LR Enhancing Study Success

Teaching less, learning more

Aldert Kamp

Preface and disclaimer

The critical success factor for improving study success at the Faculty of Aerospace Engineering is a paradigm shift for the students and teaching staff. With a high appreciation of the new (2010) curricular framework, the corrective measures will focus on a **reduction** of **study load** and **in-class hours**, the role of **assessments** in our education, the introduction of **compensatory** assessments and a strengthening of **cohesion** and **correlation** within the modules and the semester themes.

Distribution list

LR Enhancing Study Success Committee

Gertjan Broekman Vincent Brügemann Irma Croese Luka Denies	Lotte Engelen Aldert Kamp Simone Kuiper Witold Koning	Jill Morales Ron Noomen René van Paassen	Eefke Rienstra Gillian Saunders Mark Voskuijl

Study Success Steering Group

Boudewijn Ambrosius Rinze Benedictus	Hester Bijl Jacco Hoekstra	Aldert Kamp Max Mulder	

TU Delft Stuurgroep Studiesucces

Paul Rullmann Rob Mudde	Jan Rots Anka Mulder	Lisanne Schmit (secr)	

Table of contents

1 Context

Between 2006 and 2010 the Faculty of Aerospace Engineering has made a large investment of about 25,000 manhours in a radical innovation of its bachelor and a new structure of its master. The new bachelor curriculum[1] (BICA, 2010) is based on the foundational engineering sciences, the disciplines of aerospace engineering and the professional and occupational norms. It has a well-structured knowledge base in a motivational context of engineering themes and hands-on projects and experiments, where learning-by-doing-(together) creates good interaction with others and an atmosphere of collaboration. The students' experience in the new bachelor is about engagement and enjoyment of the thrill of the profession of an aerospace engineer. The curriculum has been shaped around the engineering, design and operations of aircraft and spacecraft and has a thematic structure that represents the life cycle of an engineering process. It makes use of state-of-the-art learning materials and active learning methods to apply theory and consolidate knowledge. Its constituents are mostly multidisciplinary courses in which the teaching staff from different chairs collaborates to achieve a broad and consolidated knowledge of engineering sciences applied to aerospace engineering. It trains the students explicitly in the personal and interpersonal skills as well as product, process and system building skills.

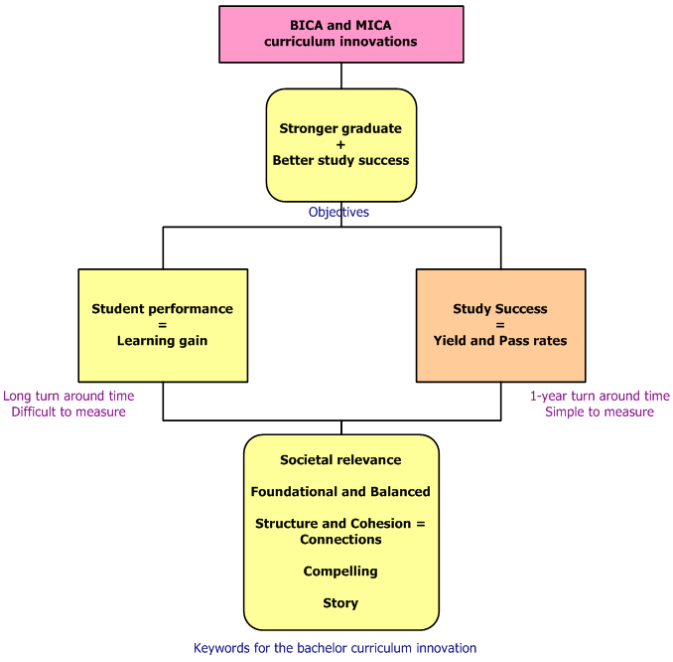

Figure 1 Objectives of the bachelor curriculum innovation

The new bachelor curriculum has been launched in September 2009 (propaedeutic year) and 2010 (2nd and 3rd year of study). It makes use of Malone and Lepper's taxonomy[2] on factors that promote intrinsic motivation. It meets many of its expectations[3] with regard to student performance (Figure 1) and matches with the TU Delft measures to enhance study success to a great extent:

The content of the curriculum has been recalibrated with more emphasis on the fundamentals of (aerospace) engineering. It has a thematic structure in which the content is tied together per semester, but is not organised around the subjects or problems of the themes with disciplines interwoven. Contrary to such problem-based curriculum the content is contained in disciplinary entities that contain disciplinary knowledge or skills. Besides the thematic, the curriculum has also a modular structure. In each semester three modules run in parallel (Figure 2): Aerospace Design (thematic projects and design courses (orange courses in the schematic); Aerospace Engineering & Technology (with aerodynamics, aerospace materials and structures, production engineering, flight and orbital mechanics, systems and control, flight dynamics,

[1] Kamp, A., Delft Aerospace Engineering Integrated Curriculum, Proceedings of the 7th International CDIO Conference, Technical University of Denmark, Copenhagen, June 20 - 23, 2011
[2] Malone T. W, and M.R. Lepper. (1987). Making learning fun: A taxonomy of intrinsic motivations for learning. In R.E. Snow and M.J. Farr (Eds.), Aptitude, Learning and Instruction III: Cognative and Affective Process Analyses. Hillsdale, N.J.: Erlbaum, 1987
[3] Blueprint & Development Plan of the BSc Curriculum Aerospace Engineering, issue 3rev3, Delft, 19Jun2008

propulsion, the blue courses), and Generic (mechanics, physics, mathematics, the grey courses). Each Aerospace Engineering & Technology course correlates with the theme and with the other courses in the semester module. To further improve cohesion each semester makes use of one and the same storyline (currently immature). Each module has a volume of 5-10 EC per educational period. Compensatory assessments are still the main missing elements in the modular structure. They will be implemented in 2012-2013 in the scope of the LESS (LR Enhancing Study Success) project. The bachelor applies activating tuition forms in smaller groups in the first study year (mathematics, mechanics, studio classrooms and in the projects) but also in the second year (studio classroom groups, project teams). Some of these courses require obligatory presence and commitment of the student. There are three to four regular exams per period at most with one resit opportunity per year per course. Formative and staggered summative assessments have been introduced in first- and second-year courses with active learning formats.

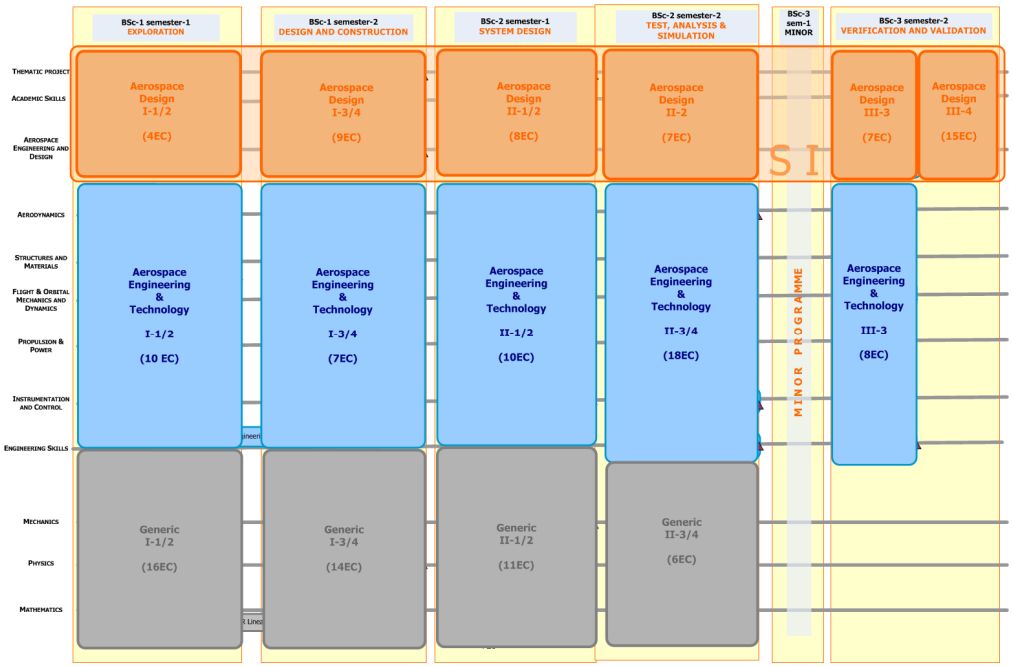

Figure 2 The modular structure of the BSc Aerospace Engineering

Immediately after the first production of the new curriculum in 2010-2011, the Faculty has initiated "Operatie Stofkam[6]" to to resolve teething problems, stimulate the debate about discrepancies and consolidate the curriculum in a controlled manner. In 2011 already an important measure was taking by deleting three courses and two lab work practicals, thus reducing study load.

[6] Operatie Stofkam, Delft, latest version 9a, 31 August 2011

2 Targets

The main target of the Faculty is that a median student with the right starting qualifications is able to complete the bachelor or master successfully in the nominal duration, under the assumption he spends 1680 hrs gross study time per year. The Faculty has established the following target values[7] for study success in the bachelor and master Aerospace Engineering.

BSc targets	BSc actuals (2010)
60% positive BSA*) 40% P-in-1*) 50% BSc-in-4 years (ref 2nd-yr registrations*) 5% max drop-out after propaedeutic year (ref 2nd-year registrations)	40% positive for BSA=45EC 21% P-in-1 35% BSc-in-4 years 15% drop-out after P

Table 1 Study success targets and actuals for the BSc Aerospace Engineering

MSc targets	MSc actuals (2010)
80% MSc-in-2 years 95% MSc-in-3 years 5% max drop-out	TBD TBD <5% drop-out

Table 2 Study success targets and actual for the MSc Aerospace Engineering

3 Study success enhancement strategy

In its conceptual Strategic Plan 2012-2015, the Faculty describes its study success enhancement strategy as follows: *"The changes are aimed at reducing the abundance of content in the bachelor curriculum, strengthening the cohesion between courses and projects thus forming clusters of courses to be followed in parallel (modular scheduling) , reducing the amount of in-class hours and assuring that self-study is stimulated in the active teaching formats, taking the growth in student autonomy into account, and enhancing assessments and student feedback. In the master, the measures focus on improving the planning skills and progress monitoring of master students, and capping the inflow of students per track when necessary. All measures will be elaborated, implemented and iterated in the next two years, with as little impact as possible on the curricular framework and learning outcomes, and with a minimum of rework effort for the staff.* "

The 22 November 2011 Management Team meeting agreed to stick to the BSc and MSc Final Qualifications (or at worst accept negligible changes only) and maintain the points of departure, framework, coherence and cohesion of the BICA and MICA curricula.

3.1 Bachelor

We will cut back any "nice-to-have" content, ineffective in-class time and related teaching effort from the courses, practicals or projects. We have set a target of 30-35% contact time for courses with an instruction format of lecturing, instruction or application session. One or more curricular constituents may be descoped and transferred to other courses, or deleted entirely, but only if the Final Qualifications are not significantly affected. Our aim is to achieve a study load reduction of about 15% in the major of the as-designed BICA curriculum. This value includes the deletion of 8 EC we have already incorporated in the scope of "Operatie Stofkam" in 2011. We will therefore evaluate the curricular constituents with respect to the compliance with their original learning objectives, key questions and key subjects. On the basis of detailed time-on-task analyses by staff and students, we

[7] *) Strategic Plan Aerospace Engineering 2012-2015

will cut back each constituent to its core. This undertaking will be done in close cooperation between the Director of Education, the Course Coordinators and Companions, and external disciplinary or didactic experts.

Part of the evaluation of each course will address the effective use of formative or summative assessments. The planning of the deliverables and assessments during the educational periods will be further harmonised to avoid peaks in study loads. The Course Coordinators will establish a study plan for their course, indicating the schedule of assessments and a detailed estimate of time-on-task. For the courses where the assessment consists of written examinations or hand-in homework assignments we will put more emphasis on the need of issuing prompt feedback[8] to the students.

We will investigate whether any courses could be scheduled as short fat (3½ week) courses to minimise "time-robbing" between courses. We will also consider alternative structures in which the scheduling of the thematic projects is interwoven with the design courses or skills training.

We maintain the three contemporary modules (Figure 2) and will further strengthen the coherence and cohesion. The disciplinary courses will not be transformed into integrated multidisciplinary courses about subjects, but will stay identifiable disciplinary entities. Within the modules we will develop rules for compensatory assessments.

3.2 Master

For the planning of the master phase, Master Track Owners, Master Track Coordinators en Education & Student Affairs (O&S) will recalibrate the level of ambition of our master programme. We will investigate how to improve the grip on study success. Possibly the Literature Study, Master Orientation Project and Internship Kick-off will be included in a study contract with the student. A default timeline will be made applicable to the thesis project that breaks it down into milestones, reviews and deliverables. It includes an intake to obtain a Thesis Entrance Permit, a Mid-term meeting and a Green-light Review, and a forecast of the date for the Graduation day. Master Thesis project assignments may have to be reviewed and approved before being released to the student.

Furthermore we will review the balance in study load for each master Track/Profile and review our internship policy. Many students start too late with their planning of the (international) internship, and on top of that, quite a number of students have a high level of ambition and take longer internships.

[8] Assessment and Examination Policy Plan for the Faculty of Aerospace Engineering, Delft, May 2011

4 Activity Plan LR Enhancing Study Success (LESS) project

4.1 CvB measures bachelor

Als gevolg van de volgende CvB besluiten:

- de invoering van modulair onderwijs
- toetsen:
  - compensatoir beoordelen binnen marges
  - tussentijdse formatieve toetsen instellen
  - het aantal toetsmomenten beperken
- Uitgebalanceerde studielast

én daarbij rekening houdend met de randvoorwaarden en adviezen uit de nota 'Koersen op Studiesucces'….the Faculty of Aerospace Engineering will execute the activity plan as defined in this document, detailed in chapter 5.2.

4.2 Work breakdown and planning

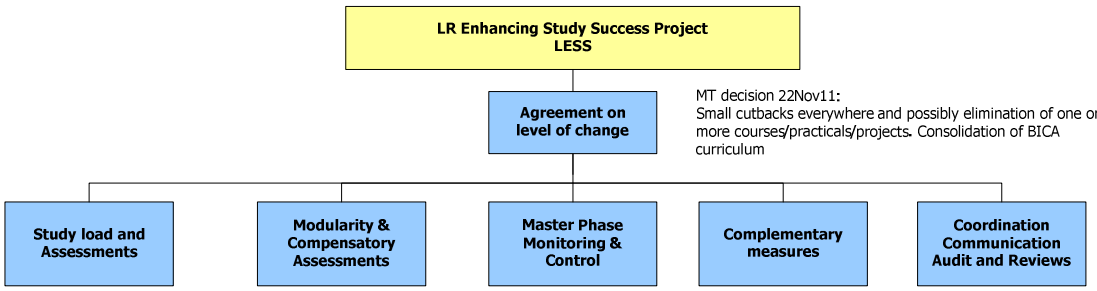

Figure 3 Work Breakdown Structure LESS project

The above Figure 3 shows the work breakdown of the LR Enhancing Study Success project. The Director of Education will take full responsibility for the reduction of the study load and the role of assessments in the education. He is also in charge of the Coordination, Communication, Audits, etc. The activities regarding Modularity & Compensatory Assessments and Complementary Measures are the main topics for the LESS-Committee. Furthermore the committee will act as a sounding board for the Director of Education. The committee has 13 representatives of senior lecturers, students, academic counselors and other representatives of Education & Student Affairs.

Figure 4 shows the milestone planning for the LESS project. It shows that the emphasis in the first half year of 2012 is on study load, assessment and compensatory assessments with the highest priority to the propaedeutic year. Since the BSA norms will rise per September 2012, also the academic counseling and learning of study skills are high priority subjects. We plan to incorporate all measures for the propaedeutic year in 2012-2013 and aim for the other bachelor years as well.

Until June 2012 an orientation will take place about the master monitoring and control. The development of concrete measures and implementation of the measures is expected in September 2013.

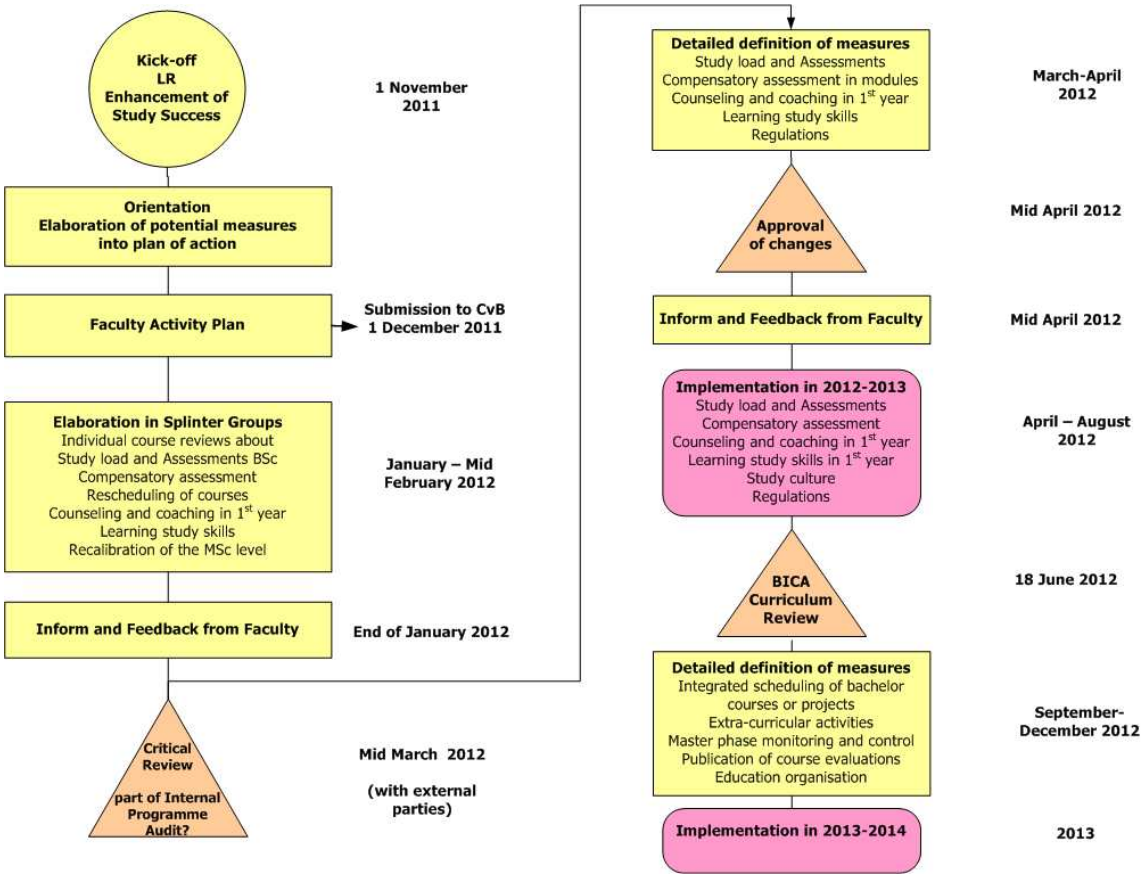

Figure 4 Milestone planning of the LESS project at Aerospace Engineering

STUDY LOAD AND ASSESSMENTS **Brief description of action**	**Results/deliverable**	**Start date**	**Date of completion**	**Actionee and other involvements**
Kickoff Teaching LESS = Learning More Explanation of the road ahead, the urgency, and the tasks and responsibilities of all involved	Kickoff meeting with all Course Coordinators and Companions Request to establish Time-on-task analysis for each course as input to review	Early Jan12	Early Jan12	Aldert Kamp Jacco Hoekstra
Data collection, information retrieval (student experience, course results (QA); time-on-task, teacher handbook (Course Coordinators); advice to Director of Education	Evasys surveys of all courses and projects (2010,2011), QCG reports, Time-on-task analysis, Student time records (2011), BICA Review records June 2011	Mid Dec11	End Jan12	Vincent Brügemann Aldert Kamp, Witold Koning, Course Coordinators, LESS Committee
Individual reviews about BICA learning objectives, key questions, urgency to 10%<cut back<25% of study material, in-class time, time-on-task, formative and summative assessments, (peer) feedback, bonus points, deliverables, tuition method, course or assessment flexibility (intensive or lecturing only), storyline. With Course Coordinator, Companion, Director of Education, external disciplinary expert , didactic expert OC Focus	Per course: topics to be deleted, reduction of in-class hours. Change in learning outcomes, applicable material for the exam, tuition forms and assessment formats, including flexibilities. Weekly schedule of deliverables and intermediate assessments. Change in scheduling (short-fat or integrated with other course or project). Applicable rules for bonus points, resits. Agreements on harmonization issues with courses, projects, theme, storyline. First priority is propaedeutic year	Jan12	Mar 12	Aldert Kamp Course Coordinators & Companions, didactic expert OC Focus, external disciplinary experts Harmonisation of study load over period and possibilities of different scheduling occasionally moderated by a neutral moderator (LESS Committee staff member or other).
Institutionalization of module or semester communities that harmonize content, study load, storyline, deliverables or assessments to avoid time-robbing between courses and peak-loading for students and improve correlation and strengthen cohesion in semester. Neutral leadership essential	Definition of tasks and responsibilities of semester coordinators, housekeeping rules for the communities, in line with other Delft programmes. Recruitment and selection of coordinators.	Jun13		Aldert Kamp Management Team, Faculty Secretary, Ingrid Emmerik, FSR, Board of Studies

MODULARITY & COMPENSATORY ASSESSMTS Brief description of action	**Results/deliverable**	**Start date**	**Date of completion**	**Actionee and other involvements**
Draft scenarios for compensatory assessment regulations within modules. Alignment with other compensatory assessments in other TU Delft bachelor programmes.	First step: different scenarios regulation. Draft regulation: how many compensations within a module? how many per year? freedom of choice for the student?	Mar12	Apr12	Irma Croese and Simone Kuiper LESS Committee, FSR, Board of Studies, Academic Counselors, students, Board of Examiners
Effect analysis for cohorts 2009 and 2010	Analysis summaries 2009, 2010, (2011?), as input to scenario trade offs	Mar12	Mar12	Vincent Brügemann Education & Student Affairs
Scenario tradeoff and selection of best	Regulation in draft format	Mar12	Apr12	Irma Croese and Simone Kuiper LESS Committee, FSR, Board of Studies
Harmonization of existing rules for student commitment, bonus points, validity, resit regulations in courses with summative assessments	Uniform set of rules and regulations applicable for all bachelor courses and projects Directive to the Course Coordinators	Apr12	Apr12	Gertjan Broekman and Simone Kuiper LESS-Committee, FSR, Board of Examiners, Course Coordinators
Detailing the uniform regulations for OER	Updated regulations for OER	Apr12	Apr12	Simone Kuiper LESS-Committee, Board of Examiners
Establishment of transition regulations	Transition regulations as input to OER 2012-2013	Apr12	Apr12	Irma Croese, Simone Kuiper Gertjan Broekman, Aldert Kamp, Jill Morales

MASTER PHASE MONITORING & CONTROL **Brief description of action**	**Results/deliverable**	**Start date**	**Date of completion**	**Actionee and other involvements**
Data collection (student experience, time-on-task analysis per course); advice to Director of Education	Statistics of master phase duration and thesis duration per Track/Profile. Statistics about internship durations Statistics about Exchange durations and frequency Student experiences of master project work (MOP, Literature Study, Internship, Thesis) Statistics of deliverables for project work (throughput time, report volume, papers?)	Early Mar12		Vincent Brügemann Aldert Kamp, Femke Verdegaal, Cora van Haaren, Master Track Coordinators, Master Track Owners
Facilitation Master Track Owners in recalibration of level (ambition) of the master	Discussion paper with comparison MSc Aerospace Engineering with other programmes TU Delft; recommendations how to improve	End Jan12		Aldert Kamp Master Track Owners, didactic expert OC Focus, MSc Programme Directors of other faculties (3mE, EWI, TNW)
Agreement on common constraints for the MICA framework (study contract with the student with committing statement, duration, balanced study load, course and project scheduling, approval procedure of Literature Study and Thesis project assignments, use of rubric assessments, grading, policy with respect to long internships and international student exchange, scientific paper or thesis report, planning or substitution of Literature Study, student coaching, spotting students at risk)	Terms of reference for the MSc Aerospace Engineering	Feb12	May12	Aldert Kamp Master Track Owners, Master Track Coordinators, didactic expert OC Focus, Management Team, Board of Examiners
Definition of measures and tool(s) to monitor and control Thesis Entrance Permit, Literature Study, MOP, Research Methodologies, Internship, Master	Set of turn-key tools and existing best practices, ready to implement in MSc Aerospace Engineering	Apr12	Aug12	Vincent Brügemann and Paul Roling (?), Steven Hulshoff, Academic Counselors, Master Track Coordinators, MSc Programme Directors

Thesis. Aligned with other programmes.				other faculties (3mE, TBM, TNW, EWI)
Coaching of MSc Track Coordinators and Profile Advisors to create the paradigm shift in the study culture in the master. Instruction of master students at Kick-off and in the course of master	Training of Master Track Coordinators Master Track Coordinators are well aware and comply with the Terms of reference Terms of reference that apply to the MSc	Jun12		Aldert Kamp Dean, OC Focus trainer

COMPLEMENTARY MEASURES **Brief description of action**	**Results/deliverable**	**Start date**	**Date of completion**	**Actionee and other involvements**
Study culture: Role of VSV student association in paradigm shift Stronger academic or social integration of students in the Faculty	Proposal of measures, events, how VSV student body could stimulate study success culture	Apr12	Jun12	Witold Koning FSR, Board of Studies, LESS Committee
Extracurricular activities: Investigation which activities (if any) could substitute part of the major of the bachelor or master? Draft of a regulation	Terms of reference for extra-curricular activities, as input to Board of Examiners and OER	Sep12	Nov12	Simone Kuiper LESS Committee, Board of Examiners
Counseling and coaching: Feasibility of reflective interviews (individual or in groups) about choice of study. Possibly aligned with initiatives at other faculties in the scope of study success enhancement.	Proposal how to improve student counseling in the propaedeutic year, how to spot students at risk.	May12	Sep12	Gertjan Broekman/Jill Morales
Training in Learning study skills	Proposal how to proceed for the propaedeutic year. If applicable: new lay-out of AE1150 Personal & Professional Development training, or different implementation	May12	Sep12	Gertjan Broekman/Jill Morales LESS Committee, didactic expertise OC Focus
Publication of course evaluations: Definition which evaluations, which media, which authorisation procedure	Proposal to publish course evaluation on public media. Checked with respect to privacy regulations	Nov12	Feb13	Vincent Brügemann Irma Croese, FSR, P&O Officer

COORDINATION, COMMUNICATION, AUDIT AND REVIEWS **Brief description of action**	**Results/deliverable**	**Start date**	**Date of completion**	**Actionee and other involvements**
Definition of project role LESS Committee; Coordination of LESS project	Execution of this Faculty Activity Plan with the ultimate goal to meet the targets	Dec11	Jan14	Aldert Kamp
Progress reporting to TUD Study Success Steering Group	Regular progress reports and meetings with TUD Study Success Steering Group and the Didactic Working group	Dec11	Jan14	Aldert Kamp Jacco Hoekstra
Communication of study success urgency and progress at LR in AE News, speeches by the Dean, presentations to lecturers, etc	Up-to-date Faculty staff	Dec11	Jan14	Aldert Kamp Dean, Heads of Department, M&C Officer
Preparation and organization of course reviews and audit with external members to review curriculum framework, ambition level, content as Faculty LR specific objective in Limited Programme Audit (TBC)	Efficient individual reviews and successful and useful Limited Programme Audit for the Faculty and the LESS project in particular	Jan11	Apr11	Aldert Kamp and Vincent Brügemann Heads of Department, external experts (preferably TU Delft, or international)
Discussion and agreements about takeover of course leadership by other lecturers or parties	Agreement(s) on takeover of course leadership by non-LR	Jan11	Mid Feb11	Aldert Kamp Management Team, Directors of Education/Programme Directors
Change of education organization in communities with module or semester coordinators	Community of coordinators that assures adequate harmonization of course content, study load, storylines, deliverables or assessments, good correlation and cohesion in the semester modules.	Jan13	Aug14	Aldert Kamp Management Team, Ingrid Emmerik; semester coordinators