



D3.2.3 Report on Core Curricula in Ontology and Semantic Web

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Abstract.

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Deliverable D3.2.3(WP3.2)

This document describes core curricula based on the four learning scenarios defined in deliverable D3.1.1(WP3.1). These curricula are initial in that they describe and group the available courses from the collected learning material described in D3.2.1.

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Executive Summary

This document describes the core curricula which can be built from the collected learning materials described in D3.2.1. The curricula deal with the different learning scenarios defined in D3.1.1, namely the Education for Professionals scenario, the Shared Master degree scenario, the Community of Practice scenario, and the Repository Usage scenario. As this report is targeted at describing the available status, there are still missing courses which have to be added in the future, and future discussion about what courses shall be added or which existing ones shall be modified. The final curricula will be described in a further deliverable D3.2.4.

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1. Introduction

1.1. Overview

This document describes the core curricula which can be built from the collected learning materials described in D3.2.1. The curricula deal with the different learning scenarios defined in D3.1.1, and describe the available status. The different sections of this document summarize which courses are available for which curriculum. The document can be used as a basis for a discussion about the final curricula to be realized in the future. The final curricula will be described in a further deliverable D3.2.4.

This document is structured as follows: subsection 1.2 discusses the relation to other deliverables. Section 2 contains a description of the courses available for the first scenario, the “Semantic Web Education for Professionals” (abbreviated as “Prof. scenario” in the following). Section 3 describes a possible curriculum for the Shared Master Degree on “Semantic Web and Ontologies” (abbreviated as “Shared Master” scenario). In Section 4, the curriculum for a Communities of Practice scenario (abbreviated as “CoP scenario”) is discussed.

1.2. Relation to Other Deliverables

1.2.1. Specification of VISWE Tasks and Goals (D3.1.1)

This work heavily relies on the document D3.1.1 which describes the envisioned learning scenarios. They are summarized here; for more details see D3.1.1:

- The **Professional scenario** envisions providing training programs for industrial learners such as: detailed technical courses for programmers, introductory technology seminars for software architects and executives, and individual consulting on concrete proposals for project leaders. Based on this scenario, a cooperation between the work packages *Industry* and *Education* is planned.
- The **Shared Master scenario** outlines different levels of a shared master in “Semantic Web and Ontologies”. Based on this scenario, University partners interested in cooperating to a shared M.Sc. degree, specify administrative and organisational requirements as well as a curriculum.
- The **Communities of Practice (CoP) scenario, Ph.D. program** goes beyond the provision of courses and training programs to support learners in less formal contexts. The learning infrastructures, that is intended to construct, facilitates the creation of ontology based semantic layers over web resources to support interpretation. Furthermore, communication infrastructure supports synchronous and asynchronous communication. Tools and spaces for collaboration and communication as well as Semantic Web based learning system features support Ph.D. students and others new in the field to orient themselves and to learn by moving into the research community. Based on this scenario requirements for tools, designed in WP3.3 are specified.
- The **Repository Usage scenario** outlines the provision and usage of a suitable infrastructure for course delivery to manage and deliver learning resources.

While all learning units are suitable for repository usage, they may be targeted to one or several of the first three scenarios. Therefore, core curricula are specified for the first three mentioned scenarios, but not for the repository usage scenario.

2. Learning Unit Overview

2.1. General Statistics

We got responses from 12 partners, obtaining descriptions for 24 courses. In detail, the partners provided the following number of courses: FUB(3), FUBerlin(1), INRIA(3), UKARL(2), UniTn(3), VUM(3), L3S(2), VUA(1), OU(1), USFD(1), CERTH(1), UPM(3). Scenario coverage varies significantly: Education for Professionals(4), Shared Master Degree(14), Community of Practice(9). (Note that some courses can be used for several different scenarios.) Nearly all courses are already available, about 1/3 can be used as is, but are to be adapted to the KnowledgeWeb context.

2.2. Areas and Topics

The provided units come from various areas and cover a wide range of topics, which are classified here provisionally. A more thorough approach for classification will be undertaken during the development of the final curricula.

No.	Title	Scenarios	Partner
Foundations			
<i>Logic</i>			
1	Computational Logics	CoP,MSc	FUB
2	Description Logics	CoP,MSc	FUB
3	Description Logics for Conceptual Design, Information Access, and Ontology Integration	MSc	FUB
4	Logics for knowledge representation and reasoning	MSc	UniTn
<i>Web Technologies</i>			
5	Internet Technologies	MSc	L3S
6	A three hour introduction to XML	CoP, MSc	UniTn
7	Information Retrieval, Hypermedia and the Web	Rep	VUM
Semantic Web Core			
<i>Knowledge Representation</i>			
8	Models of knowledge representation	MSc	UniTn
9	Knowledge Representation and Reasoning	MSc	VUM
10	Web-based Knowledge Representation	MSc	VUA
<i>Ontologies</i>			
11	Ontology in a Nutshell	Rep	INRIA
12	Course on Ontologies	Rep	INRIA
13	The Semantic Web: Ontologies and OWL	MSc	VUM
14	Ontological Engineering and the Semantic Web	CoP, MSc, Prof	UPM

<i>Semantic Web Technologies</i>			
15	Semantic Web Information Day	Prof	FUBerlin
16	RDF for the Semantic Web	Rep	INRIA
17	Intelligente Systeme im WWW	CoP	UKARL
18	Einführung in das Semantic Web	MSc	L3S
<i>Semantic Web Special Topics</i>			
19	Upgrade legacy content to the Semantic Web	Prof	UPM
20	Semantic Web Services	CoP	OU
21	Introduction to Human Language Technology for the Semantic Web	CoP	USFD
22	Knowledge Assisted Multimedia Content Analysis Using Semantic Web Technologies	CoP, MSc	CERTH
23	Semantic portal technology	Prof	UPM
24	Wissensmanagement	CoP	UKARL

3. Core Curriculum for the Professional Scenario

3.1. Requirements

The requirements on the professionals which will attend the courses listed below cannot be stated in general. Instead, they depend highly on each individual course and the final curriculum, if one will be created during the KnowledgeWeb project.

3.2. Courses

In the “Professional scenario”, two main questions were asked in the questionnaire (c.f. Section 1.3 in D3.2.1):

1. Is the course suitable for self-study?
2. Is the partner willing to provide the learning unit as a professional training course?

The answers to these questions are summarized in the last two columns of the following table, which compiles a summary of the available learning units for the professional scenario. The classification of the courses is in accordance to the preliminary classification made in D3.2.1.

No.	Title	Partner	Hours	Status	Self study?	Professional training?
Foundations						
Logic						
	n.a.					
Web Technologies						
	n.a.					
Semantic Web Core						
Knowledge Representation						
	n.a.					
Ontologies						
14	Ontological Engineering and the Semantic Web	UPM	40	Ready	Yes	Yes
Semantic Web Technologies						
15	Semantic Web Information Day	FU Berlin	n.a.	Ready	Yes	Yes
Semantic Web Special Topics						
19	Upgrade legacy content to the Semantic Web	UPM	n.a.	To be adapted	No	Yes
23	Semantic portal technology	UPM	n.a.	Planned	No	Yes

In summary, there are four courses intended for Professional training, three of them are actually available and one is planned. The corresponding partners for the courses would all be willing to provide them in a professional training context, two units could be used for self-studying also.

The main focus of the available courses is on advanced topics, there are currently no foundation courses for professionals. Whether such foundation courses are really necessary or whether a curriculum for professionals shall be restricted to providing advanced courses only, is not yet clear and has to be discussed in the future. In anyway, more courses for professionals are necessary to attract interest from the industry. The KnowledgeWeb partners need to increase their engagement in professional education. This is especially important for future financial support of VISWE beyond the EU funding.

4. Core Curriculum for the Shared Master Scenario

The definition of the “Shared Master” scenario has not been finalized yet. Currently, four different levels of a “Shared master” are proposed (for more details, cf. D3.1.1):

0. **Free movers:** This is similar to the ERASMUS program where students can freely move between the universities for some courses. Finally, they get a degree from the home university only so that coordination between the universities is restricted to negotiations which courses / exams from foreign universities are recognized at the home universities (e.g. the ECTS credit system).
1. **Movers under agreement:** This is similar to level 0 but there are specific bilateral unidirectional agreements between the home and the visiting universities.
2. **Movers with Specialization Diploma:** There is a more specific agreement between two or more universities about the topics and the structure of a curriculum so that not even exchange of students but also supervisors of courses becomes possible. The students get a M.Sc. degree from the home university plus a specialization diploma from the visiting university or the consortium responsible for the agreement.
3. **Double degree education:** Students get two M.Sc. degrees, one from each university.
4. **Double degree education with focused programs:** In this case, new M.Sc. curricula can be created by a combination of courses from different universities.

Depending on the level which will become the final scenario for a shared master in the context of the work of work package WP3.1, different curricula can be defined for a “Shared Master” scenario.

- A curriculum for a one-year specialization diploma for the topic “Ontologies and the Semantic Web”
- A curriculum for a full two-year M.Sc. degree with 120 credit points to be gained within two years.

A typical example for a curriculum for a two-year M.Sc. degree could be as follows:

- 30 credits for introductory courses

- 60 credits for the main topic of the Master's program (in this case "Ontologies and the Semantic Web")
- 30 credits for the master thesis

4.1. Requirements

The requirements on the students starting "Shared Master" studies depend on the chosen scenario (one-year vs. two-year programme).

For the two-year scenario, the introductory courses are necessary in order to bring the students, which typically will come from different universities all over the world, on the same level of basic knowledge. This knowledge forms the base for the special courses dealing with the main topics. A B.Sc. in computer sciences might be helpful in this context, but this has to be discussed for the final version of the curriculum.

For the one-year programme, less time is available for introductory courses. Therefore, the requirements could be higher or specified more precisely than for the two-year scenario. A B.Sc. in computer sciences might also help here, but this is also to be discussed further.

4.2. Courses

A rough schedule for a two-year M.Sc. programme could be as follows:

- First term: Introductory courses in order to bring all students to the same level of basic knowledge.
- 2nd/3rd term: Special courses on the topic "Ontologies and the Semantic Web".
- 4th term: Master thesis

A one-year specialization diploma would naturally cover only a part of the above programme with a high reduction of introductory courses and most likely a shorter thesis to conclude the programme. Details on this one-year curriculum have to be discussed in the future.

The important issue with regard to the available learning units was to find out how many credits could be covered by the existing courses or if more courses are necessary for the one-year / two-year scenario.

A further interesting issue is related to the mode, in which the learning unit can be used: Face-to-face courses vs. distance courses. Face-to-face courses require the physical attendance of the students whereas distance courses allow for a more flexible definition of a curriculum, but they require a higher effort of preparation from the teacher and a higher organizational effort, for example, for remote exams.

Two scenarios arise from these two modes:

1. The "initial scenario" without distance course: If students want to attend different courses at different universities, courses have to be organized such the students can attend courses at one university within one term of the programme and can change the university at the end of a term to attend the courses at a different

university. This scenario is the one which can be implemented immediately since face-to-face lectures are already available.

2. The “advanced scenario” with distant courses allows for a more flexible definition of a curriculum. It enables students to attend several courses at different universities in the same term. However, learning units for distance lectures are available only sparsely so that this scenario might need more time to implement than the initial scenario.

Details about the length of learning units, the associated credits, and the teaching mode can be found in the following table which summarizes the learning units for the “Shared Master” scenario. The mode of the unit can be face-to-face or “Dist.” = distant. It can be already available in that mode or the partner has signaled the willingness to provide the unit in a different mode in the future for the KnowledgeWeb context.

No.	Title	Partner	Credits (Hours)	Mode	
				Avail.	Planned
<i>Foundations</i>					
<i>Logic</i>					
1	Computational Logics	FUB	4 (24)	Face-to-face	Dist.
2	Description Logics	FUB	4 (24)	Face-to-face	Dist.
3	Description Logics for Conceptual Design, Information Access, and Ontology Integration	FUB	4 (24)	Face-to-face	Dist.
4	Logics for knowledge representation and reasoning	UniTn	3 (20)	Face-to-face	Dist.
<i>Web Technologies</i>					
5	Internet Technologies	L3S	4 (24)	Face-to-face	Face-to-face
6	A three hour introduction to XML	UniTn	0 (3)	Face-to-face	Face-to-face, Dist.
<i>Semantic Web Core</i>					
<i>Knowledge Representation</i>					
7	Information Retrieval, Hypermedia, and the Web	VUM	n.a.	Face-to-face	n.a.
8	Models of knowledge representation	UniTn	5 (35)	Face-to-face	Face-to-face
9	Knowledge Representation and Reasoning	VUM	5 (40)	Face-to-face	Face-to-face
10	Web-based Knowledge Representation	VUA	6 (82)	Face-to-face	Face-to-face
<i>Ontologies</i>					
13	The Semantic Web: Ontologies and OWL	VUM	15 (40)	Face-to-face	Face-to-face

14	Ontological Engineering and the Semantic Web	UPM	4 (40)	Face-to-face	Face-to-face, Dist.
<i>Semantic Web Technologies</i>					
18	Einführung in das Semantic Web	L3S	n.a. (24)	Face-to-face	Face-to-face
<i>Semantic Web Special Topics</i>					
22	Knowledge Assisted Multimedia Content Analysis Using Semantic Web Technologies	CERTH	n.a. (32)	Face-to-face, Dist.	Face-to-face, Dist.

In summary, there are learning units with a total of 54 credits (plus an estimated 13 for the units, where no numbers were given) = 67 credits where 19 credits belong to introductory courses and the remaining 48 credits to the advanced courses. Hence, from the numbers there are already quite many courses available: Sufficiently many for a one-year degree and almost enough for a “Shared Master”. Most of the units are available for a face-to-face mode but not yet for distance learning. Therefore, the above described initial scenario, where students visit other universities for a whole term, would be feasible initially. The advanced scenario would require more work to prepare courses for distance learning, but this is planned already for half of the courses. Therefore, the advanced scenario should be possible to implement in the future.

There is, however, one remaining problem: Some of the course contents overlap (cf. the detailed course descriptions in D3.2.1). In order to create a “Shared Master” from the available learning units, the units must be modularized so that a student can choose the modules such that topic no longer overlap among the modules.

5. Core Curriculum for the Community of Practice Scenario

5.1. Requirements

As the Community of Practice scenario is targeted towards Ph.D. students, a M.Sc. or an equivalent degree could be required for students who want to attend these courses. However, this is also to be discussed for the final version of the curriculum.

5.2. Courses

For the Community of Practice scenario, the questionnaire contained the following additional questions:

1. How many teaching hours does the learning unit comprise?
2. Is it suitable for self-studying?
3. What mode is the partner willing to provide (face-to-face, distance, in the context of a summer school)?

These data are summarized for the available course for the community of practice scenarios in the following table.

No.	Title	Partner	Hours	Self-Study	Mode (planned)
Foundations					
Logic					
4	Logics for knowledge representation and reasoning	UniTn	20	n.a.	Dist.
Web Technologies					
6	A three hour introduction to XML	UniTn	3	n.a.	Dist.
Semantic Web Core					
Knowledge Representation					
10	n.a.				
Ontologies					
14	Ontological Engineering and the Semantic Web	UPM	30	Yes	Dist., summer school
Semantic Web Technologies					
17	Intelligente Systeme im WWW	UKARL	n.a.	Yes	n.a.
Semantic Web Special Topics					
20	Semantic Web Services	OU	n.a.	Yes	Summer school
21	Introduction to Human Language Technology for the Semantic Web	USFD	4	n.a.	Dist., summer school
22	Knowledge Assisted Multimedia Content Analysis Using Semantic Web Technologies	CERTH	35	n.a.	Dist., summer school
24	Wissensmanagement	UKARL	n.a.	Yes	n.a.

In summary, there is a significant amount of courses which are suited for the Community of Practice scenario. This is partly because many of the advanced “Shared Master” courses are also suited for this scenario. Furthermore, approximately half of the material is suited for self-studying scenarios, and another 50% could be provided in the context of a summer school.

6. Conclusions

The amount of material offered for each scenario differs significantly. For the “Shared Master” curriculum the foundation and Semantic Web core is already covered quite well. Here the main challenge will be to establish agreements between the universities so that a “Shared Masters” programme becomes reality (see WP 3.1). Most of the required content is already there.

Currently the weakest support is available for professional training. Here partners need to increase their engagement in professional education. On the other hand especially offers in the Community of Practice area may cover the needs of professionals as well. Also, increased cooperation with the industrial work packages may help here.

In the area of Community of Practice we see a lot of offers (comparable to the “Shared Master” scenario), but it is not yet clear how to organize them. Note that the collection does not yet contain the material from the summer school 2004. This will be a significant addition.

The learning material classification is very preliminary. We need to develop this classification further version in cooperation with REVERSE and the other projects of the SDK cluster.

Summarized, the material collected in D3.2.1 is a good step towards the WP 3.2 goals, especially for the “Shared Master” scenario and in the Community of Practice context.