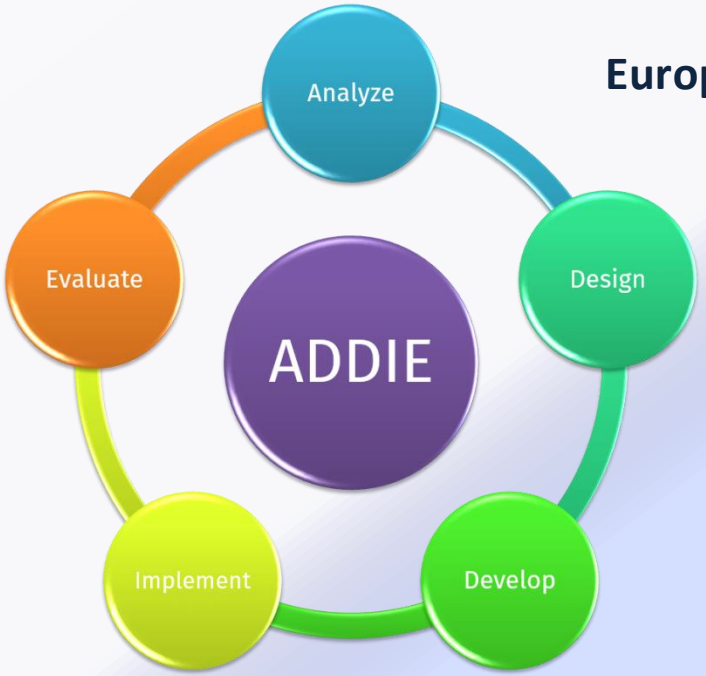
Strategy for curricula design



European experience in developing new and upgrading existing teaching modules and programs. Quality Assurance

CUPAGIS+ Project
Project Methodology on-line session

Presenter: Dr. Arnold Sterenharz
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Main Principles of Instructional Design

9 principles based on the " 9 instructional events and corresponding cognitive processes" by the American psychologist Robert Mills Gagne, one of the founders of instructional design and author of several books on education:

1. Gaining the attention of students, creating motivation for learning, gaining interest in the topic and methods.

2. Informing learners of the objective. Not only giving answer to „why" we learn, also forming a level of expectancy concerning results and the overall process.

3. Presenting new material. Most difficult part of the process - human mind intrinsically has selective perception of any new material → important to plan and implement elements which will hold the students' attention and presenting important points and the core idea in the most approachable way.

Main Principles of Instructional Design

4. Guiding the learning process. Managing the students, semantic coding to ensure newly acquired material will stay in long-term memory.

5. Practical implementation. While knowledge is fresh – implement it on the spot or conduct an experiment to effectively create a connection between theoretical knowledge and practical understanding.

6. Receiving feedback. While planning and working on the learning course, include a flexible system which allows for communication between teacher and students – use the results of the target group analysis. This will be needed for Quality assessment and control.

7. Assessing Performance. Analyse the effectiveness and overall quality of the learning course.

8. Translating theoretical knowledge to practical understanding. Help the students store their newly gained knowledge and explain how to implement it correctly.

9. Transfer knowledge and practical skill onto new and unexpected areas. Inform the students how they can implement their gained knowledge and skill outside of the learning course framework and field.

Strategy for curricula design

Student Centered Learning:

Active instead of Passive learning – discussing, asking and answering

Mutual relationship and respect between teacher and student

The student carries responsibility for his/her decisions to shape study-programme

The Student is central to the learning process

Student is autonomous – chooses courses, manages time and study programme independently

Preparing Students for the future job market

Critical and analytical learning and understanding

Student is not just handed dry information & facts – is encouraged to think and navigate

However, the teacher's role remains primary!

Strategy for curricula design

Student Centered Learning:

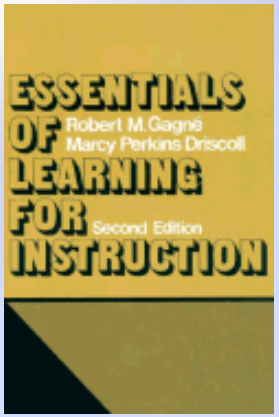
- Student chooses courses of interest, can shape his/her own timetable and decides the course of their study programme

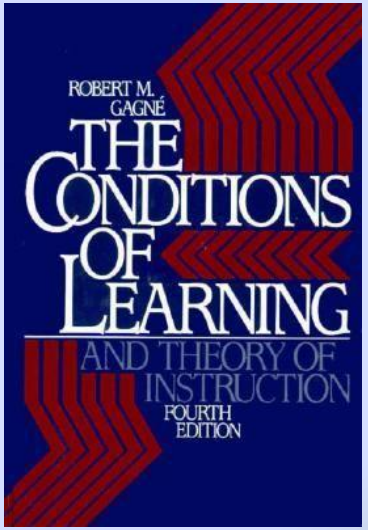
- The goal is to prepare the students for a new, dynamic job market, which requires independence and self-education →
  Therefore a lecturer has to provide more than 'just' information – encourage critical thinking, enhance ability to comprehend new material independently

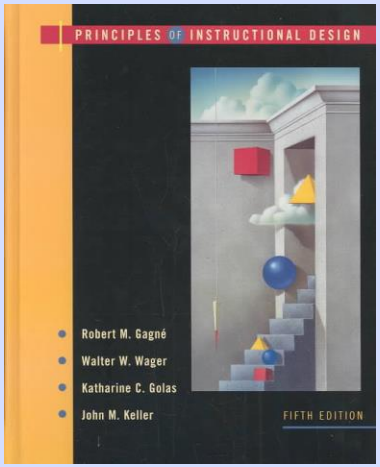
- The lecturer is not in an authoritative, superior position – communication and respect is mutual, lecturer and students can interact eye to eye

Books by Robert Gagne

- *The Conditions of Learning* (1965)
- *Principles of Instructional Design* (with L.J. Briggs, 1974);
- *Psychological Principles in Systems Development* (1962)
- *Essentials of Learning for Instruction* (1975)







Main Elements of a Learning Course

- **Academic Content**: A list of themes and an abstract on the course. A list of mandatory themes and a list of optional themes.
- **Practical exercises:** laboratory or practical work – exercises based on the academic content
- **Exercises to be done independently:** list of exercises, concise task and problem definition.
- **List of possible learning excursions:** e.g.: potential future employers, universities, research centres
- **Technical Infrastructure**: class rooms and laboratories + list of needed equipment, consumable materials and software for theoretical and practical learning.
- **Exams and Tests:** preparation of exercises and possible results
- **Training Manuals and methodological literature**
- **List of primary and secondary academic literature**: important - integrating international sources.

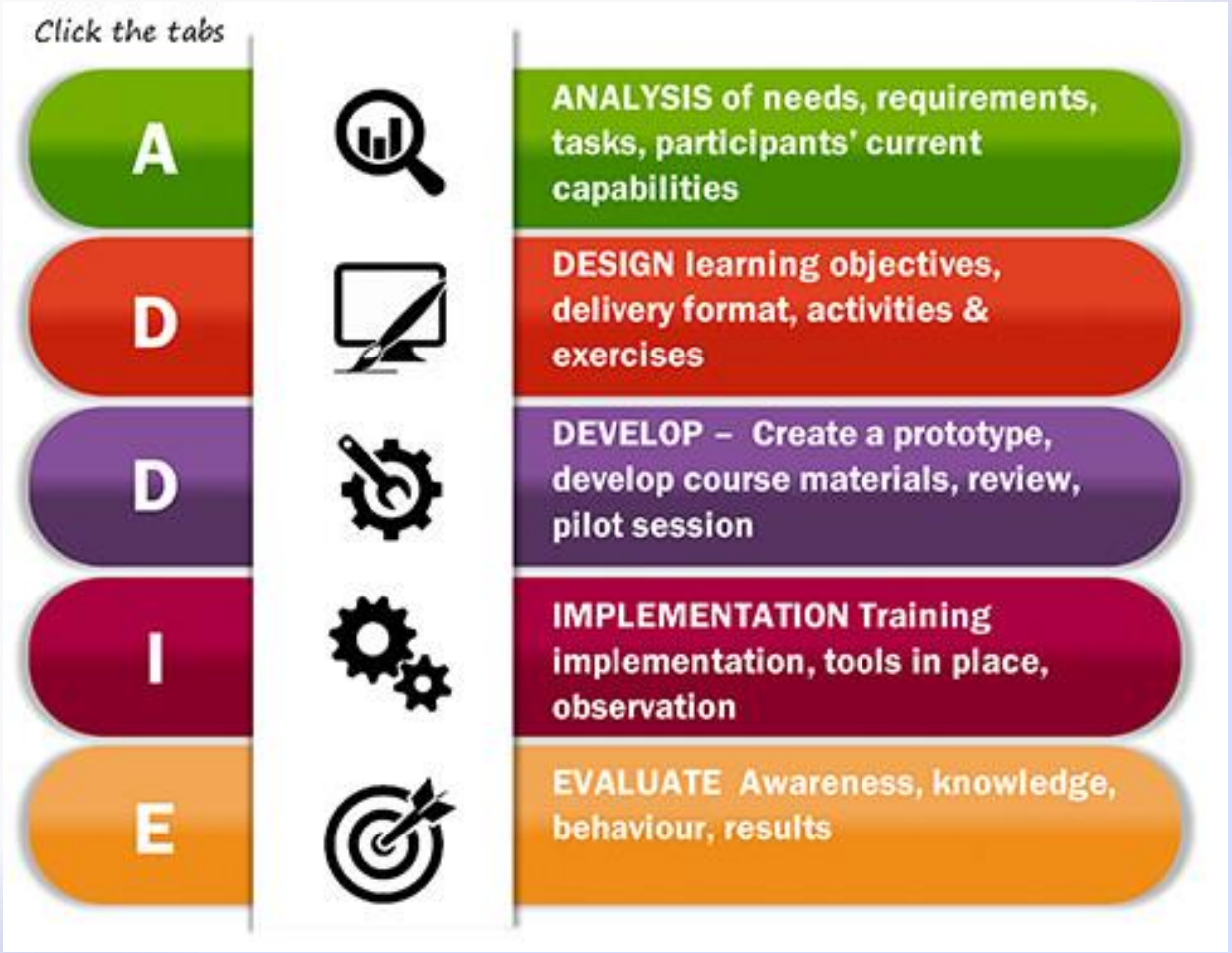
SCL – Student Centred Learning

Method of shifting the focus of instruction from the teacher to the student

- Method is **contrary** to teacher-centred learning, where the teacher is active, student passive.
- In SCL students can influence what they will learn, how they will learn, and how they will assess their own learning - e.g. choice of university courses, choice of theme for essay/written assignment etc.
- SCL implies that each student has their individual learning pace and learning methods which they can implement and which will be respected.

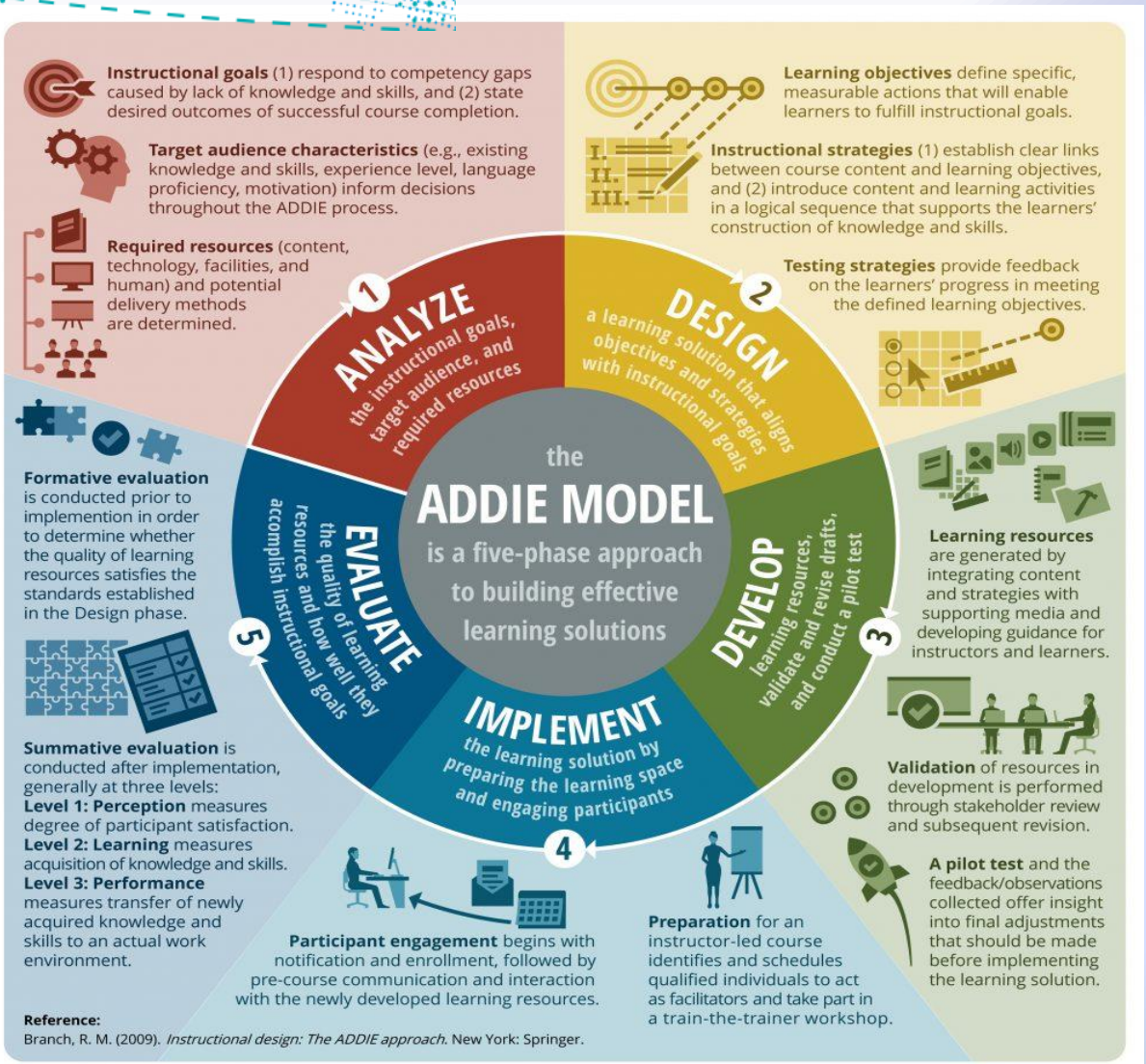
Strategy for curricula design

Methdology on new course development - The ADDIE Model



Currently **ADDIE** is regarded as the standard approach to developing new learning courses.

Strategy for curricula design



ADDIE Model – 5 Stages of Course Development

1. Need Analysis

- Formulating the subject field and the objectives of the analysis
- Defining who the learners are to conduct need analysis
- Creating questionnaires for each target group
- Conducting surveys, collecting and analysing information → creating a report and a list of needs.
- Creating a list of competencies (knowledge and skills) which should be gained from the course.

Possible target groups:
Employers, students, students' parents, alumni, first year students, students who have not been accepted to university, school teachers, university lecturers, members of student selection committee

ADDIE Model – 5 Stages of Course Development

2. Design

Creating a Curriculum description:

- name of the course, target group, time effort of the participants (including theoretical and practical part, practical exercises, independent work, exams and tests, excursions etc.).
- Description of the competencies which will be conveyed (what will the participant know, understand and be able to do after successfully participating in the course).
- Time and quality plan of course (deadlines, responsibilities, control procedures and quality assurance)

Creating a list of possible academic content:

- list of individual seminars within the course, description of each seminar (goals and results), planning learning aids and teaching materials, planning for class room and laboratory, planning excursions, etc.

Assessing plans and descriptions while creating them:

- Organising internal and external quality control.
- Discussing academic content and plans with representatives of the target groups.
- Last modifications taking into account opinions of experts and results of discussions.

ADDIE Model – 5 Stages of Course Development

3. Development

- **Creating a draft version of the academic content:** complete list of individual seminars within the course, complete description of each seminar (goals and results), list of learning aids and teaching materials, plans for class room and laboratory (buying, installing all necessary materials), preparing excursions, etc.
- **Preparing the educational and technical staff:** Short training courses on the theme of the new course. Testing presentations and seminars for student pilot groups (representatives of target groups) – implementing new material and conducting in class rooms.
- **Assessing drafts and test runs while creating and conducting them.** Conducting internal and external quality control. Discussing academic content and test seminars with representatives of the target groups. Making last modifications on the draft taking into account opinions of experts and results of discussions.

ADDIE Model – 5 Stages of Course Development

4. Implementation

- **Conducting course in test phase** - quality assessment and quality control of the academic content. Conducting internal and external quality control. Discussing academic content and test seminars with representatives of the target groups.

- **Making final modifications on the course**, taking into account opinions of experts and results of discussions.

ADDIE Model – 5 Stages of Course Development

5. Evaluation

After gathering first information on the learning course its effectiveness must be evaluated.

- Comparing set goals with real outcome - academic content, the gained competencies of participants, the exercises (are they doable? are they conducive?)
- Modifications on the course as a whole or on certain elements must be made → course must be reviewed and renewed as needed.

Modernisation of Existing Learning Courses

- Analysing new needs and requirements.
- Conducting a review analysis.
- Analysing whether the academic content of the course is in accordance with new requirements.
- Reviewing the quality assurance system and modifying it if needed.
- Creating a plan on steps to improve the existing learning course.

Example 1 Curricula Description Model

Embedded System Development: DS

TMMA - BE 17/05/2017	
TITLE OF THE MODULE	**Code**
Embedded System Development: Digital Systems Design	

Teacher(s)	Department
Coordinating:Dirk Van Merode **Others:**	Technology Campus De Nayer Electronics – ICT

Study cycle	Level of the module	Type of the module
BA	BA	compulsory

Example 2 Curricula Description Model

Form of delivery	Duration	Langage(s)
Presentations/Lab sessions/Hands on	12 weeks	English

Prerequisites	
Prerequisites: - Students need to have a starting knowledge on digital, electronics, both combinatorial and sequential logic.	**Co-requisites (if necessary):** - students need to be able to use a computer - students need a good knowledge of the English language B1 (speaking, understanding and reading) A2 (Writing) according CEFR (Common European Framework of Reference for languages)

Example 3 Curricula Description Model

ECTS (Credits of the module)	Total student workload hours	Contact hours	Individual work hours
3	90	54	36

Aim of the module (course unit): competences foreseen by the study programmes
To get a profound knowledge about hardware and software aspects of performant digital systems. To be able to develop, put into use, test and improve a digital system on a FPGA with the use of VHDL.

Learning outcomes of module (course unit)	Teaching/learning methods	Assessment methods
Explain the operation of basic digital gates on a transistor level.	Classroom teaching	Oral Exam
Explain the different hardware aspects in digital systems design.	Classroom teaching	Oral Exam
Explain general principles and different hardware resources within an FPGA.	Classroom teaching	Oral Exam

Example 4 Curricula Description Model

Explain the different subjects, usage and meaning from the datasheet of a modern-day FPGA.	Classroom teaching	Oral Exam
Explain usage, application field, language aspects, synthesis, Finite State Machine development, simulation with VHDL.	Classroom teaching	Oral Exam
Explain testing strategies in digital systems.	Classroom teaching	Oral Exam
Explain timing aspects in digital systems design.	Classroom teaching	Oral Exam
Develop, test and improve an elaborated digital system on an FPGA with the use of a Hardware Description Language.	Lab exercises	Practical Test
Develop a hierarchical design with the use of components.	Lab exercises	Practical Test

Example 5 Curricula Description Model

Themes	Contact work hours							Time and tasks for individual work	
	Lectures	Consultations	Seminars	Practical work	Laboratory work	Placements	Total contact work	Individual work	Tasks
Logic Families	2						2	1	Learn for the oral exam
FPGA Architecture	4						4	2	Learn for the oral exam
FPGA hardware in-depth analysis with datasheets	6						6	3	Learn for the oral exam
VHDL	8						8	4	Learn for the oral exam
Testing in Digital Systems			2				2	1	Learn for the oral exam

Example 6 Curricula Description Model

Assessment strategy	Weight in %	Deadlines	Assessment criteria
Oral Exam	50%		3 questions on the theoretical subjects
Practical test	20%	Week 6	
Project work	30%	Week 12	

Author	Year of issue	Title	No of periodical or volume	Place of printing. Printing house or internet link
Compulsory literature				

Strategy for curricula design

Example 7 Curricula Description Model

Assessment strategy	Weight in %	Deadlines	Assessment criteria
Oral Exam	50%		3 questions on the theoretical subjects
Practical test	20%	Week 6	
Project work	30%	Week 12	

Author	Year of issue	Title	No of periodical or volume	Place of printing. Printing house or internet link
Compulsory literature				
Additional literature				
Richard E. Haskell Darrin M. Hanna	2014	Digital Design Using Digilent FPGA Boards		LBE Books – Third Edition

Quality Control

1. Quality Group

Create a quality group in your university that will be responsible for the quality level of each new or modernized curricula/courses/modules in the target field. Possible quality group's members:

Students (1-2 persons)
Alumni (1-2 persons)
Teaching staff (2-3 persons)
Potential employers (1-2 persons)
Non-academic partners/other organizations that have an appropriate qualification an competence/experience in the curricula development in the target field (other universities, research centers, hospitals, ministries, etc) – (1-2 persons)

Quality Control

1. Quality Group. Tasks of the quality group:

- Constant control of implementation of tasks
- Need analysis
- Review analysis of current curricula
- List of curricula/courses/modules that should be modernized
- List of new curricula/courses/modules that should be developed
- Plan of modernization and development of curricula/courses/modules
- Implementation of modernization and development of curricula/courses/modules with participation of teaching stuff that took part in the trainings in European universities
- Ensuring of communication with the labor market, potential employers and other organizations during implementation of the tasks

Quality Control

1. Quality Group. Tasks of the quality group:

- Regular conducting of meetings, negotiations regarding the tasks
- Conducting of surveys of target groups in order to learn about their opinion regarding curricula/courses/modules modernization/development
- Studying of teaching material received from the European consortium partners; summarizing, studying and disseminating of the information received on the trainings in the European universities
- Studying of national/international educational standards, as well as recommendation of Bologna process
- Studying of the latest (up to 5 years old) results of scientific research of foreign scientists
- Organization and implementation of peer review (see 3)

Quality Control

2. Quality Indicators (examples)

- Balance of student's workload: theory, practical work (not less than 50%), individual work, internship in a company, testing system
- Application of ECTS by developing new modules/courses/curricula or modernizing the old ones
- Usage of information about the latest (up to 5 years old) results of scientific research of foreign scientists in teaching materials
- Usage of the university online educational platform during the educational process
- Ability of students to influence the educational content or process. For instance, ability of students to choose a topic of reporting or practical works, to attend elective modules/courses.

Quality Control

2. Quality Indicators (examples)

- Partial teaching and implementation of reporting works in English
- Portfolio of student's completed practical works in a group
- Correspondence to the national norms (standards) of education
- Consideration of a new module by the university council of experts with the participation of potential employers (chair meeting, meeting of educational council)
- Publications of teaching staff or students, participation in conferences on the module's topics

Quality Control

3. Peer evaluation of new/modernized modules/courses/curricula

Potential peer reviewers:

•Create a list of potential peer reviewers (organizations or persons) that you consider competent enough to conduct a peer review of your new/modernized modules/courses/curricula. These could be representatives of research centers, universities in your country and outside your country, hospitals, ministries, etc.

•Define 1-3 peer reviewers and conduct negotiations with them of when to send them materials for a peer review

Quality Control

3. Peer evaluation of new/modernized modules/courses/curricula

- **For a peer reviewer you have to provide at least:**

Curricula description
List of quality indicators
Selected documents, which will correspond and support your quality indicators.
You have to decide YOURSELF which accompanying documents suit best.

- **Quality assessment of implementation of new and modernized modules/courses/curricula: Peer review template -** This template will allow peer reviewers to give quality assessment of each curricula module.

Quality Control

3. Peer evaluation of new/modernized modules/courses/curricula

Award system of the peer review:

•Each module is assessed by each of your quality indicators.
•Five-point grading scale is used for the assessment (5 is the highest (excellent) point, 0- the lowest).
This five-point grading scale should assess each indicator.
•After the assessment of all indicators, all points that they received should be summarized and divided by the amount of indicators. Therefore, you will get an arithmetic mean, which will be a “grade” for your module.
•Besides, peer reviewers should explain in details their scores and leave their recommendations, suggestions about what should be done better in order to improve a module.

Quality Control - Peer review template

Name of the university: **Module/curriculum/course title:** Xxxxxxxxxxx

Award criteria:	**Score**	**Max**
Indicator 1: Balance of student's workload	4	5
Comments/recommendations of a peer reviewer		
Indicator 2: Application of ECTS	4	5
Comments/recommendations of a peer reviewer		

И так по каждому индикатору

Quality Control - Peer review template

Total score:	**40 (max. 50)**
Number of indicators	**10**
Arithmetic Mean	**4***
Summary of the peer reviewer:	

Score of the Module "Occupational Health" = 40

Number of quality indicators: 10

*40/10 = 4 (arithmetic mean = "grade" of xxxxx module)

Strategy for curricula design

Thank you for your attention!

EXOLAUNCH GmbH

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