and the program-specific ones.

The progression chart shows which courses support which outcome, in order to illustrate the students' path and progress through the program. It is designed as a matrix with the program's courses on one axis and the learning outcomes on the other.

The progression chart is a central piece of evidence of good planning and design of the program, and should be well matched to the learning outcomes at the course level. It also shows which courses provide evidence of students' learning for specific learning outcomes.

Progression is expressed in three levels, RAC. The levels link to Bloom's taxonomy for cognitive skills:

- **R** stands for Remember – Reproduce – Understand and refers to the lowest level.
- **A** stands for Analyze – Apply and refers to the intermediate level.
- **C** stands for Create – Evaluate and refers to the highest level.

Annex A contains a table illustrating how RAC can be interpreted in relation to other ways of describing progression in learning in higher education.

In order for quality assurance and assessment to be uniform throughout LTH, it is necessary to have a common understanding of progression and what progress students must have made when they reach graduation. For each degree outcome there will be instructions with:

- A summary of the required progression level of a degree for a specific outcome. The levels should be set by LG GU.
- The interpretation of the progression levels RAC for different degree outcomes.

PROGRAM IMPLEMENTATION

At LTH, the departments are responsible for teaching in accordance with the program and course syllabi. While these syllabi are decided by program management, they should be developed in close collaboration with departments. Examples of such collaboration are the annual agreement dialogue, participation in the course evaluation process, and communication with teachers and departmental leaders throughout the academic year.

Students' learning is not only affected by the teaching itself but also by the learning environment at large, such as study social support, classroom design, access to places for independent study, the psychosocial climate of the student group asks well as scheduling. It is essential that the program portfolios clearly mark if such factors prevent students from achieving the outcomes, and it falls on the LTH leadership to address any issues that arise.

ANNUAL CYCLE

Every cycle within the quality assurance system is carried out during one academic year. The time schedule is:

November
The Office for Quality Assurance announces:

‣ Which quality objectives are to be addressed the coming annual cycle.
‣ Which templates and formats should be applied to the program portfolio.

December
The evaluation team is appointed.

January-March
Objectives and progression levels (RAC) are are specified and/or reviewed and updated.

May
The program portfolio is submitted.
The evaluation process begins.

October
The evaluation process is completed.

November
The assessment is reported.

SYSTEM SUPPORT

The Office for Quality Assurance provides instructions and templates for designing the program portfolio. Initially, these will consist mainly of templates in Excel.

As the quality assurance system is refined, the templates will be replaced with digital, web-based tools.

PEDAGOGICAL SUPPORT

The Academic Development Unit, Genombrottet, provides four different types of support:

‣ Pedagogical courses, aimed at developing the general academic pedagogical competences of teachers and other staff.
‣ LTH-wide workshops and seminars. Some of these link directly to quality assurance, while others are more general.
‣ Tailor-made workshops and seminars arranged on the initiative of programs, teachers, or departments.
‣ Consultancy support for programs and individual teachers.

Part 2 of this manual reflects the LTH-wide workshop "The Program Portfolio", which is arranged for program directors and staff.

Genombrottet's academic developers can act as facilitators at workshops with program managers and teachers.

Contact person for Genombrottet is Roy Andersson, roy.andersson@cs.lth.se.

FINAL COMMENTS

It is unrealistic to expect programs to demonstrate that each individual student achieves every learning outcome. Instead, the objectives sections should show that the majority of students achieve the outcomes. Nevertheless, the objectives sections should show that the majority of the students achieve the outcomes, and that all students are given the opportunity to achieve them, regardless of their path through the program.

LTH has many students participating in student exchange, especially in at the master's level in engineering, industrial design, and architecture. A high level of ambition regarding quality assurance of LTH's education programs must not constitute an obstacle to international mobility or the students' choice of electives. Instead, a follow-up strategy for international mobility could be developed.

Part 2 – Guidance

1. ANALYZE AND CONCRETIZE THE OBJECTIVE

The degree outcomes in the Higher Education Ordinance are written to suit all fields of engineering, architecture and main fields of study. Fields of engineering include mechanical engineering, computer engineering, industrial economics and so on. Main fields of study (*Swedish: huvudområde)* at LTH include industrial design, electronics engineering, biotechnology, etc. The outcomes might be perceived as wordy or unclear if taken out of context, but become meaning when related to context of the field. In LTH's quality system, there must be clarity as to what the degree outcomes mean for a particular education program. Unless the outcomes become sufficiently clear, it will not be possible for the evaluation team to determine if the program design is appropriate and whether or not the students reach the objectives.

In interpretation of the degree outcomes must be provided for each program, and the program management is responsible for providing an interpretation of how the degree outcomes apply to their program.

For example, the meaning of concepts such as "products, processes and systems" and "proven experience" will be very different for different areas. A chemical process in chemical engineering is something completely different from real estate formation process in surveying.

Also the concretization of graduation goals such as "demonstrate the capacity for teamwork and collaboration with various constellations" will vary between engineering fields. In computer science, teamwork in software development may be particularly relevant and often involve a strict distribution of roles, while in biomedical engineering, it is necessary to learn to interact with different stakeholders in healthcare.

For professional degrees, you should also consider the outcomes in light of the needs of the specific labor market for a particular category of graduates.

Several degree outcomes are complex and in practice contain several independent outcomes. An example of this is the degree outcome "ability to clearly present his or her conclusions and the knowledge and arguments on which they are based in speech and writing […]". Arguably, the outcomes for oral and written communication may need to be made independent of each other. In the templates for the program portfolio, it will be made clear how the outcomes are to be divided and how each objectives section should be designed for evaluation of the different parts of the outcome.

In several current program curricula there are program-specific outcomes (see section 1.3 of the curricula). In some cases, such objectives concretize a degree outcomes, in other cases, it supplements the degree outcomes. In that case, this outcomes is to be considered a program-specific outcomes. As the quality system develops, it may be necessary to harmonize program curricula with the program evaluation system.

Examples of how a degree outcomes can be defined for a program. In the self-evaluation of the Master of Science in environmental engineering, written in 2012, the concepts "Products, Processes and Systems" where described as: "Within the field environmental engineering, the products, processes and systems constitute links between the environment and engineered systems. Thus, a product may be a biotechnological reactor, but also an urban runoff plan for a municipality or a coastal

hydraulic erosion calculation. A process can be both physical, for example a water purification process, or intangible such as a structured environmental impact assessment. A system can be a bioreactor, a wetland, a restored river, a waste disposal or a wind farm in a protected natural environment."

Examples of how an existing program-specific outcome concretizes a degree outcomes. In the program curricula of the MSc in Biomedical Engineering, parts of degree outcome regarding the ability to develop and design products, processes and systems while taking into account the circumstances and needs of individuals has been articulated as "Be able to design and develop medical devices in cooperation with engineers, doctors, healthcare professionals, patients and their families as well as stakeholders outside the healthcare sector.''

2. MAKE AN INVENTORY – GET AN OVERVIEW

When the interpretation of the outcomes is clear and concrete, you can find the existing courses and activities that support the objective. The inventory will result in a large amount of information, which can then be used to create an overview of how the students' learning progresses towards the objective.

The inventory can be done using the learning and timetable (L&T). L&T contains all courses offered within the program, including the electives and the courses within different specializations.

You should not limit the inventory to courses where the outcome is currently assessed or included in the course syllabus. The most important thing is to include relevant courses and activities in the table. If the program finds a need to make changes to course content, pedagogical strategy, examination or formalities, it should be seen as an opportunity for quality development, not as a burden in the evaluation process.

Many of LTH's long (5-year) education programs contain specializations. It is important that the inventory and overview also cover the most important specializations of the program.

In some programs, however, there are specializations with many courses and very few students, making it difficult to create a meaningful overview. It is the task of the program to argue if any specialization can be de-emphasized in the analysis.

3. IDENTIFY THE COURSES MOST RELEVANT FOR THE OUTCOME

The inventory and overview of the program will include several of courses relevant for each outcome. This is natural since professional and professionally oriented degrees by nature integrate different competences and skills within a network of courses from different subject areas.

However, in order for the evaluation team to assess the students' achievement of the learning outcomes, the amount of information must be reduced and focus on a smaller number of key courses. On long education programs, key courses should be selected from both the compulsory courses and the specializations.

Having written self assessments for UKÄ's national program evaluation in 2012/13, many programs have already identified key courses for selected degree outcomes. In these self-assessments, key courses provided evidence that outcomes were met..

5-year programs usually have a good understanding of which compulsory courses can be considered key courses. For specialization courses, however, there is likely a need for teachers and students to provide additional information.

4. DESCRIBE KEY COURSES

To clarify why a course should qualify as a key course for for a certain outcome, the course needs to be described, for example with regard to:

‣ Specific activities supporting the outcome.
‣ Match between course learning outcomes and degree outcomes.
‣ Links to other courses offered before, or after, in the program.
‣ Some aspect of the outcome that is not considered in any other course.
‣ Progression.
‣ Any specific elements that have a transformative effect on the students.
‣ Direct examination of the outcome.
‣ The students' way of working with the course.
‣ Pedagogical form such as project, case or research oriented approach.
‣ A key role within a specialization.
‣ Relevance for the overarching purpose of the program and employability.
‣ Access to evidence of student learning.
‣ Planned actions and changes in the course.
‣ Useful information from course evaluations, focus groups, alumni surveys etcetera.

The descriptions of key courses are important when the program management formulates their analysis and self-assessments in the objectives sections of the program portfolio. They are also instrumental for collecting evidence of student learning and describing student progression.

Keep in mind that courses change continuously. Planned changes are relevant and important information that should be included in the descriptions!

5. COLLECT EVIDENCE

The evidence is used to support the descriptions, analyses and self-evaluations in the reflective text included in the program portfolio's different objectives sections. The evidence falls into two categories:

1. Evidence showing that the program is well designed and implemented.
2. Evidence showing that the students achieve the learning outcomes.

Evidence that shows that the program is well designed and implemented may consist of the program curriculum, outcome analyses, progression chart (RAC matrix), syllabi, course programs, policy documents, literature reviews, benchmarking, planned actions, etcetera.

Evidence that shows that the learning outcomes are met may consist of examination tasks, student work, analyses of degree projects, alumni surveys, focus group interviews, surveys, statistics, course evaluations, progression studies, input from peers, etcetera.

Strong evidence assert the quality claims made, while weak evidence devaluate the claims made.

LTH's program evaluation should be forward-looking and inspire development. Therefore, a planned change, such as a draft revised syllabus or curriculum, may also serve as evidence that the program is well designed and planned. However, it can not serve as evidence that the learning outcomes are met.

All evidence should ultimately be collected in a digital portfolio in the form of PDF documents, videos and images.

There is often evidence available that a program management is not aware of or has not thought of. Engage teachers, administrators, students, employers and colleagues at other universities – be creative!

6. CREATE THE PROGRESSION CHART – RAC

When the goal is concretized, key courses identified and described, and evidence collected, key courses are to be placed in a progression chart (Figure 3) and given the designation R (Remember/Reproduce), A (Analyze/Apply) and/or C (Create/Evaluate). The progression chart is a compulsory piece of evidence to show that the program is well designed and implemented. On the other hand, the progression map is not in itself proof that the learning objectives are met.

R, A and C are absolute levels that should be equivalent across LTH's different programs. For a given program, the progression chart does not need to show that all outcomes are met at level C by the end of the program, but rather that outcomes reach the final progression level specified for the degree.

There are generic definitions of the RAC levels for each outcomes. It is important to note that for a given outcome, these definitions should apply even if the outcomes are conctretized differently for each program.

For some outcomes, a program can be designed so that student learning progresses far, even early in their education. In other cases, progression to the final level can only be reached through the degree project.

The progression chart must contain enough courses to cover the most important aspects of the outcome. However, there is no point in having an excess of courses in the progression chart. The purpose of the progression chart is to illustrate the quality of the program design with respect to the progression and achievement of the students, not to give a complete picture of the program.

7. FORMULATE THE REFLECTIVE TEXT

Based on the evidence compiled, the program management should formulate a reflective text that illustrates the design of the program and the achieve of outcomes, as well as planned measures and changes.

The text should discuss and argue for the program's strengths, weaknesses, and needs for development regarding the outcomes. In the argumentation, the text should explicitly refer to the evidence presented. It is not the task of the evaluation team to link the arguments in the text to the evidence presented.

It is a strength to be able to identify weaknesses.

The planned measures may have very different character. They may involve changes in existing courses, revision of specializations, setting up a working group on a particular issue, suggestions for improvement of the teaching capacity, etcetera.

The text may be written either in Swedish or in English.

	FIRST YEAR OF STUDIES								LAST YEAR OF STUDIES							
	Courses								Courses							
Learning outcome	1	2	3	4	5	6	7		15	16	17	18	19	20	22	22
1a. demonstrate knowledge of the scientific basis of the field	R		R				A	……	A				C			C
1b. demonstrate awareness of current research			R	A							C			A		C
…																
9. demonstrate an ability to engage in teamwork						R						A				

Figure 3. Example of a progression chart with demonstration learning outcomes.

Appendix A

The literature on teaching and learning in higher education includes several models and systems for describing progression at different levels of abstraction and complexity.

Within LTH's program evaluation system, Bloom's taxonomy (cognitive domain) is the starting point for the definitions of RAC. However, it has proved impossible to strictly follow Bloom's taxonomy for each degree outcome, and it is useful to consider several progression frameworks.

Table 1 shows how RAC relates to a selection of other models.

Comments:

LTH classification (G1, G2, A) refers to entire courses, not to specific learning outcomes. This means that the progression for a specific learning outcome can be at both higher and lower levels than the course as a whole.

The "ladder of student independence" is a model developed at Luleå University of Technology. You can find more about the model by a search, using the string "LTU Självständighetstrappan Slutrapport"

Table 1. Points of reference to illustrate how RAC relates to a selection of other models.

		PROGRESSION LEVEL		
		R	**A**	**C**
Comparable level in Bloom's taxonomi	Cognitive domain	Remember and Understand	Apply and Analyze	Evaluate and Create
	Psykomotoric domain	Perception, Attention to act and Imitation	Recurrent practice	Developed skills and Complex skills
	Affective domain	Susceptibility och Reaction	Estimation och Organisation	Characteristic
Comparable structures in the SOLO taxonomy		Mono- and multistructural	Relational	Extended abstract
Comparable levels in LTH's classication of courses		G1	G2	A
Levels in the ladder of student independence		Professional student	Participating actor	Independent professional actor
Characteristics of what the students engage in		The task: Given The knowledge base: Given The method: Given	Either the task, the knowledge base or the method: Open	The task: Open The knowledge base: Open The method: Open