

# ID 7.12 – Revised version of the learning path description and validation plan

## Citation for published version (APA):

Herder, E., Kärger, P., Berlanga, A., Janssen, J., & Heyenrath, S. (2010). *ID 7.12 – Revised version of the learning path description and validation plan*.

## Document status and date:

Published: 06/01/2010

## Document Version:

Peer reviewed version

## Document license:

CC BY

## Please check the document version of this publication:

- A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
- The final author version and the galley proof are versions of the publication after peer review.
- The final published version features the final layout of the paper including the volume, issue and page numbers.

[Link to publication](#)

## General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal.

If the publication is distributed under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license above, please follow below link for the End User Agreement:

<https://www.ou.nl/taverne-agreement>

## Take down policy

If you believe that this document breaches copyright please contact us at:

[pure-support@ou.nl](mailto:pure-support@ou.nl)

providing details and we will investigate your claim.

Downloaded from <https://research.ou.nl/> on date: 09 Feb. 2023

Open Universiteit  
[www.ou.nl](http://www.ou.nl)





Building The European Network for Lifelong Competence Development

Building the European Network  
For Lifelong Competence Development

TENCompetence IST-2005-027087

## Internal Project Deliverable Report

### ID 7.12 – Revised version of the learning path description and validation plan

<b>Work package</b>	WP7 – Competence Development Programs		
<b>Task</b>	Task 7.3		
<b>Date of delivery</b>	<b>Contractual:</b> 31-05-2009	<b>Actual:</b> 08-07-2009	
<b>Code name</b>	ID7.12	<b>Version:</b> 1.0	Draft <input type="checkbox"/> Final <input checked="" type="checkbox"/>
<b>Type of deliverable</b>	Report		
<b>Security (distribution level)</b>	Public		
<b>Contributors</b>	Eelco Herder, Philipp Kärger, Adriana Berlanga, José Janssen, Stef Heyenrath		
<b>Authors (Partner)</b>	UHANN, OUNL, FBM-UPF		
<b>Contact Person</b>	Eelco Herder (UHANN)		
<b>WP/Task responsible</b>	Eelco Herder (UHANN)		
<b>EC Project Officer</b>	Martin Májek		
<b>Abstract (for dissemination)</b>	Update of the Learning Path Description.		
<b>Keywords List</b>	Learning Path Description, Learning Path Editor		

TENCompetence Project Coordination at: Open University of the Netherlands  
Valkenburgerweg 177, 6419 AT Heerlen, The Netherlands  
Tel: +31 45 5762605 – Fax: +31 45 5762800

# Table of Contents

<b>EXECUTIVE SUMMARY</b> .....	<b>2</b>
<b>1 LEARNING PATH SPECIFICATION</b> .....	<b>3</b>
1.1 INTRODUCTION .....	3
1.2 LEARNING PATH SPECIFICATION .....	4
1.3 PRACTICAL IMPLICATIONS .....	7
1.4 CONCLUSIONS.....	8
<b>REFERENCES</b> .....	<b>10</b>
<b>APPENDIX 1: LEARNING PATH INFORMATION TABLES</b> .....	<b>12</b>

## Executive Summary

Based on preliminary evaluation results and peer review of the schema, a second iteration of the **Learning Path Specification** has evolved. Its applicability and benefits are currently demonstrated by the development of a Learning Path Editor, which allows authors to create learning paths that are structured according to the learning path specification. These learning paths are used by the PDP Planning tool for presenting lifelong learners with a personal development plan that they can further edit toward their needs.

# 1 Learning Path Specification

In this chapter we present the next iteration of the Learning Path Description, which from now on will be called *Learning Path Specification* (LPS). The previous iterations of the LPS, which were well received by the community, are described in D7.1<sup>1</sup> and D7.2<sup>2</sup>. Rather than drawing a subset from IMS-LD [15], it was decided to create a new model, in order for the specification to stay lean and concise. This also allowed for some of the terminology of the specification to be adapted, more closely in line with common concepts regarding paths generally, e.g. ‘start’ and ‘finish’ rather than ‘prerequisites’ and ‘learning objectives’.. A schema was developed based on this second iteration of the specification.

Along with the new specification, a tool has been developed that allows human resource managers and others involved in the creation of competence development programs to create learning paths, which are used by lifelong learners to create their competence development programs. This tool – the Learning Path Editor, described in chapter 3 – provides a practical user interface that hides the complexity of the specification from the authors.

This chapter is structured as follows. In the first introductory section we shortly introduce the theory and concepts behind the learning path specification. In section 1.2 the LPS is described in detail, including an overview diagram and references to the XML schemas, which can be found in the appendix. In section 1.3 we discuss deployment issues of the LPS, to further clarify the scope of the LPS and the way it should be used. We end this chapter with a concluding section.

## 1.1 Introduction

Educational and training opportunities available to lifelong learners have greatly increased in recent decades: educational institutions traditionally focusing on initial education have made a shift to target lifelong learners as well, the training market has expanded, and more and more courses have become available through Internet. By far the largest part of adult and lifelong learning though occurs informally, in day to day practice [1-3]. The Commission of the European Communities [4] describes informal learning as “a natural accompaniment to everyday life” which is not necessarily intentional learning. Finally, non-formal learning is learning that takes place alongside the mainstream systems of education and training, for instance at the workplace or in arts or sports, which does not necessarily lead to formalised certificates. In contrast, formal learning is learning that occurs in education and training institutions, which leads to recognised diplomas and qualifications.

Especially when learners seek to develop skills or gain knowledge in a relatively unknown field or when they are faced with numerous ways to learn something, they need help to chose a suitable way to reach their learning goals [5, 6]. This problem exists not only in formal education, where increased modularization necessitates navigation support [7-9], but also in non-formal and informal learning [10]. The following example will illustrate the problem: a person who is interested in interior design and who would like to develop her competences in this direction might have a look to see what courses are available, for instance through a search on Internet. Deciding upon a course means that a particular learning path is chosen. The search entry “interior design course” in Google presently (April 2009) results in over 70 thousand hits, referring to all kinds of interior design courses and pages referring to these courses, at varying levels, some accredited others not, with different price tags attached, with varying study load, etcetera. This clearly represents a case of information overload, even though to a novice in the field some course titles might offer a hint (‘introduction’, ‘basics’). Though adding ‘basics’ to the query reduces the number of hits considerably, there are still 9000 left.

---

<sup>1</sup> <http://dspace.ou.nl/handle/1820/1002>

<sup>2</sup> <http://dspace.ou.nl/handle/1820/1311>

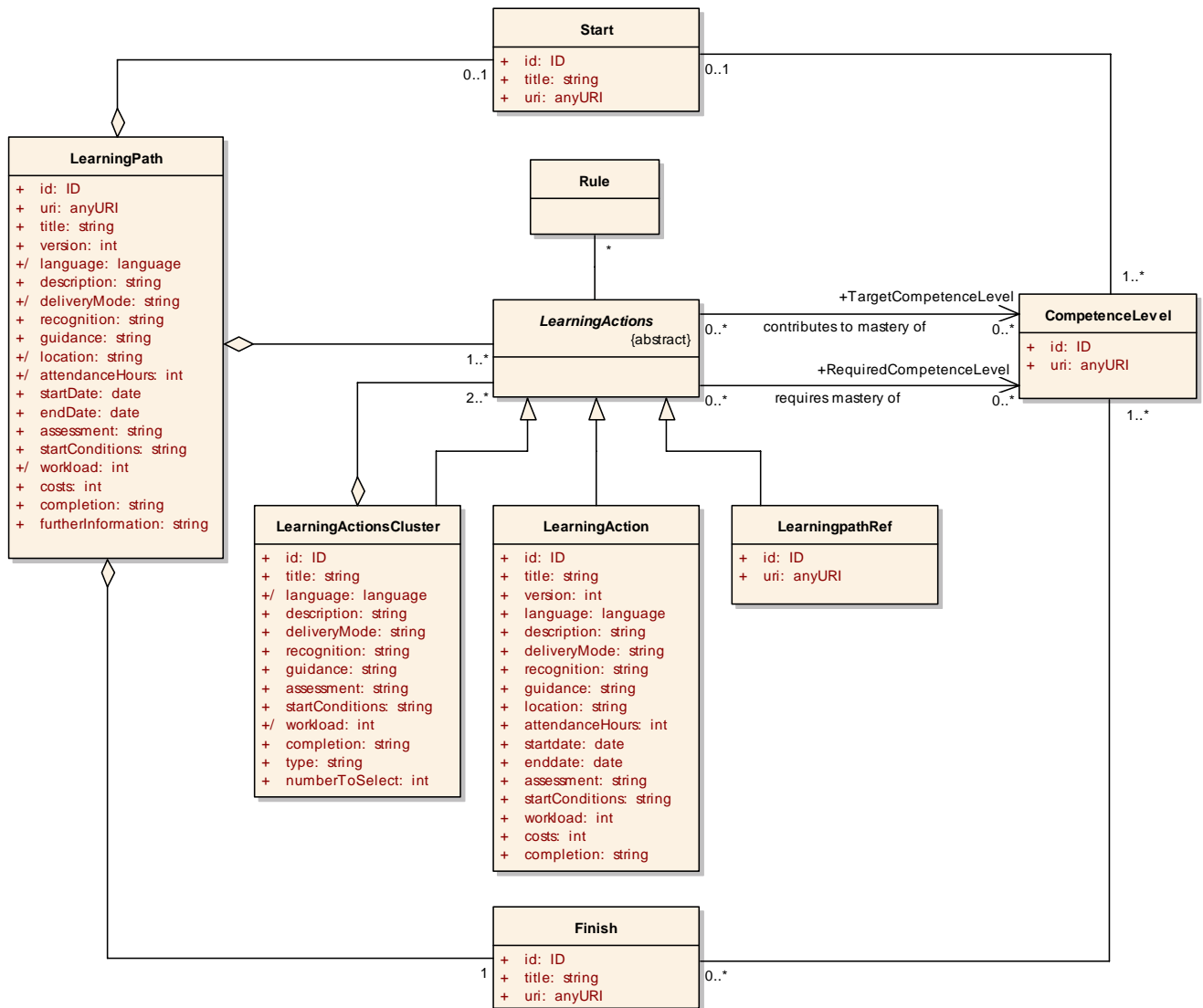
In order to enable lifelong learners to compare and select suitable learning paths, a learning path specification was developed. *Learning paths* are defined as sets of one or more learning actions leading to a particular learning goal. They can vary from a relatively small activity like reading a book or taking a course to following an entire programme or curriculum. Learning paths may vary also regarding the level of formality and may describe for instance actions taken to develop interior design skills oneself: books read, simulations used, lectures attended, exhibitions visited.

Requirements for the specification have been formulated based upon a review of literature on curriculum design and an analysis of different approaches to support comparison and/or selection of courses and programmes. The same study revealed that we might draw on the existing IMS Learning Design specification [15] to describe learning paths [25]. However this would entail including a number of constructs which the learning path specification itself does not require, but which would be required to ensure compliancy with IMS-LD. Eventually it was decided not to use a subset of IMS Learning Design to specify learning paths but to develop a new ‘lean’ specification.

A new learning path model was developed, less closely connected to IMS-LD and its terminology. The new conceptual (UML) model presented in section 2.2 looks different from the initial model but has not changed fundamentally. The new model more explicitly shows that a learning path has a start (formerly ‘prerequisites’) and a finish (formerly ‘learning objectives’) which are defined in terms of competences at particular levels of proficiency. The learning path specification distinguishes itself from related specifications in the field, which also aim at supporting learners in finding suitable learning opportunities, like XCRI (eXchanging Course-Related Information) [12], CDM (Course Description Metadata) [13] and MLO-AD (Metadata for Learning Opportunities - Advertising) [14], because these specifications focus on advertising courses provided through formal learning, whereas the learning path specification enables description of formal, non-formal and informal learning. The learning path specification has clear links with the IMS-LD (IMS Learning Design) [15] specification [16], but distinguishes itself from this specification because it does not provide a detailed description of the actual learning process: the activities, assignments and materials involved. Instead the learning path specification is a vehicle to connect units that describe learning processes and activities in more detail. These units might in fact be an IMS-LD Unit-of-Learning, but they might also be a workshop, a manual, a video, a classroom course, a blog, and so forth.

## 1.2 Learning Path Specification

The learning path specification was developed to support comparison and selection of possible ways to develop oneself by describing learning paths in a generic and formal way. Like any path, a learning path has a *Start* (prerequisites) and a *Finish* (learning goals). As Figure 1 illustrates, both start and finish are defined in terms of (a set of one or more) competences and associated levels of proficiency (CompetenceLevel). The model does not distinguish a separate class ‘competence’ because it is the combination of a competence with the associated level of proficiency that allows for a meaningful interpretation of the goal (finish) of the learning path and its constituent actions.



**Figure 1: Learning Path specification**

*Competence* is defined as the ability of a person to act effectively and efficiently in an ecological niche (e.g. occupation, hobby, sport, etc.) [20]. Whereas specification of the path’s finish is mandatory, specification of prerequisite competence levels by defining a start is optional. Both start and finish could be as elaborate as a competence profile.

A learning path further defines the steps (*LearningActions*) that lead from the start to the finish, i.e. to attainment of specific competences at specific levels. These steps may involve:

- a single learning action (*LearningAction*: ‘workshop X’, ‘course Y’, ‘consult expert Z’, ‘read A’)
- a cluster of learning actions which are related (*LearningActionsCluster*: ‘chose one of the following actions’, ‘perform the following actions sequentially’)
- a reference to an existing learning path (*LearningPathRef*: this enables nested structures of learning paths, e.g. one leading towards the Bachelor degree and the other leading to the Masters degree).

Each learning action may contribute to mastery of one or more competences and may require mastery of one or more competences at a particular level. The methodical description of competences and associated levels of proficiency is out of scope for the learning path specification. The model assumes that competences and their levels are described elsewhere in a standardised way that can be referenced [18-20]. The relation between different levels (e.g. attainment of Competence X level 3 is preceded by

attainment of levels 1 and 2) might be made explicit in the learning path through a sequence of actions or through specification of a Start, but there are no built in constraints in this respect. A learning path is further described by a set of metadata specifying content, process, and planning information (e.g. title, description, assessment, tutoring, delivery mode, contact hours), which are relevant to the process of choosing a learning path.

The learning path specification is meant to support a number of processes:

1. Description of lifelong learning paths
2. Selection of suitable learning paths
3. Navigation of learning paths (i.e. following the designated steps)
4. Personalisation of learning paths (reckon with learners' entry levels).

When learning paths and learning actions are described as proposed by the specification (i.e. connected to standardised competence descriptions, with metadata, and explicating distinct steps as well as how they are related) computer supported selection, navigation and personalisation of learning paths can be realised. Search engines can be developed that enable learners to specify criteria for the selection of suitable learning paths (e.g. costs, start date, delivery mode, location), visualisation of learning paths (optional and mandatory parts, fixed orders) can be automated in support of navigation, and learning paths can be personalised for instance by setting some learning actions to 'completed' when the learner already has attained the associated competence levels through prior learning. Another interesting service that could be realised through wider adoption of the learning path specification is recommendation of learning paths that build upon competence levels already attained by a learner.

Both learning paths and their constituent action are described by a set of metadata specifying content, process, and planning information (e.g. title, description, assessment, tutoring, delivery mode, contact hours). Some of these metadata are compliant with the IEEE Learning Object Metadata [24] (e.g. *identifier, title, language, description, version, further information, typical learning time, cost*) while others are specified in addition (*uri, start conditions, recognition, delivery mode, guidance, teaching place, start date, end date, contact hours, assessment, completion, type, number to select*). These metadata are assumed to play a role in learners' process of choosing a learning path. Their (relative) importance is currently investigated through semi-structured interviews with lifelong learners who recently decided upon a new learning path.

The XML schema was developed using the Free Community Edition of the Liquid XML Studio 6.1.18.0 software. The more detailed information tables of the schema are described in Appendix 1. The learning path model of Figure 1 was initially created in UML (Unified Modelling Language), as a means for graphical representation to facilitate communication about the model. For the technical implementation of the model in a binding we used XML (eXtensible Markup Language) which enables interoperability. The XML schema was developed using the Free Community Edition of the Liquid XML Studio 6.1.18.0 software. The more detailed information tables of the schema are described in Appendix 1.

The Learning Path XML schema is based on the UML model provided in Figure 1 but is not an exact match. For pragmatic reasons (i.e. readability and usability of the schema) some regrouping has been done. For instance the attributes from the UML model have been grouped in a container element 'Metadata'. Start, Finish and LearningActions have been grouped in an element 'Learning Path Design'. These results in a schema which at the highest level distinguishes between metadata, design and the building blocks which are referenced in the design: CompetenceLevels, LearningActions and LearningActionsClusters.



### 1.3 Practical implications

Deployment of the learning path schema is likely to raise some questions. Some questions we anticipated will be addressed in this section.

#### Which Metadata should I add?

Metadata are crucial when it comes to supporting search of learning paths. So even though only few metadata are mandatory it is recommended that all relevant metadata are added.

Some learning paths may involve face-to-face meetings at a particular location or fixed start and end dates. These more dynamic metadata which refer to a particular occurrence of for example a program, workshop or course are grouped in the container element RunInformation: Location, StartDate and EndDate. Location is defined as anyType because several standards might be used to specify a location. GeoRSS Simple [26], for instance, offers a lightweight solution in those cases where Location element is used to enable a search engine to identify learning paths with face-to-face meetings within a limited distance from the users location.

The metadata referring to the learning process show limited overlap with the main standard in this area, the IEEELOM [24] metadata. So rather than name spacing the IEEE LOM metadata set, a set of metadata elements has been specified of which the following can be directly mapped on the IEEE LOM metadata:

Element label	IEEE LOM element
Id	1.1 Identifier
Title	1.2 Title
Language	1.3 Language
Description	1.4 Description
Version	2.1 Version
Workload	5.9 Typical Learning time

Though the LOM metadata also contain an element Cost, this element is used to indicate whether or not use of the Learning Object is free of costs, whereas the metadata element Cost of the learning path specification is used to specify total costs involved in following the learning path.

Metadata can be specified at the level of the LearningPath as well as the level of its constituent LearningActions. When a LearningPath consists of a single LearningAction the Metadata for the LearningPath are in fact identical to the LearningAction Metadata.

When a LearningPath consists of a sequence of LearningActions some Metadata at the LearningPath level may be automatically derived from the Metadata of its constituent LearningActions, e.g. the workload of the LearningPath is the sum of the workload of the LearningActions, the language of the LearningPath is a list of all the languages mentioned in the Metadata of the LearningActions etcetera. However there are some limitations to automatically deriving LearningPath Metadata. A first limitation consists of the fact that no or not all Metadata may be specified at the LearningAction level. A second limitation arises in the case of a LearningActionsCluster, which consist of a set of LearningActions the learner can choose from. To the extent that the constituent LearningActions have different metadata values associated to them, the higher level LearningPath Metadata cannot automatically be derived. In those cases a solution might be found in specifying an 'average' number.

#### How and when do I add Rules?

The expression of rules is out of scope of the learning path specification. Existing script languages might be used for this purpose. A deployment issue relating to the Rule element is that the possibility to express rules will only be required in those cases where the learning path specification is used to recommend a specific route through a learning path or otherwise support navigation – i.e. when the specification is deployed to support a particular learning path instantiation. To the extent that the

learning path specification is used to inform comparison and selection of learning paths, the Rule element is not needed. To the extent that rules pertaining to a particular learning path are relevant to the process of comparing and selecting learning paths they will be described through Metadata like StartConditions or Completion.

A Learning Path Editor is currently being developed which enables referencing to standardised competence descriptions and also supports adding of metadata both at the learning path level and the level of constituent actions, as the following section describes.

### **How does it work: referring to CompetenceLevels?**

Competence descriptions are out of scope of the learning path specification. However CompetenceLevels are referred to at different points within the LearningPath: at the highest level of the LearningPath, but also at the level of LearningActions. Ideally standardised competence descriptions are available and can be referenced through an URI. The element CompetenceLevel indicates a competence at a particular level of proficiency. The assumption is that external competence descriptions enable referencing to this particular combination: competence + level.

At the *LearningPath* level the mandatory element Finish can also be used to reference to an existing competence profile or job profile. This should lead to automated import of the related competences+levels into for instance a learning path editor. Such an editor should enable import of these descriptions and render them for example as a competence map or a dropdown list to facilitate referencing / selection of relevant competences and related proficiency levels by a single click.

At the *LearningActions* level required CompetenceLevels and targeted CompetenceLevels can be identified optionally. The TargetCompetenceLevel is optional since a LearningAction can also consist of a reference to an existing LearningPath which already has a Finish. It is highly recommended though that LearningActions and LearningActionsClusters are associated with at least one or more TargetCompetenceLevels. Despite this recommendation no constraints should be placed on the relation between competences referenced at this lower level and the competences referenced in the Finish and possibly Start of the LearningPath, since these relations are rarely an exact one to one match.

### **When I want to describe a LearningPath that is offered in two different forms, e.g. part-time and fulltime or face-to-face and at a distance, can I express this in one LearningPath description?**

Though the Metadata set allows specification of different runs of a program (Location, Startdate, Enddate), the element DeliveryMode and AttendanceHours have a maximum occurrence of 1. This means that for each different type of delivery a new learning path description has to be made. It is assumed that different modalities are likely to involve different LearningActions as well, making it necessary to include different LearningPathDesigns as well. In that respect creating a new LearningPath is likely to be easier and more straightforward than trying to include several modalities in one description.

## **1.4 Conclusions**

Though the investigation of lifelong learners' choice processes has not been finalised yet and several more interviews are still to be conducted, initial findings have given no indication that crucial metadata are missing from the currently defined set. Interestingly a number of interviewees reported that other learners' experiences had been important in deciding upon a particular learning path. Though this is not information that can be described beforehand, it suggests an additional metadata field much like the LOM 'annotation', might provide a desirable addition to be used to enable learners to describe their experiences with a learning path retrospectively.

Meanwhile a Learning Path Editor is being developed which relies on the specification to enable description of learning paths. We expect to finalise the investigation of learners' choice processes in time to implement necessary changes to the metadata form used in the Learning Path Editor. An important asset of the learning path specification and of the Editor is the fact that they draw on standardised competence descriptions, which not only serves to guide the design of learning paths but also to enhance comparison, choice and personalisation of learning paths. Both the specification and the tool assume that competence profiles have been described and can be included by reference.

## References

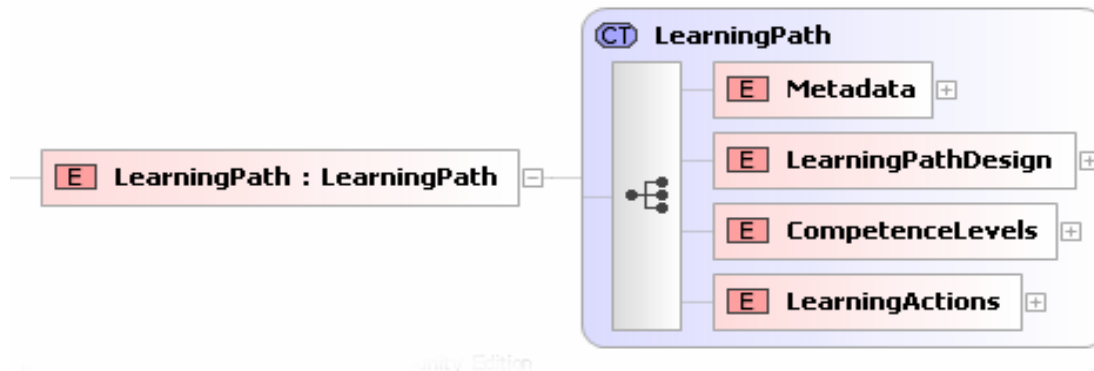
1. Livingstone, D.W.: Exploring the Icebergs of Adult Learning: Findings of the First Canadian Survey of Informal Learning Practices. NALL Working Paper No. 10, <http://www.nall.ca/res/10exploring.pdf> (1999)
2. Skule, S.: Learning conditions at work: a framework to understand and assess informal learning in the workplace. *International Journal of Training and Development*, 8 (1), 8-20 (2004)
3. Colley, H., Hodkinson, P., Malcom J.: Informality and formality in learning: a report for the Learning and Skills Research Centre. Learning and Skills Research Centre: London (2003)
4. CEC, A Memorandum on Lifelong Learning. Commission of the European Communities: Brussels (2002)
5. Chen, S.Y., Fan J.-P., Macredie, R.D.: Navigation in hypermedia learning systems: experts vs. novices. *Computers in Human Behavior* 22, 251-266 (2006)
6. Lea, S.J., Stephenson, D., Troy, J.: Higher Education Students' Attitudes to Student-centred Learning: beyond 'educational bulimia'? *Studies in Higher Education*, 28 (3), 321-334 (2003)
7. Yorke, M.: Leaving Early. Undergraduate Non-completion in Higher Education. London: Falmer Press (1999)
8. Simpson, O.: Access, Retention and Course Choice in Online, Open and Distance Learning. In: Third Eden Research Workshop. Oldenburg, Germany (2004)
9. Kilpatrick, S., Fulton, A., Johns, S.: Matching training needs and opportunities: the case for training brokers in the Australian agricultural sector. *International Journal of Lifelong Education*, 26(2), 209-224 (2007)
10. Klink, M.v.d., Boon, J., Schlusmans, K., Boshuizen, E.: Learn as you like. Research into informal learning of employees. Paper presented at AERA, San Diego (2009)
11. TENCompetence Integrated Project, Building the European Network for Lifelong Competence Development, <http://www.tencompetence.org> (2005)
12. XCRI, eXchanging Course-Related Information, <http://www.elframework.org/projects/xcri> (2006)
13. CDM, A Specification of Course Description Metadata, <http://cdm.utdanning.no/cdm/cdm-2.0.1/doc/courseDesc201004.pdf> (2004)
14. MLO-AD, Metadata for Learning Opportunities (MLO) - Advertising, <http://blogg.skolverket.se> (2008)
15. IMS-LD, IMS Learning Design Information Model. Version 1.0 Final Specification, <http://www.imsglobal.org/learningdesign/index.cfm> (2003)
16. Janssen, J., Berlanga, A.J., Vogten, H., Koper, E.: Towards a learning path specification. *International Journal of Continuing Engineering Education and Lifelong Learning*, 18(1), 77-97 (2008)
17. Janssen, J., Hermans, H., Berlanga, A. J., Koper, E.: Learning Path Information Model, <http://hdl.handle.net/1820/1620> (2008)
18. Van Assche, F.: Linking Learning Resources to Curricula by using Competencies. In: First International Workshop on Learning Object Discovery & Exchange (LODE'07). Crete, Greece (2007)
19. Kickmeier-Rust, M.D., Albert, D., Steiner, C.: Lifelong Competence Development: On the Advantages of Formal Competence-Performance Modeling. In: International Workshop in Learning Networks for Lifelong Competence Development, TENCompetence Conference. Sofia, Bulgaria (2006)
20. TENCompetence, TENCompetence Domain Model, <http://hdl.handle.net/1820/649> (2006)
21. Melero, J., Hernández-Leo, D., Arroyo, E., Aguilar, A., Blat, J.: An approach for visually supporting the creation of Personal Development Plans. In: The 9th IEEE International Conference on Advanced Learning Technologies. Riga, Latvia (2009)
22. Moody, D.L.: Theoretical and practical issues in evaluating the quality of conceptual models: current state and future directions. *Data & Knowledge Engineering*, 55, 243-276 (2005)
23. Leung, F., Bolloju, N.: Analyzing the Quality of Domain Models Developed by Novice Systems Analysts. In 38th Annual Hawaii International Conference on System Sciences. Hawaii (2005)

24. IEEE/LOM. (2002). Standard for Learning Object Metadata. Learning Technologies Standards Committee of the IEEE 148.41.21. from [http://ltsc.ieee.org/wg12/files/LOM\\_1484\\_12\\_1\\_v1\\_Final\\_Draft.pdf](http://ltsc.ieee.org/wg12/files/LOM_1484_12_1_v1_Final_Draft.pdf)
25. Janssen, J., Berlanga, A., Vogten, H., & Koper, R. (2008). Towards a learning path specification. *International Journal of Continuing Engineering Education and Lifelong Learning*, 18(1), 77-97.
1. GeORSS simple. <http://georss.org/simple> (version of 22 April 2009).

## Appendix 1: Learning path information tables

This appendix provides a detailed description of the learning path schema by presenting a number of information tables revealing different levels of detail of the schema: Learning Path, Metadata, Learning Path Design, CompetenceLevel, Learning Action and Learning Actions Cluster.

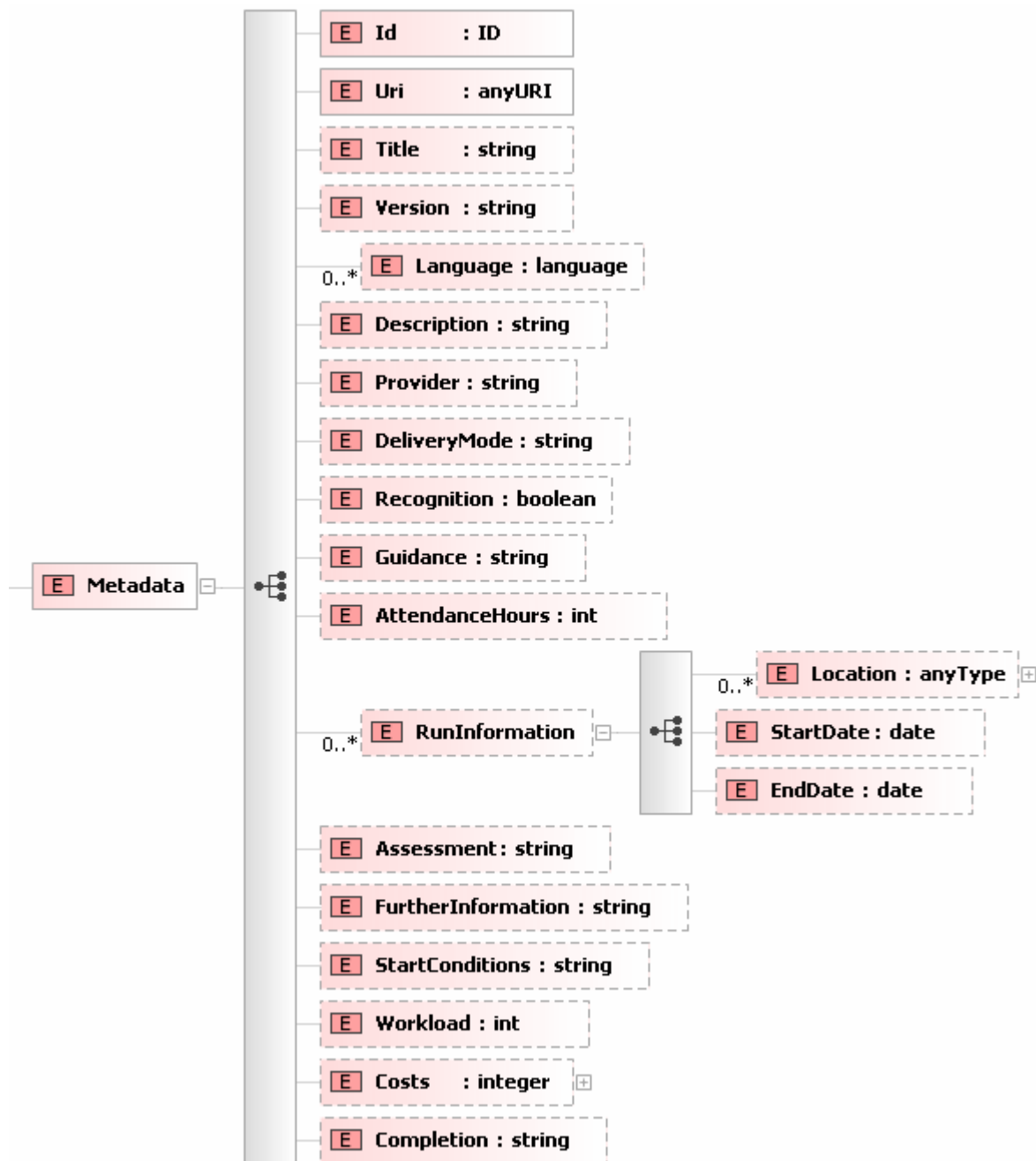
### 1. Information table Learning Path



### Learning Path

Name	Explanation	Reqd	Mult	Type
LearningPath	Specification of a set of 1 or more learning actions and the way they are structured, leading to a defined set of one or more competences at particular proficiency levels.	-	-	sequence
Metadata	Container element for data which provide content, process and planning information on the LearningPath.	M	1	sequence
LearningPathDesign	Container element for specification of the Finish and Start (optional) of a LearningPath in terms of CompetenceLevels as well as the steps (LearningActions) that lead to the Finish.	M	1	sequence
CompetenceLevels	Container element for specification of CompetenceLevels which are referenced in the LearningPathDesign.	M	1	sequence
Learning Actions	Container element for specification of LearningActions which are referenced in the LearningPathDesign.	M	1	sequence

## 2 Information Table ‘Metadata’



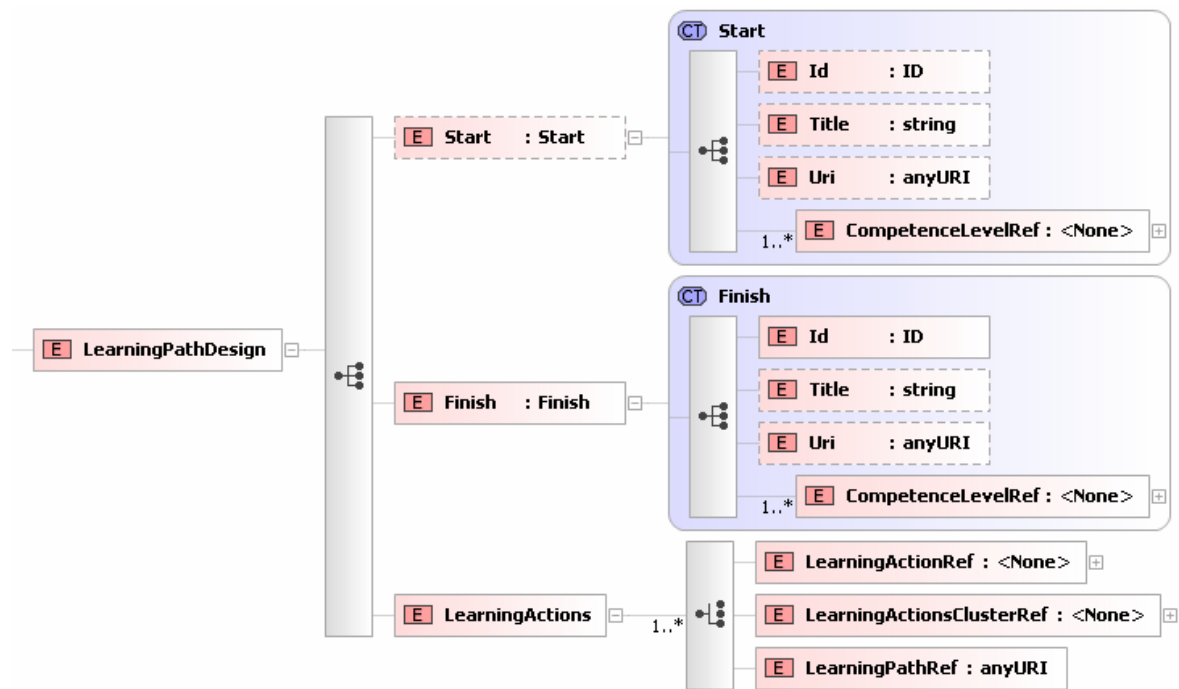
### Metadata

Name	Explanation	Reqd	Mult	Type
Metadata	Container element for data which provide content, process and planning information on the LearningPath.	-	-	container
Id	Identifier of the LearningPath (local)	M	1	ID
URI	Uniform resource identifier of the LearningPath	M	1	anyURI
Title	Title of the LearningPath	O	0..1	string
Version	Version of the LearningPath; necessary to allow for updates of LearningPaths and to enable identification of specific versions.	O	0..1	string
Language	Language of the LearningPath. Can be derived from the language attributes of the subsequent LearningActions; the value is a generated enumeration of all unique	O	0..*	language

Name	Explanation	Reqd	Mult	Type
	languages specified within the LearningActions (language attribute).			
Description	Short general description of the LearningPath.	O	0..1	string
Provider	Provider of the LearningPath. If the LearningPath involves more than one provider this element contains the main provider. Other providers can be specified through the metadata linked to separate LearningActions.	O	0..1	string
DeliveryMode	Mode(s) used for the delivery of the Learning-Path: distance learning, face-to-face, or mixed.	O	0..1	string
Recognition	Specifies whether successful completion of the LearningPath leads to a formally recognized diploma or certificate.	O	0..1	boolean
Guidance	Description of available support in terms of tutoring, counselling, feedback, et cetera.	O	0..1	string
AttendanceHours	Estimation of number of hours for realtime learner attendance within the LearningActions; the value is the generated summation of the AttendancetHours of all LearningActions within the LearningPath. Note that attendance may be on location or virtual.	O	0..1	integer
RunInformation	Container element grouping metadata which are connected to a specific 'run' of a LearningPath: Location, StartDate, Enddate.	O	1	sequence
Location	Optional element for specification of the physical location for face-to-face meetings.	O	0..*	anyType
StartDate	Optional attribute to specify fixed starting dates for the LearningPath.	O	0..1	date
EndDate	Optional attribute to specify fixed end dates for the LearningPath.	O	0..1	date
Assessment	Description of the formative and/or summative assessments available to determine to what extend the learner has acquired the competence(s) at the specified level.	O	0..1	string
FurtherInformation	Description of more detailed information on the LearningPath (may contain URL's).	O	0..1	string
StartConditions	Specification of practical, pedagogical and technical issues that must be satisfied to be able to follow the LearningPath.	O	0..1	string
Workload	Estimated workload of the LearningPath specified in hours; the value of this attribute is the generated summation of the workload attribute values of all LearningActions within the LearningPath.	O	0..1	integer
Costs	Total costs of enrolment and specific expenses (books, tools, et cetera). The Costs element contains an attribute 'currency'.	O	0..1	integer
Completion	Specification of the rule(s) for completion of the LearningPath, e.g. does it involve formal completion via a test, or is it up to the learner to decide the Finish has been reached.	O	1	string



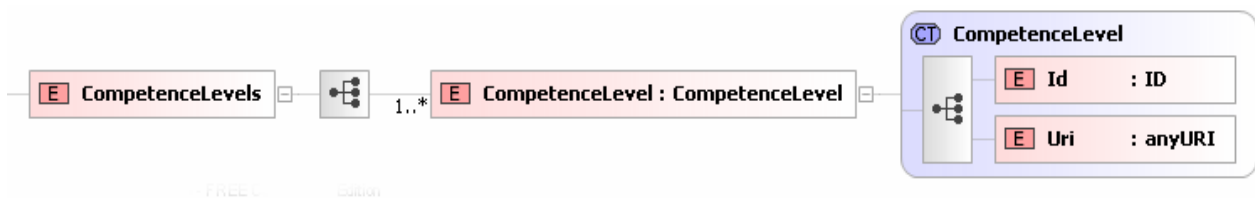
### 3 Information Table 'LearningPathDesign'



## LearningPathDesign

Element	Explanation	Reqd	Mult	Type
LearningPathDesign	Element specifying the Finish (and possibly Start) of a Learning Path in terms of Competences at particular levels as well as the steps (Learning Actions) to be taken to reach this Finish.	-	-	sequence
Start	Container for specification of one or more CompetenceLevels which constitute the starting point of the LearningPath.	O	0..1	sequence
- Id	An identifier for the Start specified for this Learning Path which is unique within the LearningPath.	O	0..1	ID
- Title	Optional attribute for the title of a set of competences at particular levels that are prerequisite to start the LearningPath. This may be an existing competence profile or a job profile.	O	0..1	string
- URI	Uniform resource identifier to be used for referencing existing profile definitions outside the LearningPath as the Start for the LearningPath.	O	0..1	anyURI
CompetenceLevelRef	Reference to a competence at a particular level.	M	1..*	Idref
Finish	Container for specification of one or more CompetenceLevels which constitute the targeted endpoint of the LearningPath.	M	1	sequence
- Id	An identifier for the Finish specified for this LearningPath which is unique within the LearningPath.	M	1	ID
- Title	Optional attribute for the title of a set of competences with specific proficiency levels the LearningPath helps to attain. This may be an existing competence profile or a job profile.	O	0..1	string
- URI	Uniform resource identifier to be used for referencing existing profile definitions outside the LearningPath as the Finish for the LearningPath.	O	0..1	anyURI
CompetenceLevelRef	Reference to a competence at a particular level.	M	1..*	Idref
LearningActions	Container element used to reference one or more Learning Actions, Learning Actions Clusters or LearningPaths.	M	1	Choice
LearningActionRef	Reference to a LearningAction to be performed by a learner which has been declared elsewhere within the LearningPath (see LearningPath - LearningAction).	M	0..*	Idref
LearningActions ClusterRef	Reference to a collection of LearningActions which has been declared elsewhere within the Learning Path (See LearningPath - LearningActionsCluster).	M	0..*	Idref
LearningPathRef	Reference to an existing LearningPath to be included.	M	0..*	anyURI

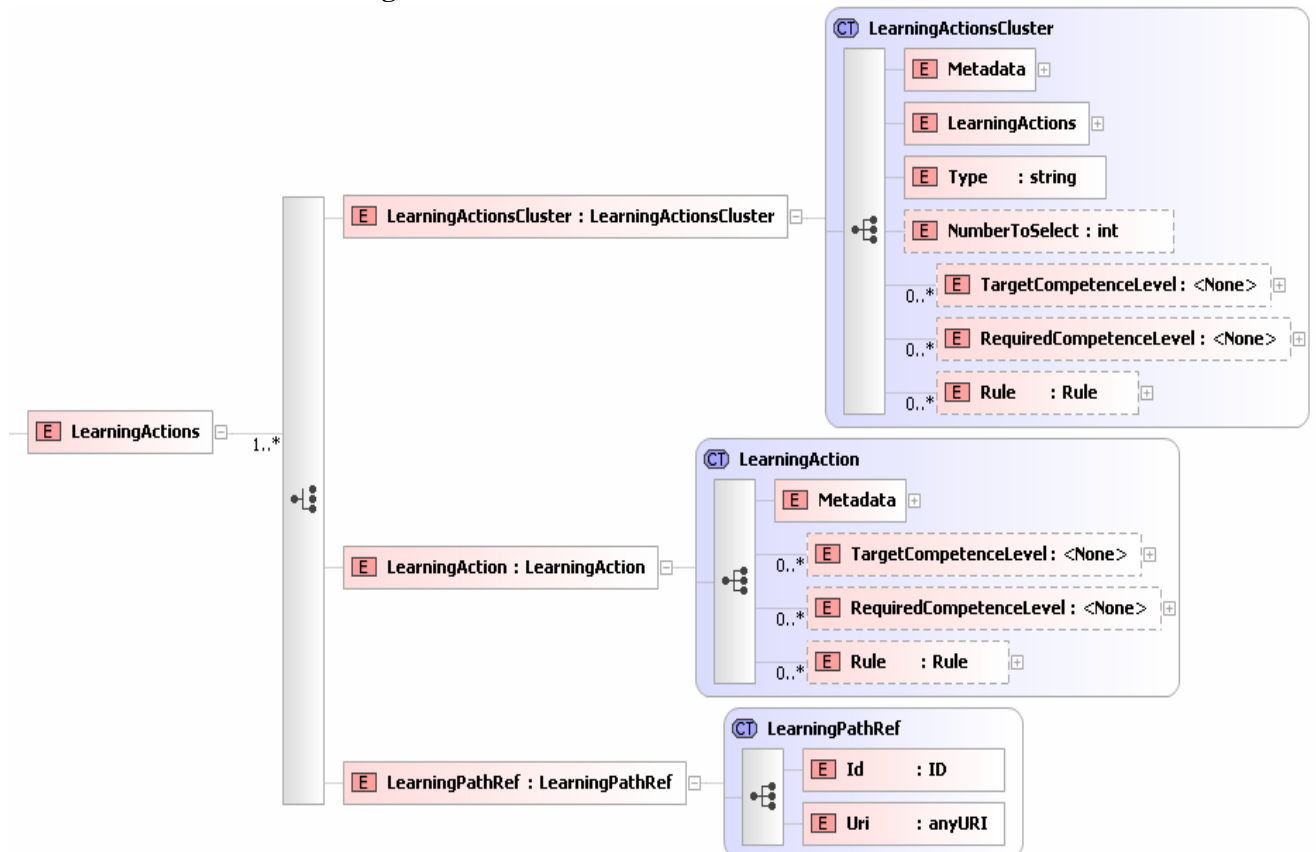
#### 4 Information Table ‘CompetenceLevels’



#### CompetenceLevel

Name	Explanation	Reqd	Mult	Type
CompetenceLevels	Container element for specification of CompetenceLevels which are referenced in the LearningPathDesign.	-	-	container
CompetenceLevel	Element to declare a competence at a particular level of proficiency which is referenced in the LearningPathDesign.	M	1..*	sequence
Id	Identifier (local) of the CompetenceLevel.	M	1	ID
URI	URI of the addressed CompetenceLevel; the assumption is that each combination of competence and proficiency level actually has an URI that can be addressed.	M	1	anyURI

#### 5 Information Table ‘LearningActions’



Logo: Copyright © 2005-2006 - FREE Community Edition

## Learning Actions

Name	Explanation	Reqd	Mult	Type
LearningActions	Container element used to group all LearningActions, LearningActionsClusters or LearningPathsRefs which are referenced in the LearningPathDesign. The LearningActions element also appears in the LearningActionsCluster to indicate that a LearningActionsCluster always contains at least two components which can be either a LearningAction a LearningActionsCluster or a LearningPathRef.	-	-	choice
LearningActionsCluster	Collection of LearningActions with specification of order rules (Type: sequence, selection, parallel).	M	1..*	sequence
Metadata	Container element for data which provide content, process and planning information on the <i>LearningActionsCluster</i> (Id, Title, Language, Description, DeliveryMode, Recognition, StartConditions, Guidance, Assessment, Workload, Completion).	M	1	sequence
Type	Specifies whether the LearningActions within the LearningActionsCluster have to be performed in a certain order (sequence or parallel) or can be done in a random order (free order).	M	1	string
NumberToSelect	This element is used to specify a choice from the collection of LearningActions within the LearningActionsCluster. When this element is not specified, all LearningActions within the LearningActionsCluster should be completed.	O	1	integer
TargetCompetenceLevel	Element to specify the CompetenceLevel which successful completion of the LearningActionsCluster will contribute to.	O	0..*	idref
RequiredCompetence Level	Element to specify the CompetenceLevel a learner is expected to have mastered before starting the LearningActionsCluster.	O	0..*	idref
Rule	A Rule specifies how to handle a LearningAction within the LearningPath when instantiated for a specific learner. Rules refer to characteristics (e.g. background, mastered competences, preferences, performance) of the learner and may pertain to: <ul style="list-style-type: none"> <li>- inclusion of the LearningAction</li> <li>- version of the LearningAction</li> <li>- delivery of the LearningAction</li> <li>- etcetera.</li> </ul>	O	0..*	sequence
LearningAction	Any action to be performed by a learner with the aim to develop one or more competences. The element contains a sequence of elements to describe the LearningAction.	M	1..*	sequence
Metadata	Container element for data which provide content, process and planning information on the <i>LearningAction</i> (Id, Title, Version, Language, Description, Provider, DeliveryMode, Recognition, StartConditions, Guidance, AttendanceHours, RunInformation, Assessment, Workload, Completion).	M	1	sequence
TargetCompetence Level	Identification of the CompetenceLevel successful completion of the LearningAction will contribute to.	O	0..*	idref

<b>Name</b>	<b>Explanation</b>	<b>Reqd</b>	<b>Mult</b>	<b>Type</b>
RequiredCompetenceLevel	Identification of the CompetenceLevel a learner is expected to have mastered before starting the Learning Action	O	0..*	idref
LearningPathRef	Reference to an existing LearningPath to be included in the current LearningPath. Though the specification places no constraint on referencing only one LearningPath it does not make sense to do so; it would only result in wrapping an existing LearningPath in an extra layer of metadata.	M	0..*	anyURI