

Development of a learner-centered learning process for a course

Case: The course Business Information Systems in Hasselt University

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Abstract—A learner-centered learning process combines the concepts of competence directed curriculum design and constructivism based learning process design. We define general competences (critical reflection, creativity, research attitude) and course domain specific ones (content topics). Constructivism learning theory means active construction of new knowledge based on learner's prior experience. We defined general, collaborative and assessment design elements. A Model for the development of the learning process has been built. Attention goes to the blended ICT based model.

Key words: Constructivism based learning, Student centered learning, Course development, Collaborative learning.

I. A SHIFT FROM TRADITIONAL TEACHER-CENTERED LEARNING TO LEARNER-CENTERED LEARNING

A. A shift to learner-centered learning [10]

In the teacher-centred teaching method the focus of teaching is on the delivery of the content by the teacher as defined in a curriculum commission fitting pre-defined objectives of the study program. The individual student is not involved and the curriculum does not care about the individual student's preferences. The instructor determines the content and organization of the course to a great extent. The students are recipients of the instructor's knowledge.

Nowadays students are more demanding than they have ever been. They need a more individualized way of learner-centred learning, fitting their personal learning styles. In learner-centered learning and teaching methods we see a shift of the focus of the activities from the teacher to the learners. Learner-centred learning includes active learning, cooperative learning, and inductive learning. In active learning, students solve problems, answer questions, formulate questions of their own, discuss, explain, debate, or brainstorm during class. In cooperative learning students work in teams on problems and projects under conditions that assure both positive interdependence and

individual accountability. In inductive teaching and learning students are first presented with challenges (questions or problems) and learn the course material in the context of addressing these challenges. Inductive methods include inquiry-based learning, case-based instruction, problem-based learning, project-based learning, discovery learning, and just-in-time teaching.

B. Learner-centered teaching

Learner-centered teaching represents a paradigm shift from traditional teaching methods by focusing on how students learn instead of how teachers teach. Following are key selected premises of learner-centered teaching [1].

- 1) Assume that students are capable learners who will blossom as power shifts to a more egalitarian classroom.
- 2) Use content not as a collection of isolated facts, but as a way for students to critically think about the big questions in the field.
- 3) Change the role of teacher from sole authoritarian to fellow traveller in search of knowledge.
- 4) Return the responsibility for learning to the students, so that they can understand their learning strengths and weaknesses and feel self-directed in their knowledge quest.
- 5) Utilize assessment measures not just to assign grades, but as our most effective tools to promote learning.

The result of this paradigm shift is that teachers will become co-learners with students, thus blurring the categorical distinction between these two groups. The broad learner-centred paradigm encapsulates our current understanding of the "best practices" in teaching, including an emphasis on active learning, problem-based learning and, more generally, a thoughtful understanding of what the best teachers actually do in their classrooms [2].

II. COMPETENCY BASED TEACHING AND COMPETENCY BASED CURRICULUM DEVELOPMENT

Learner-centered means that the curriculum is developed based on a set of required competences. For the learner, being competent means being able to display relevant skills and knowledge in order to solve a (even poorly defined) problem.

A. Competency based teaching

A description of a competence includes the required skills, the knowledge and the attitudes. We can differentiate between general competences, general academic competences and scientific, domain specific knowledge competences. General competences in higher education are about critical reflection, creativity, basic management tasks (if education program is in management), communication skills and orientation towards life-long learning. General academic competences are about research attitude, research methodology, explorative research, multidisciplinary teamwork. While scientific domain specific competences are about the relevant learning content topics of that domain.

B. The development of a competency based curriculum follows next development steps:

- 1) *Competences design(To be explained in next section).*
- 2) *Development of the study program or curriculum, being a set of courses covering the content domain of the study program.*
- 3) *Development of each course of the curriculum. It includes the formulation of the objectives, the competences, the content, the teaching methods, the assessment methods and the learning materials.*

C. Competency design process

Following GC. Burrill [3], the competency design process consists of 5 steps:

- 1) *Assumptions.*
- 2) *Developing general competences.*
- 3) *Skill definition.*
- 4) *Format of competency statements.*
- 5) *Validation.*

1) *Assumptions:* Several assumptions have to be clarified concerning students learning. So we set forward in higher education that general as well as professional as well as research oriented competences are required. We also set forward that the beliefs, and skills. With a constructivist approach, students synthesize new understanding from prior learning and new information.

requirements differ for bachelor and for master level. On master level we expect, for example, that a student can handle complex problems, can reflect on own work solutions and can communicate about it and can act as an independent researcher. In addition, we set forward that the requirements will differ for different study domains.

2) *Developing general competences areas:*

The general competences result from contact with the future working environment. Preliminary interviewing of professionals can be organized.

3) *Skill definition:* Domain specific competences result from both contact with the job environment and with the knowledge of international curricula references.

4) *Format of competency statements:* A skill is formulated in a general way. Afterwards a skill will be detailed in a set of tasks. Demonstrating that the student has the skills can be done by an examination by an expert, or by a letter including the verification by a supervisor via observations of learning activities.

5) *Validation:* The format of the competency statements will be revised based on comments, observations and problems uncovered in the field by experts being professionals working in the course domain and by academicians with extensive experience in the domain.

III. CONSTRUCTIVISM THEORY

A. A definition of constructivism learning

In Koohang et al [4], the following definitions about constructivism can be found:

“Rooted in learning theories advanced by Dewey (1916), Piaget (1973), Vygotsky (1978) and Bruner (1996), constructivism learning theory is defined as active construction of new knowledge, based on learner’s prior experience”.

“ The key idea is that students actively construct their own knowledge: the mind of the student mediates input from the outside world to determine what the student will learn. Learning is active mental work, not passive reception of teaching“.

B. Constructivism and Conversation theories and implementation aspects

Constructivism theory is based on the idea that people construct their own knowledge through their personal experience. Constructivism is a learning strategy that draws on students' existing knowledge,

The effectiveness of Constructivism is that it prepares students for problem solving in complex environment [5]. In Constructivism theory; students

are more active in building and creating knowledge, individually and socially, based on their experiences and interpretations [6].

Conversation theory supports Constructivism theory by facilitating collaboration, communication, interaction, and knowledge construction and sharing amongst the students and with the teacher, which improves learning outcomes and quality more effectively. Conversation theory of learning fits into the constructivist framework, since the emphasis is on student as an active maker of knowledge [8].

To apply Constructivist theory, a learning environment should be designed, implemented, and then guided through the process of collaboration and interaction between students, as stipulated in Conversation theory, so that learning is constructed by the group, rather than just the individual [7].

Teacher's role is essential and important in the learning process. The role of the teacher in Constructivism theory is to try to understand how students interpret knowledge and to guide and help them to refine their understanding and interpretations to correct any misconception arises between students at an early stage and improve learned knowledge quality. The constructivist teacher sets up problems and monitors student exploration, guides student inquiry, and promotes new patterns of thinking. Working mostly with raw data, primary sources, and interactive material, constructivist teaching asks students to work with their own data and learn to direct their own explorations. Ultimately, students begin to think of learning as accumulated, evolving knowledge. Constructivist approaches work well with learners of all ages, including adults.

C. *Constructivism based learning process design model*

Constructivism based learning process design consists of learning design elements and learning assessment elements. Learning design elements consist of fundamental design elements and collaborative design elements; as illustrated in Figure 1.

- 1) *Fundamental design elements:* The fundamental design elements are essential for designing learning activities, and they include:
 - a) *Students are encouraged to develop their own goals and objectives in solving problems.*
 - b) *Problem solving, application of knowledge, higher-order thinking skills and deep understanding are emphasized.*
 - c) *Students are encouraged to do exploration to seek knowledge independently.*
 - d) *The student plays a central role in mediating and controlling learning.*
 - e) *Students are asked to include and apply their own previous experience and knowledge in the situation.*
 - f) *Interrelatedness and interdisciplinary learning are encouraged.*
 - g) *Students are asked to expound what they have learned.*

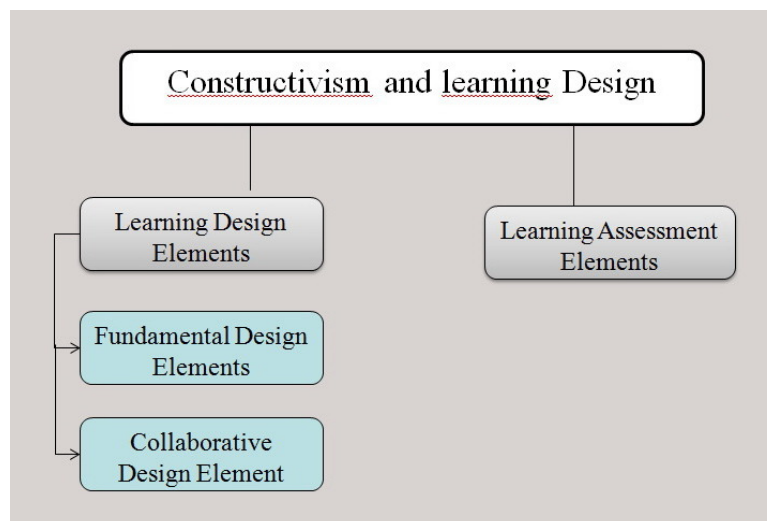


Figure 1. Constructivism based learning process design [4].

- h) *Interrelatedness and interdisciplinary learning are encouraged.*
- i) *Students are asked to expound what they have learned.*
- j) *Learning is embedded in a realistic and relevant context.*
- k) *Students are presented with a real-world situation.*
- l) *Students are asked to reflect on what they have learned.*
- m) *The learner should be required to give justification for his or her answers, and scaffolding becomes a vital learning means.*

2) Collaborative design elements

The collaborative design elements are essential for collaboration and constructing new knowledge, and they include:

- a) *Cooperative and collaborative learning are favored in order to expose students to alternative view points.*
- b) *Knowledge construction takes place in individual contexts and through social negotiation, collaboration and experience.*
- c) *Interchange of knowledge and discussion about viewpoints within a team of students.*

3) Learning assessment elements

The learning assessment elements which include: self-assessment, team assessment, and teacher assessment, are essential in learning process and should be integrated with a project or a task rather than a separated activity.

IV. LEARNING PROCESS DESIGN

1) Learning content structure

Linked with the phase of defining the specific course competences, the learning content of the course will be decided and structured as a set of topics or modules. In this phase also the intended learning level for each module has to be identified. For some modules the learning process can be limited to only a traditional classroom session and for the learner being informed and becoming knowledgeable about the topic. Though for more important topics the learning process will include more participation of the learner and even will be organized as a real constructivism

based learning process consisting of several learning activities.

2) The 5 E-model [9]

The 5 E-model is an instructional model based on the constructivist approach to learning. The model proposes 5 learning principles:

- a) *Engage:* Learners will become engaged in the concept, process or skill to be learnt.
- b) *Explore:* Learners actively explore their environment or manipulate materials.
- c) *Explain:* Learners experience opportunities to verbalize their conceptual understanding or to demonstrate new skills or behaviors. In this phase the teachers will also introduce formal terms, definitions and explanations about the learning content.
- d) *Elaborate:* To practice skills and behaviors resulting in deeper and broader understanding of major concepts.
- e) *Evaluate:* To assess learners understanding and abilities.

3) Intended learning level [11]

Related with the importance of the learning content, the intended learning level will be different. From being only informed to being included as a responsible participant if a project, we differentiate the following learning levels:

- a) *To know, to be informed.*
- b) *To understand and create personal insight.*
- c) *To understand the application of the knowledge in relevant practice.*
- d) *To extend the knowledge by searching new linked knowledge.*
- e) *To analyze new knowledge to reflect and to create new insights.*
- f) *To apply the knowledge and generalize new alternatives in a new domain.*

4) Teaching activities

From teaching point of view teaching can be seen as a composition of phased activities. Based on the e-model we adapted the following phases in our learning process:

- a) Content presentation by the teacher (sometimes combined with self-paced and ICT enhanced learning =blended model)
- b) Exercises.
- c) Organize an activity where students will have to find new related knowledge. Often they can search for literature in the (e-) library.

- d) Link with business practice will be presented.
- e) organize a project so that learners will have to apply and expand the knowledge in a new situation.
- f) Evaluate what “learnt” = assessment.

V. LEARNER-CENTERED CONSTRUCTIVISM BASED LEARNING PROCESS DEVELOPMENT MODEL

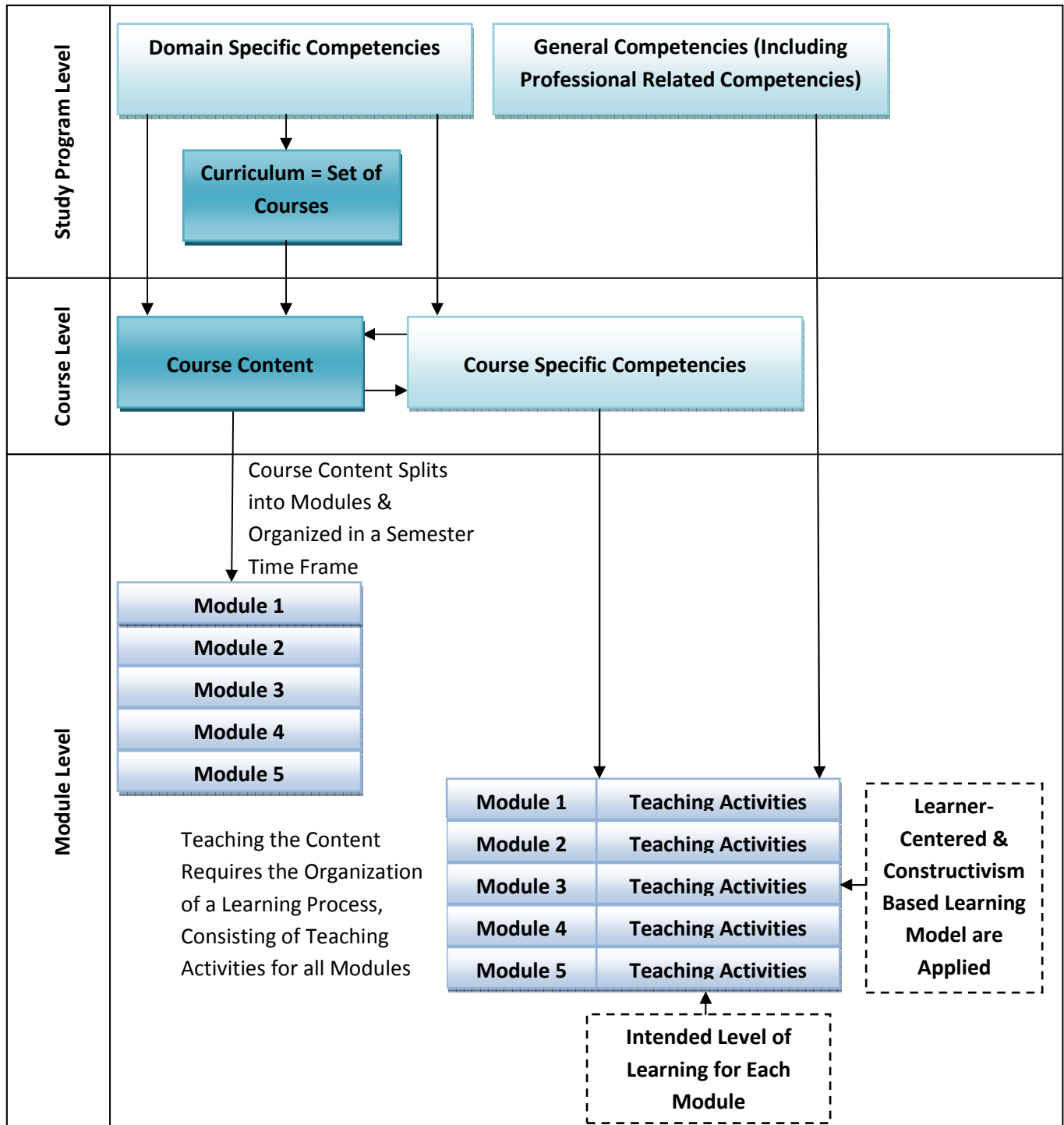


Figure 2. Learner-centered constructivism based learning process development model.

Curriculum development means that a curriculum development committee is deciding about which content (and courses) will be included in the study program (See Fig. 2). On study program level the program specific competences (also called outcomes, learning objectives) and the general competences, including the professional ones will have to be defined.

As a teacher we have on course level to define the course specific competences (outcomes: learning objectives) and linked with it the content of the course. In the development of the learning process of the course we will take into account the requirements as formulated on study program and on course level. For each of the modules the intended learning level will be defined. We will have also to integrate in the learning activities some learner-centred and constructivism elements. These are based on **Learner-centered, constructivism based learning model** [4].

In our research we developed a model for the development of the **Constructivism based learner-centered organization of the learning process**. We see the integration of competence base learning and constructivism based learning in this model.

VI. CASE: THE COURSE BUSINESS INFORMATION SYSTEMS AT HASSELT UNIVERSITY

This course is a 2nd year bachelor course in the study program BI (Business Informatics). Based on the domain specific competences, the general competences as defined in the faculty for this study program bachelor in Business Informatics, the course specific competences and the course content was developed. The course content topics/ modules are related to the course specific competences.

Example: A competence: know how and why a company has to evolve to integrating internal processes and inter-organizational processes with customers and suppliers. The

correspondent learning content module is:
Enterprise Information Systems.

- 1) *Course specific competences (outcomes/objectives)*
 1. Know why a company has to evolve to integrating internal processes and inter organisational processes with suppliers and customers.
 2. Know how the internet is changing the business information systems.
 3. Understand the information requirements of an organisation and knowhow and which kind of information systems are supporting management processes and decision making.
 4. Know the need of securing data and systems and which security measures can be taken.
 5. Know why and how to maintain information systems.
 6. In practice students learn to use computer tools as are used by management.
- 2) *Content*
 - a) *Theory modules*
 - 1) *Enterprise IS.*
 - 2) *E-business and e-commerce.*
 - 3) *Knowledge management and systems for collaboration and decision support systems.*
 - 4) *ICT security and risk management*
 - 5) *Building and re-engineering of information systems.*
 - 6) *IT project.*
 - b) *Practice*

Building systems to support decision making, using computer tools excel and access in the computer room.
- 3) *The learning process*

TABLE I. LEARNING PROCESS

Week	Course modules	activity	Constructivism elements	General competences (outcomes/ objectives)
1	Enterprise IS	Classroom teaching		
		Self test	Self assessment	
2	E-business and e-commerce	Classroom teaching		
		Self test	Self assessment	
3	E-business and e-commerce	Adoption of e-business : study of the websites of companies + discussion and conclusions	- Exploration - Embedded learning in a realistic context	To have attention to the practical relevance of what one learns

Week	Course modules	activity	Constructivism elements	General competences (outcomes/ objectives)
4	KM & management support systems	Classroom teaching		
		Self test	Self assessment	
5	KM & management support systems	Self-study tutorial		The ability to work goal-oriented
6	KM & management support systems	Computer practice in lab: access + link Excel	-Problem solving -Application of knowledge	
7	KM & management support systems	Computer practice in lab: Excel DSS	-Problem solving -Application of knowledge	
8	Security management	Classroom teaching		
		Self test	Self assessment	
9	Security management	Team task: interview in company, using a predefined questionnaire	Real world situation	The ability to communicate effectively and respectfully with individuals and groups
10	Security management	Discussion about the results of the survey (all data combined in one file)	Reflexion	To gather information in a scientific way, interpret critically and report in a businesslike manner
		Preparing a team paper : make a study to compare “our” results with the published result bij CSI based on a survey in USA.	Reflexion	To gather information in a scientific way, interpret critically and report in a businesslike manner
11	Building and re-engineering IS	Classroom teaching		
		Self test	Self assessment	
12	Team project	Select as a team 1 topic of the course, find additional info(at least 3 scientific articles in e-library) and write a paper about it (5 pages)	Expand and go beyond what is learnt	To adopt a research attitude
13	Team project, continuation			
End of semester	Individual written exam		Professor assessment of individual learning	

VII. CONCLUSION

Nowadays learners are more demanding than they have ever been about the way they want to learn. They need a more individualized way of learning as defined in learner- centred learning, and fitting their personal learning style.

As a result we see a shift of focus from teacher centred to learner centred learning. The new learner is active in creating knowledge based on his own existing knowledge and as part of a team of

other learners is taking part in a learning experience (constructivism based learning).

Constructivism based teaching, by facilitating collaboration, communication, interaction and knowledge construction and sharing in a team of learners and with the teacher, will improve learning outcomes and quality.

Defining the required competences is a first phase in the development of a learning process. Following the 5E-model, being an instructional

model based on the constructivism approach, the learning process can be built in phases of learning activities, all linked with competences and including constructivism characteristics.

The model of constructivism based learning process design has been included as part of our model **“learner centred constructivism based learning process development model”**, integrating the competence based learning and the phased constructivism based learning.

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