

COMPETENCY-BASED CURRICULUM DEVELOPMENT. VERTICAL MODULARISATION IN MULTI-CYCLED TRAINING

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It should not be proved, that competency or module is one of the most often used terms in the field of education. For almost every school level, today it is a widespread "fashionable" trend usage, and a curriculum developing principle, which explanation and usage is studied by several researcher in Hungary and abroad as well.(1) In the following part, I would like to show relations—without completeness- that can help to clarify the terms, throughout firstly in the curricular, structural and developing work of vocational training and higher education.

About the term of module-system in briefly

We can hardly find a term, which we use so "fashionable" in the field of pedagogy. Disregarding the presenting-analysing explanations with the high standards of education science, -mainly their education history roots- in the following I try to show the most important characteristics and relations.

A general definition: "The module is a teaching-learning element, which content is relatively homogenous, connecting integral themes together".(1)

It follows from the foregoing that the learning of homogeneous, connecting integral curriculum elements are not depend on the timing of learning themes, or its schedules. Not, as in case the *time-based teaching-learning models*, where it requires a particular *sequence*.

The term of module is often *used synonym with the term of "subjects group" or subject*. This is not fortunate, as the single *subject topics based on very different logical structural principles, scientific fundamentals, disciplinary and function elements*. Despite, we naming them modules, the most important criterion, the homogenisation of curriculum, won't be realised. However, this is also a wide term and understanding, what do we call "homogenous" in case of a subject, or curriculum. Thereby, this definition also gets wider explanations, when we **step out** from a certain education form, or education area and try to bring the **verticality** considerations to this investigation.

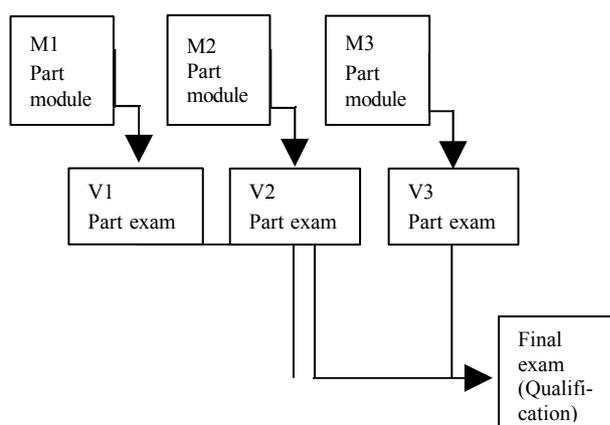
Instead of continuing the further principle-theoretical philosophising about the use of terminology, let's see the types of modules in more detail.

Types of modules

By way of introduction, I would like to tell, that there are many different ways of classifications, but all has to follow the specific principles of teaching-learning process.

From the point of view of teaching-learning process

- *Content module*: This means differentiation between the contents in different educational structure. This content modules show the integral connection of themes that related to aims and the characteristics and of specializing in the training.
- *The module of education (teaching-learning), training*: In this module, the input, the main *diagnosing (self-checking)* momentums of teaching-learning process, the aims of *correction, close-up, addition, bringing on same levels etc.* based on this. If we try to represent on the basis of this the module system learning process, then we can use effectively the *special block-scheme of part-modules and part-exams* as follows:



Module of control and valuation

Basically, this is the module of containing pedagogical control and valuation, and the final valuation, examinations during and in the end of the briefly mentioned process beforehand. (What, who, how, by what, when, and from *what kinds of point of view* valuate/qualify and document.)

Module of requirements

This also can be connected to the process-classification, as at the beginning of training (input) there are some elements *containing the content and level together*, that makes unit. As well as at the end of process, on the output, we also find *tasks, requirements*, which *related to the valuation-control process*. At the same time, when we think of the modern-, not the ones, that coming to the front the process-approach -learning- organizational methods, than the *outgoing requirements has regulation for the process itself, the containing and the activity module coming afterwards*. A special type of outgoing module is *the ending part of part-modules, or the requirements of examination*.

Activity modules

It has a significant role in the vocational training, but also in the public education and higher-education, as the *improvement of different general-*

and professional-, and key-abilities implement throughout the student activity. (2). It means, that in this case, in the centre of module related to contents there are the followings: What kind of task, how rapidly, and how long does the student? In the field of professional training the *professional activities has significance (drawing, measuring, fitting, manufacturing, planning, mending etc.)*, and the situations, simulations and other activities serving the development of key-qualifications (tolerance, cooperation, creativity, professional and language communication etc).

Horizontal module

Until now, this was the most popular type of module, as it arranged the contents related to the teaching-learning process on same level and school section, into "moduls" based on some principles.

That is, the shaping of modules was applied on the levels of primary school, secondary school, vocational training, college and university education separately.

On the basis of that, the modules M1, M2, M3 and M4 in Figure 2 extend only to the training levels of skilled workers or only to that of technicians or only to that of engineers.

Vertical module

It comes from the above-mentioned, that a module-system would be more and more essential, that implements not horizontal, the side by side modularisation related the same school-level, but also the **vertical levels** as well. (3)

I try to represent on a concrete professional area, on the field of wood-industry.

We carried out the principle of vertical modularisation in generally (Fig. 1) and in the wood-industry (Fig. 2) in the framework of vocational training pedagogical research.

Figure. 1. Vertical module-system in the wood-industry. The general model of profession-structure

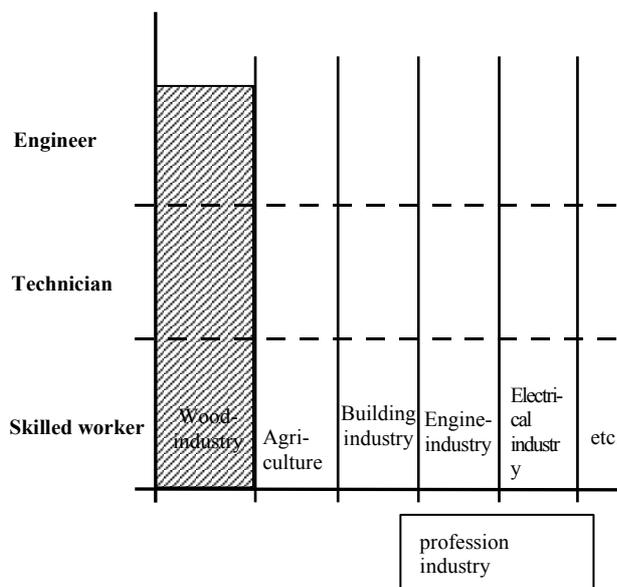
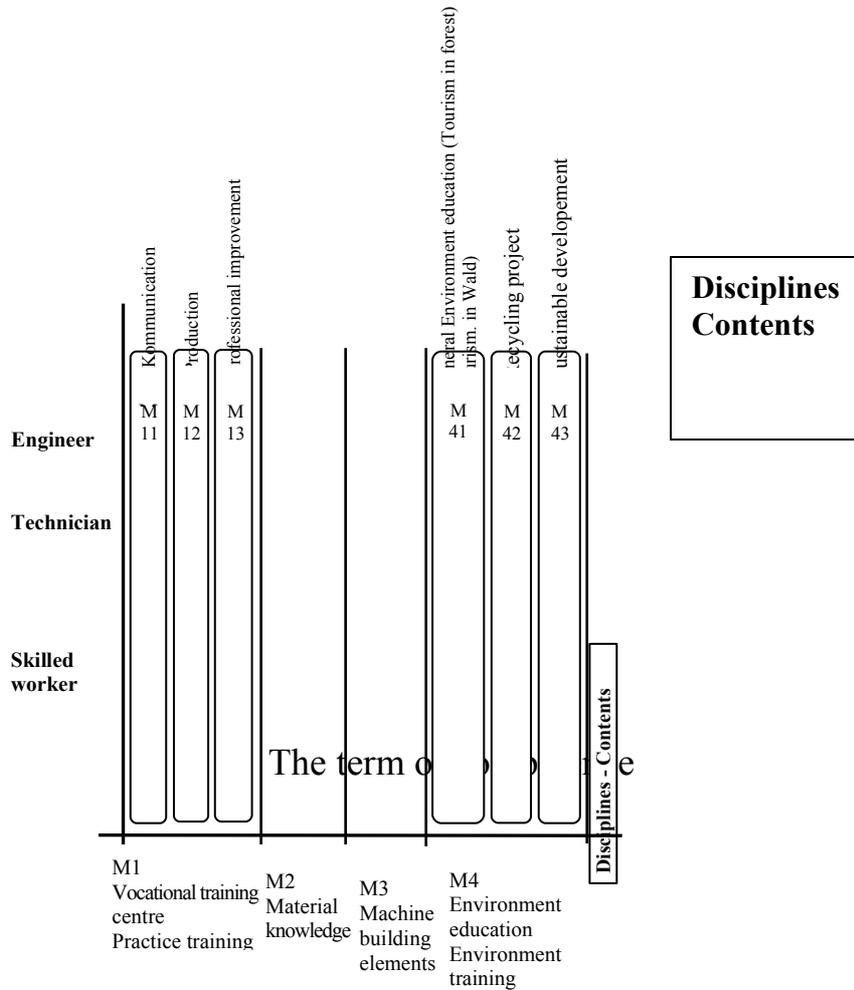


Figure. 2. Module-system (B) "Vertical Modularisation"
Wood-industry / Woodtechnic

Quality level



The explanation of competence. According to the general explanation it means cognizance, title, special knowledge. In the education-training we can definite the *multi-level meaning* of this term according to a specific hierarchy. According to this:

- Work/ specialization expansion (competency map)
- Activities, professional tasks
- The necessary abilities for working/learning, the knowledge itself, as higher learning achievement
- We can interpret as the synonym of *key-qualification/abilities*.

Types of competences

A distribution of term always shows "voluntary" aims. This is the same in case of competency, so now follows a taxonomy according to specific point of view:

- Methodological competence
- Social competence
- Activity competence
- Communication competence

Perhaps, it is the most important to present the different terms, the relations determining the syllabuses and activity systems. For example, the skill and qualification are close to this definition.

Skill – sensomotoric coordination by needlework, key skill, core skill.

Qualification – cultural level, justifiable, comparable, can be examined. (4)

The multi-cycled training and competency, and module-system

Here we can briefly mention, related to the so called Bologna process reform of higher education, that now we make the preparation for the two-cycled education. In the framework of this, the register of the basic subjects and map of competence should show harmony, that can be helped by the scientific grounding and the clarifying of definitions. By nowadays, the list of specialisations is clear, but it is still not clear, that how can the MSc level connect to the outputs of BSc levels? Where will be differences? For these questions, the answer has to be looked by general aspects and concrete specialisations as well. Somehow like this:

1. *Main principled questions:*

1.1. How the BSc and MSc level education build on each *other in the field of competence?*

The main „arranging principle“: The academical engineer is practice-oriented, making the preparation for production of products, while the university graduates preparing for the theoretical-oriented planning, *researching and leading tasks of organisation units.*

1.2. *Competences of wood engineers*

- *Planning and controlling technological processes* in wood industry
- *Operation and maintenance* of producer equipments
- Preparation and production of different wood products
- Programming, quality-control, control

1.3. *Competences of qualified wood engineers*

- Controlling technological processes, *leading organisation units*
- *Planning and developing new technologies and equipments*
- *Planning* products of wood industry
- *Research* of structures of wood-industry, technologies, materials and machines

1.4. In what the syllabus way has to be difference?

Firstly, in subjects showing *higher theoretical levels* and in task-systems, and contents connected to competences.

Secondly, in the nature of *orientation* (technological planning, developing, operating, and develop and research of products and constructions, head of company, leader).

1.5. How shall we take into consideration the different foundation?

- For students graduated from gymnasium have to fulfil on BSc level 1 semester 4 hour per week *founding practice in wood science* in vocational training centre, which held by the trainers from the vocational training centre and *graduates from technical school* together.

- Students being on different level in computer science have to bring on same level.> Minimal engineer level, that has to be diagnosed.
- Compensating and closing up education based on the knowledge level of foreign language + *professional language education*. After the concrete thing, we touch on generally the building of three (BSc, MSc, PhD) cycle of technical specialisation, exactly the structure of module system and their naming.

**CURRICULUM OF TECHNICAL SPECIALISATION
(MODULE AND SYSTEM OF SUBJECTS)
Higher education basic BSc level**

Basic module (by function)	<i>Module (by content)</i>	Total Credit	Subject		
			Köt.	Köt. vál.	Sz. v.
Generally education	<i>Humanities -social science</i>	18	6		
Intellectuals training	<i>Economical Environmental science Closing-up(*)</i>		10 2		0
Natural science- Engineering fundamental	<i>Maths Physics Chemistry Engineering fundamentals and Practices(**)</i>	38	10 8 6 14		
Professional basic education	<i>Material science Mechanical(constructional, electrical) Technological/Production, Vocational training centre-labour practice</i>	66	x x x 6		
Differential and complementary Professional Education	<i>Specialisation professional modules Logistics Quality management Industrial-production practice 4</i>	(40)	18	12 2 2 2	
Diploma work		18			
TOTAL		180			

(*)= in foreign languages and Informatics, and for high-school graduations from professional theoretical and basic practice in training centre (Technical measurement, tool-usage)

(**)= Free-hand drawing, Material science fundamentals, Fluid and convection mechanics, Electrotechnics, Statics, Technical drawing

**MASTER EDUCATION (MSc) LEVEL CERTIFICATED X-Y
ENGINEER**

Basic module (by function)	<i>Module (by content)</i>	Tota	Credit	Subject
Generally Education	<i>Humanities -social science.(*) Economical science(**) Methodology (***)</i>		18	-
Applied nature - and technological science	<i>Applied mathematics Applied physics Applied chemistry Applied informatics Technological/Constructional</i>		24	
Professional basic education	<i>Material science and qualification Product/process planning and development</i>		36	

	<i>Technology/process and control</i>	
Differential and complementary Professional Education	<i>Environment-ergonomics</i>	22
	<i>Quality-management</i>	
	<i>Specilisation</i>	
	<i>Connected engineering practice</i>	
Diploma work		20
TOTAL		120 Kredit

SPECILISATION

In qualified Wood engineer major

- Product developer
- Wood constructional
- Wood energetic and industrial environment protection

in QUALFIED. Light Industry engineer major

- Product developer
- Media technology and development
- industrial environment protection

(*)=*Political science, Law, Engineer ethics, Engineer and technique history, Technical sociology, Professional foreign language, Environment sociology, Engineering pedagogy*

(**)=*Marketing-management, Business communication, Quality control, Leading and organising*

(***)= *Research methodology, Innovation management, Szocio-technics (trainings)*

It also would be important to specify the structural areas of doctoral education built on two higher education cycle fitting to the credit system. So a united stand, regulation would be necessary for doctoral schools to "share" the 180 credit for scientific foundation, theoretical and practical research activities. The education of leaders, the development of attitudes of quality management and skills must be ensured in higher education in harmony with the opinions in publications of doctoral schools and the program elements of NFT (National Development Plan). I suggest, that students of a non-pedagogical doctoral school should prepare within a higher education pedagogical module for the education, and we have to make foundation of *skills for knowledge transformation. The field of knowledge of research and knowledge and its part module has to be in connection with this.*

For this a draft showing the general structural ratios can be seen in the followings:

PHD DOCTORAL EDUCATION LEVELS (PERIOD)

<i>Function modules of the education</i>	<i>Credit</i>	<i>Contents module/subject</i>
General areas of scientific field	6	<i>Research methodology</i> <i>General and scientific taxonomy</i>
Specialisation scientific	14	<i>Specialisation science 1 foundation</i> <i>Specialisation science 2</i> <i>Inter,-multi ,- and trans disciplines</i>
Professional scientific theory	30	<i>Science 1</i> <i>Science 2</i> <i>Science 3</i>
Research Knowledge transforming and knowledge-research management	60	<i>Research practice</i>
	6	<i>Higher education pedagogical foundations and methods(*)</i> <i>Knowledge and research</i>

Doctoral examination	28
Defense and presentation of dissertation	30
TOTAL:	180 Credit

(*)=Only for non-pedagogical majors
> Introduction to pedagogy and psychology
>Technology and methods in education

To sum it up, I would like to emphasize. That the act ivy-oriented starting point of choose and arrange of curriculum serves the modular education. These important principles have to applied in all three cycle of higher education, and quality in doctoral education has to strengthen throughout the development of knowledge transformation and the knowledge in management of education and research.

References

- [1] LÜKŐ, István (2005), Desing and Development of Modular Training Package ILO Regional Office for Arab States Beirut – Lebanon-Sopron, 30 May, 34 pp.
- [2] UDVARDI LAKOS, Endre (2000), "A modulrendszer fogalmáról", *Szakképzési Szemle*
- [3] LÜKŐ, István (2003), "Kihívások és válaszok a kontinentális térség felsőoktatásában", *Nemzetközi Felsőoktatási Konferencia Pécs*, előadás, október 23-25.
- [4] LÜKŐ, István, „Bericht für DAAD Von Aufenthaltes an der Universität Hamburg Internationales Forschungsseminar anm Institut für Berufs,-und Wirtschaftspädagogik der UNI Hamburg"
- [5] LÜKŐ, István (2004), „Öntsünk tiszta fogalmakat a pohárba!" *Munkakultúra és szakképzés*, konferencia, előadás Hajdúszoboszló, február 12-14.