

# **Celebrate Application Profile**

version 1.1

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# 1 Introduction

This document establishes a CELEBRATE Metadata Application Profile v1.1 of the IEEE LOM –standard (LOM). This document replaces older v1.0 Application Profile document. It defines mandatory, recommended, and optional elements of LOM Data Model and extends it by defining new elements and new vocabularies for CELEBRATE project. New elements are ‘Facet’ in ‘Technical’ category, ‘Learning Principles’ in ‘Educational’ category and ‘CELEBRATE Digital Rights’ in ‘Rights’ category. New vocabularies have been defined for ‘Learning Resource Type’, ‘Intended End User Role’ and ‘Context’ in ‘Educational’ category, one term added to ‘Kind’ vocabulary in ‘Relation’ category and some refinements have been made to ‘Language’ value space and ‘Typical Age Range’ value space.

This document also gives guidance how different elements and vocabularies of this Metadata Application Profile should be used in context of CELEBRATE project and defines XML bindings for it. The XML binding is based on the current draft of LOM XML binding (P1484.12.3) that is being finalized in LOM working group and it could be changed according to possible modifications to final standard.

The next section ‘CELEBRATE Metadata’ gives guidance of usage of elements and vocabularies and is intended for both non-technical and technical readers. Section 3 ‘Binding’ is intended only for technical readers and appendixes A & B assume a working knowledge of metadata issues, and specifically of the LOM.

This document is subject to change based on experiences gained in using this version in the CELEBRATE project.

## 1.1 Changes from v 1.0

### Added

- 1.7 General.Structure to recommended elements
- 4.8 Technical.Facet element
- Term ‘Preview’ in the 7.1 Relation.Kind vocabulary
- 2.3 Life Cycle.Contribute to recommended elements
- 3.2 Meta-Metadata.Contribute to recommended elements
- Paragraph 2.2.1

### Moved

- 4.3 Technical.Location from recommended to mandatory elements

### Deleted

- 6.4 sub elements
- Constraint data type

## 2 CELEBRATE Metadata

This section describes the usage of key elements of the full element set and vocabularies of the CELEBRATE Metadata Application Profile. The full element set listing which forms CELEBRATE metadata information model is given in Appendix A. There are two types of element subsets defined here: the elements that should be filled in every metadata instance (mandatory elements) and the elements that would be very useful to be filled (recommended elements). All other elements of the CELEBRATE full element set are considered as optional and there is also information about some optional elements. In addition to element explanations this section contains full listings of the vocabularies defined by CELEBRATE project and the data types to be used as value spaces of metadata elements.

### 2.1 Introduction

The purpose of the CELEBRATE Metadata Application Profile is to support the exchange of information about online digital resources (Learning Objects) between CELEBRATE partners. The metadata scheme includes a mix of data intended for human and machine readability. Hence all metadata is not designed in a form intended to be seen by the end users directly but will rather be interpreted by the user interface of a metadata editor or a search form in a more user friendly form. For example language of Learning Object (LO) is described by a two-character language code but it is intended to be exposed to user by natural language word of his/her own choice.

The metadata described in this application profile supports a variety of LO uses including:

- Management
- Searching and finding
- Technical interoperability

and description of properties of individual LOs including:

- Educational attributes
- Digital rights
- Technical features

IEEE Learning Object Metadata standard (LOM) has been selected as basis for CELEBRATE metadata to achieve these functionalities mentioned above and to support interoperability between other metadata schemes. The information model for the CELEBRATE metadata is similar to that of LOM where metadata for a described LO is stored in a metadata element and actual content of an element is called a value. Values can be entered as free text, inserted in predefined format or they are selected from set lists which are called vocabularies.

The full element set listed in Appendix A establishes the information model for the CELEBRATE metadata. The information model groups metadata elements into nine categories: General, Life Cycle, Meta-Metadata, Technical, Educational, Rights,

Relation, Annotation and Classification. There are 85 elements in the CELEBRATE information model of which 21 do not contain values but function as container elements that group value elements together. Not all elements in the information model are seen as very useful for CELEBRATE metadata but they are there for compatibility with LOM and as optional elements they cause minimal disadvantage. Those optional elements (e.g. Annotation) may be found very useful in future elaborations as the CELEBRATE project advances.

Numbers in front of every metadata element are only for referencing purposes. They do not represent any order and are the same as in the LOM information model except in extension elements that don't have equivalents in LOM.

NOTE: Following explanations of metadata elements are clarifying and specifying information found in the full element set listing (Appendix A).

## **2.2 General Considerations**

These general considerations are rather technical so non-technical readers should read on from paragraph 2.3 Mandatory Elements.

### **2.2.1 Identifying Learning Objects and their Locations**

The CeLeBraTe (Context eLearning with Broadband Technologies) project is developing a system to support a European Learning Network (ELN) of virtual learning environments (VLEs) capable of exchanging digitally stored learning objects (LOs). The ELN is built around a Brokerage System (BS) that rules the exchanges between its members. VLEs use an 'ELN Client' to connect to the BS. This ELN Client hides the complexity of the VLE-BS communication behind a simplified API that let VLEs focus on the content of messages (e.g., query or metadata) without having to worry about the lower-level details of message exchanges. In order for the BS to support LO exchanges, it is necessary to uniquely identify LOs and their locations within the network. The elements that must be taken into account in such an identification are:

- <loProviderId> The different LO providers (digitalbrain, sanomaWSOY, giuntilabs, demoport) need to be identified by the BS. This identifier is attributed by the ELN Administrator when the provider registers its first VLE.
- <elnClientId> The relation of each ELN Client instance with the BS is defined in a separate contract. Each ELN Client instance corresponds to a different VLE instance. Each LO provider can run several VLE instances that it is necessary to identify. This identifier is attributed (by the ELN Administrator) to each new ELN Client instance when the provider registers it.
- <loId> It is necessary for each LO providers to identify its LOs. This identifier is freely attributed by each LO provider to each LO it makes available in the ELN.

#### **2.2.1.1 General.Identifier – 1.1**

This element is composed of 2 sub-elements: ‘1.1.1 Catalog’ and ‘1.1.2 Entry’. The catalog is identified by ‘eln’, whereas the entry is the composition of the LO provider Id and the LO Id separated by a colon.

Nr	Value	Example
1.1.1	eln	eln
1.1.2	<loProviderId>:<loId>	digitalbrain:1412
		demoportal:hjkw112

### 2.2.1.2 Technical.Location – 4.3

This element is composed of prefix ‘eln’, the ‘LO provider Id’, and the ‘ELN Client Id’ separated by colons.

Nr	Value	Example
4.3	eln:<loProviderId>:<loId>	eln:digitalbrain:test
		eln:demoportal:01

### 2.2.2 Language

Wherever it is necessary to specify a language such as in data element ‘1.3 General.Language’ or in any language string the following coding scheme is used.

1. use a 2 letter code from ISO 639-1 use a 3 letter code from ISO 639-2. See: <http://www.loc.gov/standards/iso639-2/normtext.html> (it does not matter between bibliographic & terminology since they only differ for languages that have 2-letter codes) add the ISO Country code [ISO3166] when necessary, separated by a dash.
4. use IANA registered language tags, prefixed with i-
5. use SIL Ethnologue 3-letter codes, prefixed with x-E-
6. make up a name for token languages prefixed with x-T-
7. make up a name, prefixed with x- for user defined languages

All the above are acceptable but CELEBRATE partners should at least implement 1, 3, and 6.

nl	Dutch
aus	Australian Languages
i-klíngon	IANA registered Klingon
x-E-pcd	Picard
x-T-Celeb	The CELEBRATE Token Language
x-T-ELR	The ELR Token Language
x-none	Not possible to identify a language

### 2.2.3 Data Types

There are five data types in the LOM information model and CELEBRATE defines one more. Stated briefly, LOM types are

**CharacterString:** text can be entered in the element directly.

**LangString:** the text must identify its language and there can be one or more character strings in the element.

**DateTime:** the element contains date and time information and there can also be textual information about this point in time.

**Duration:** the element contains information about an interval in time and there can also be textual information about the duration.

**Vocabulary:** the element contains source and value where source is a reference to publicly sourced and maintained value set and value is a value from that set.

These data types are defined more detailed in Appendix A after the full element set listing table.

## 2.3 Mandatory Elements

Ten elements of the CELEBRATE metadata full element set have been defined as mandatory. Mandatory elements should be filled in every metadata instance that are exposed to the CELEBRATE Brokerage System. Eight elements are quite straightforward to fill: '1.1 General.Identifier', '1.2 General.Title', '1.3 General.Language', '1.4 General.Description', '5.5 Educational.Intended End User Role', '4.3 [Technical.Location](#)', '5.7 Educational.Typical Age Range' and '6.4 [Rights.CELEBRATE Digital Rights](#)'. The remaining two elements: '6.1 Rights.Copyright and Other Restrictions' and '9.4 Classification.Keyword' are more complicated because more elements may have to be filled in depending on their content.

### 2.3.1 General.Identifier - 1.1

'1.1 General.Identifier' is intended to give the LO a unique label to identify the LO and its origin.

CELEBRATE value space for '1.1 General.Identifier' element is described in detail in paragraph 2.2.1 Identifying Learning Objects and their Locations.

It is possible to have more than one '1.1 General.Identifier' elements but only one of them is permitted to have '1.1.1 Catalog' value "eln". This element refers explicitly to the LO being described by the metadata record. It does not refer to the metadata

record itself. To supply an identifier for the metadata record, refer to the ‘3.1 Meta-Metadata.Identifier’ element.

NOTE: This element is for administrative purposes only and should not be exposed to common users.

### **2.3.2 General.Title - 1.2**

‘1.2 General.Title’ is intended to give the LO a human readable name.

‘1.2 General.Title’ is a LangString (see paragraph 2.2.2 Data Types) element which provides a possibility to define the used language. Information Model (Appendix A) limits the number of ‘1.2 General.Title’ elements to one but data type LangString permits multiple values (10).

There can be multiple values in ‘1.2 General.Title’ element but they must be each in a different language and semantically equivalent.

### **2.3.3 General.Language - 1.3**

‘1.3 General.Language’ is intended to identify languages used within the LO.

Value space for ‘1.3 General.Language’ element is described in detail in paragraph 2.2.1 Language and there can be up to ten language elements.

NOTE: In ‘1.3 General.Language’ element “x-none” is an acceptable value unlike in other language elements. “x-none” is an actual value stored with the element but it is mapped to an appropriate language word in user interfaces.

Every language used to communicate with a user in a LO should be described. Languages are not exposed to users as codes and tokens used by machines but in human readable form. The applications, e.g. search engines and metadata tagging tools, are mapping codes to words which are then shown to users by their respective user interfaces. Value “x-none” should be used when it is not possible to identify any language for a LO (e.g. the picture of a flower).

### **2.3.4 General.Description - 1.4**

‘1.4 General.Description’ is intended to provide summarizing description of the LO.

‘1.4 General.Description’ is a LangString (see paragraph 2.2.2 Data Types) element which gives a possibility to define the used language. Information Model (Appendix A) permits ten different ‘1.4 General.Description’ elements and data type LangString ten different languages for each individual element. Each description can be up to 2000 character long.

Although the Information Model permits up to ten elements there should not be more than one description per language.

### **2.3.5 Technical.Location - 4.3**

‘4.3 Technical.Location’ is intended to provide information where the LO is physically located.

The data type of ‘4.3 Technical.Location’ is `CharacterString` and there can be up to ten values. CELEBRATE value space for ‘4.3 Technical.Location’ element is described in detail in paragraph 2.2.1 Identifying Learning Objects and their Locations. If there are multiple values the first one should be the one that is most preferred.

NOTE: It is also possible to give a direct URL pointing to a LO in this element.

To avoid manual input, values for this element should be captured from or supplied by an electronic system whenever possible.

### **2.3.6 Educational.Intended End User Role - 5.5**

‘5.5 Educational.Intended End User Role’ is intended to indicate the typical user of the LO.

The value space for ‘5.5 Educational.Intended End User Role’ element is a CELEBRATE Vocabulary. The Information Model (Appendix A) permits seven different ‘5.5 Educational.Intended End User Role’ elements.

One or more (up to seven) values from a CELEBRATE Vocabulary should be selected for this element. Elements are ordered such that the first value is the most frequently used. Four values (Author, Learner, Manager and Teacher) are the LOM vocabulary and the other three (Counsellor, Parent and Other) are extensions.

Vocabulary values:

#### **Author**

An author creates or publishes a LO (LOM).

The person who originates or gives existence to anything (Oxford English Dictionary 2<sup>nd</sup> edition, OED).

An authoring tool that produces pedagogical material is a typical example of a learning object whose intended end user is an author.

#### **Counsellor**

One who counsels or advises; an adviser (OED).

The role of the counsellor in school - where counselling is intended as a part of the 'guidance service' - consists of:

1. Supporting pupils in their self-examination;

2. Helping pupils to make the choices that are most consistent with their attitudes, competencies, perspectives, expectations;
3. Assisting them in solving/discussing their emotional, interpersonal, adjustment problems - also by making them participate in dedicated groups;
4. Providing pupils with information, advice, and clarifications;
5. Assessing them through the administration of tests, questionnaires, interviews;
6. Support them in strengthening their self-esteem and improving their self-concept.

**Learner**

A learner works with a LO in order to learn something (LOM).

One who learns or receives instruction (OED).

**Manager**

A manager manages the delivery of a LO (LOM).

A person who organizes, directs, or plots something; a person who regulates or deploys resources (OED).

**Parent**

A person who holds the position or exercises the functions of a parent; a protector, guardian (OED).

**Teacher**

One who or that which teaches or instructs; an instructor (OED).

**Other**

Role that is not one of the above.

### **2.3.7 Educational.Typical Age Range - 5.7**

‘5.7 Educational.Typical Age Range’ is intended to indicate the typical age of the user of the LO.

The value space for ‘5.7 Educational.Typical Age Range’ element is a minimum to maximum age range expressed in integral years and separated by a hyphen. Information Model (Appendix A) permits only one ‘5.7 Educational.Typical Age Range’ element. Either minimum or maximum value can be set to U (undefined) meaning that then the range is extended in that way.

Used with ‘5.6 Educational.Context’ (see paragraph 2.4.7) element it is possible to indicate e.g. school levels and grades with enough precision. Because of very different school systems in different countries it seems impossible to make comprehensive vocabularies that meet the needs of each country. In CELEBRATE the resolution is to combine these two elements and investigate other options when experiences are gained as the project advances.

There are many possible options to hide the complexity of this solution from users. For example it is possible to design the user interface so that it shows only one country’s school grade levels and the system maps those to the CELEBRATE ‘5.7

Educational.Typical Age Range’ and ‘5.6 Educational.Context’ elements. This solution keeps metadata meaningful and useful to users from other countries too.

### **2.3.8 Rights.Copyright and Other Restrictions - 6.1**

‘6.2 Rights.Copyright and Other Restrictions’ is intended to indicate if any copyright or other restrictions apply to the LO.

The value space for ‘6.2 Rights.Copyright and Other Restrictions’ element is a LOM Vocabulary. Information Model (Appendix A) permits only one ‘6.2 Rights.Copyright and Other Restrictions’ element.

NOTE: If the value of this element is “Yes”, in elements ‘6.3 Rights.Description’ and ‘6.4 Rights.CELEBRATE Digital Rights’ there has to be more information about those copyrights and restrictions, i.e. then they are mandatory elements.

Vocabulary values:

#### **Yes**

Copyright and/or other restrictions apply to a LO.

#### **No**

No copyright or other restrictions apply to a LO.

### **2.3.8.1 Rights.Description - 6.3**

‘6.3 Rights.Description’ is intended to provide a textual description of copyrights or other restrictions that apply to the LO.

‘6.3 Rights.Description’ is a LangString (see paragraph 2.2.2 Data Types) element which provide a possibility to define the used language. Information Model (Appendix A) limits the number of ‘6.3 Rights.Description’ elements to one but data type LangString permits multiple values (10).

There can be multiple values in ‘6.3 Rights.Description’ element but they must be each in a different language. It is possible to give different description of copyrights and other restrictions in every language but this approach could lead to misunderstanding so it is not encouraged.

NOTE: If the value of element ‘6.2 Rights.Copyright and Other Restrictions’ is “Yes”, there has to be textual information about those copyrights and restrictions, i.e. then this is a mandatory element.

### **2.3.9 CELEBRATE Digital Rights - 6.4**

‘6.4 Rights.CELEBRATE Digital Rights’ is intended to provide information about permissions of use of the LO.

NOTE: This is a CELEBRATE extension element to LOM information model.

In current phase of CELEBRATE project, all accesses have to be granted, and the value of this element is a standard expression provided by Brokerage System.

### **2.3.10 Classification.Keyword – 9.4**

‘9.4 Classification.Keyword’ is intended to describe the LO’s content with a multilingual thesaurus.

‘9.4 Classification.Keyword’ element is a child element of ‘9. Classification’ container element. Value for another child element ‘9.1 Classification.Purpose’ has to be “Discipline” when ‘9.4 Classification.Keyword’ element is used for terms from ELR Thesaurus. Actual values are entered in ELR Token Language and language value for LangString is “x-T-ELR”. Information Model (Appendix A) permits 40 ‘9.4 Classification.Keyword’ elements.

NOTE: Other elements from category ‘9. Classification’ are not to be used when the value of ‘9.1 Classification.Purpose’ is “Discipline”. All the elements from this category can be used together when the value of ‘9.1 Classification.Purpose’ is other than “Discipline”.

ELR Token Language values (tokens) are not exposed to users but they are shown as words in user a selectable language. The applications, e.g. search engines and metadata tagging tools, are mapping tokens to words which are then shown to users by user interfaces. Up to 40 values could be used and the order of them is not meaningful.

NOTE: Recommended element ‘1.5 General.Keyword’ is to be used in place of ‘9.4 Classification.Keyword’ when values are free text (see paragraph 2.4.1 General.Keyword).

## **2.4 Recommended Elements**

Eleven elements of CELEBRATE metadata full element set have been defined as recommended. Recommended elements are those that would be very useful to have filled in for every metadata instance that is exposed to CELEBRATE Brokerage System but they could be left unfilled.

### **2.4.1 General.Keyword - 1.5**

‘1.5 General.Keyword’ is intended to provide free text keywords describing the LO’s content.

NOTE: Mandatory element ‘9.4 Classification.Keyword’ is to be used in place of ‘1.5 General.Keyword’ when values are derived from ELR Thesaurus (see paragraph 2.3.8 Classification).

‘1.5 General.Keyword’ is a LangString (see paragraph 2.2.2 Data Types) element which provides a possibility to define the used language. Information Model (Appendix A) permits ten different ‘1.5 General. Keyword’ elements and data type LangString permits ten different languages for each individual element.

The tagging user interface should be designed so that it provides the possibility of entering individual keywords in different languages in one element.

The most specific terms descriptive of the LO's content should be used. Each term or phrase should use a separate keyword element and lengthy phrases should be avoided.

## **2.4.2 General. Structure - 1.7**

‘1.7 General.Structure’ is intended to provide information about the structure of the LO.

The value space for ‘1.7 General.Structure’ element is a LOM Vocabulary. Information Model (Appendix A) permits only one ‘1.7 General.Structure’ element.

Vocabulary values:

### **Atomic**

A LO that is indivisible (in this context).

NOTE: The term LO is used in this document generally for every type of learning resource (assets, CELEBRATE LOs and templates).

Individual picture, sound etc. files are considered always ‘Atomic’.

### **Collection**

A set of LOs with no specified (navigational) relationship between them.

An HTML page containing assorted picture files can be considered ‘Collection’ type LO.

### **Networked**

A set of LOs that are linked together with no clearly defineable path.

NOTE: Because only one value is permitted to this element, LOs containing multiple features from this vocabulary should be defined as ‘Networked’.

### **Hierarchical**

A set of LOs that are linked together with tree structure path.

### **Linear**

A set of LOs that are linked together with clearly defineable single sequence path.

NOTE: only one value from the vocabulary is permitted.

Using this element with other elements (e.g. 4.1 Technical.Format and 5.2 Educational.Learning Resource Type) it is possible to describe LOs in even greater detail.

### **2.4.3 Life Cycle.Contribute – 2.3**

‘2.3 Life Cycle.Contribute’ is intended to describe who has contributed to the LO.

The ‘2.3 Life Cycle.Contribute’ is a container element. Information Model (Appendix A) permits up to 30 ‘2.3 Life Cycle.Contribute’ elements.

NOTE: If this element is used, in elements ‘2.3.1 Life Cycle.Contribute.Role’ and ‘2.3.2 Life Cycle.Contribute.Entity’ has to be values, i.e. then they are mandatory elements. Use of ‘2.3.3 Life Cycle.Contribute.Date’ is recommended but not mandatory.

NOTE: This element concerns the contributors of the LO. Element ‘3.2 Meta-Metadata.Contribute’ concerns the contributors of the metadata instance itself.

#### **2.4.3.1 Life Cycle.Contribute.Role – 2.3.1**

‘2.3.1 Life Cycle.Contribute.Role’ is intended to describe the role of the contributor.

The value space for ‘2.3.1 Life Cycle.Contribute.Role’ element is a LOM Vocabulary. Information Model (Appendix A) permits only one ‘2.3.1 Life Cycle.Contribute.Role’ element.

NOTE: only one value from the vocabulary is permitted.

Vocabulary values:

##### **Author**

An entity primarily responsible for making the content of the LO. An author can be a person, institution, group or other entity (CanCore).

NOTE: If a team has made the LO usually only then there is need for identifying other roles than ‘Author’ (e.g ‘ Graphical designer’, ‘Technical implementer’, etc.)

##### **Publisher**

The individual or organization responsible for making the LO available in its present form, such as a publishing house, a university department, or a corporate entity (Dublin Core).

##### **Unknown**

The individual or organization whose role of contribution is not known.

**Initiator**

The person, institution, or funding agency responsible for originally causing the development process. (CanCore).

**Terminator**

The person or entity responsible for intentionally removing access to the LO (CanCore).

**Validator**

The person or entity responsible for confirming the overall integrity of the LO (CanCore).

**Editor**

The person or entity responsible for the revision of the LO for the purposes of publication or public presentation (CanCore).

**Graphical designer**

The specialist or entity responsible for the construction of the visual elements of a LO (CanCore).

**Technical implementer**

The specialist or entity responsible for the construction of the technical elements of a LO (usually software programmer).

**Content provider**

The person or entity that is supplying content for the LO.

**Technical validator**

The person or entity responsible for confirming the technical integrity of the LO (CanCore).

**Educational validator**

The person or entity responsible for confirming the educational integrity of the LO (CanCore).

**Script writer**

The person or entity responsible for the creation of a text read or performed in an audio, video, and/or interactive learning resource (CanCore).

**Instructional designer**

The specialist or entity responsible for applying research-based principles to the design of the LO.

**2.4.3.2 Life Cycle.Contribute.Entity – 2.3.2**

‘2.3.2 Life Cycle.Contribute.Entity’ is intended for identification of and information about entities (i.e., people, organizations) contributing to the LO.

The value space for ‘2.3.2 Life Cycle.Contribute.Entity’ element is a IMC vCard 3.0. Information Model (Appendix A) permits up to 40 ‘2.3.2 Life Cycle.Contribute.Entity’ elements.

NOTE: Minimum information about a person: name (first and last) and affiliation. Minimum information about organization: name and web page address.

### **2.4.3.3 Life Cycle.Contribute.Date – 2.3.3**

‘2.3.2 Life Cycle.Contribute.Date’ is intended for the date of contribution.

The value space for ‘2.3.3 Life Cycle.Contribute.Date’ element is DateTime data type. Information Model (Appendix A) permits only one ‘2.3.2 Life Cycle.Contribute.Date’ element.

### **2.4.4 Meta-Metadata.Contribute - 3.2**

‘3.2 Meta-Metadata’ is intended to describe who has contributed to the metadata instance.

The ‘3.3 Meta-Metadata.Contribute’ is a container element. Information Model (Appendix A) permits up to ten ‘3.3 Meta-Metadata.Contribute’ elements.

NOTE: If this element is used, in elements ‘3.3.1 Meta-Metadata.Contribute.Role’, ‘3.3.2 Meta-Metadata.Contribute.Entity’ and ‘3.2.3 Life Cycle.Contribute.Date’ has to be values, i.e. then they are mandatory elements.

NOTE: This element concerns the contributors of the metadata instance. ‘2.3 Life Cycle.Contribute’ concerns the contributors of the LO.

#### **2.4.4.1 Meta-Metadata.Contribute.Role – 3.2.1**

‘2.3.1 Meta-Metadata.Contribute.Role’ is intended to describe the role of the contributor.

The value space for ‘3.2.1 Meta-Metadata.Contribute.Role’ element is a LOM Vocabulary. Information Model (Appendix A) permits only one ‘3.2.1 Meta-Metadata.Contribute.Role’ element.

NOTE: only one value from the vocabulary is permitted.

Vocabulary values:

#### **Creator**

A creator is the entity (person, organization, or indexing system) primarily responsible for making the content of the metadata record. A creator can be a person, institution, group, or other entity (CanCore).

## **Validator**

The entity that is primarily responsible for ensuring the syntactic and semantic integrity of the metadata record according to the rules and recommendations of the metadata schemas and quality control mechanisms. A validator can be a person, institution, group or other entity (CanCore).

### **2.4.4.2 Meta-Metadata.Contribute.Entity – 3.2.2**

‘3.2.2 Meta-Metadata.Contribute.Entity’ is intended for identification of and information about entities (i.e., people, organizations) contributing to the metadata instance.

The value space for ‘3.2.2 Meta-Metadata.Contribute.Entity’ element is a IMC vCard 3.0. Information Model (Appendix A) permits up to ten ‘3.2.2 Meta-Metadata.Contribute.Entity’ elements.

NOTE: Minimum information about a person: name (first and last) and affiliation. Minimum information about organization: name and web page address.

### **2.4.4.3 Meta-Metadata.Contribute.Date – 3.2.3**

‘3.2.3 Meta-Metadata.Date’ is intended for the date of contribution.

The value space for ‘3.2.3 Meta-Metadata.Contribute.Date’ element is DateTime data type. Information Model (Appendix A) permits only one ‘3.2.3 Meta-Metadata.Contribute.Date’ element.

### **2.4.5 Meta-Metadata.Language - 3.5**

‘3.5 Meta-Metadata.Language’ is intended to describe the language of the metadata instance.

NOTE: This element concerns the language of the metadata instance. Element ‘1.3 General.Language’ concerns the language of the LO.

The value space for ‘3.5 Meta-Metadata.Language’ element is described in detail in paragraph 2.2.1 and there can be only one value.

The choice of language used in this element is used as the default language of the all LangString data types in a metadata instance unless otherwise specified.

### **2.4.6 Technical.Format - 4.1**

'4.1 Technical.Format' is intended to provide information about software needed to access the LO.

Value space for '4.1 Technical.Format' element is described in detail in paragraph 2.6.1 and there can be up to 40 values.

MIME Types (actual values, e.g. "application/x-pn-realmedia") are not necessarily exposed to users but they may be shown in amore human readable text. The applications, e.g. search engines and metadata tagging tools, are mapping MIME Types to words which are then shown to users by user interfaces. To avoid manual input, values for this element should be captured from or supplied by an electronic system whenever possible.

All the components of a LO should be described. If a LO comprises several MIME types (e.g. a Web page with images and videos), all types should be listed.

NOTE: If the format of a learning object is a content package, then in this data element describes all the formats inside a package and the information about a package is provided in the element '4.8 Technical.Facet'.

NOTE: If there are additional information needed for technical format of a LO (e.g. "FlashPlayer 6 required"), it should be described as free text in '4.6 Technical.Description' element.

#### **2.4.7 Technical.Size - 4.2**

'4.2 Technical.Size' is intended to provide information about the actual file size of the LO.

The value of "'4.2 Technical.Size' is expressed in bytes and there can be only one value.

Although the actual value is in bytes, user interfaces should give users more friendly view of this data. If the LO is compressed, then this element should refer to the uncompressed size. To avoid manual input, values for this element should be captured from or supplied by an electronic system whenever possible.

#### **2.4.8 Technical.Facet - 4.8**

'4.8 Technical.Facet' is intended for classifying technical requirements of the LO.

The '4.8 Technical.Facet' is a container element. Information Model (Appendix A) permits up to fifteen '4.8 Technical.Facet' elements.

NOTE: If this element is used, in elements '4.8.1 Technical.Facet.Name' and '4.8.2 Technical.Facet.Value' has to be values, i.e. then they are mandatory elements.

##### **2.4.8.1 Technical.Facet.Name - 4.8.1**

‘4.8.1 Technical.Facet.Name’ identifies the name of a technical facet of the learning object.

The value space for ‘4.8.1 Technical.Facet.Name’ element is a CELEBRATE Vocabulary. Information Model (Appendix A) permits only one ‘4.8.1 Technical.Facet.Name’ element per facet.

Vocabulary values:

**Packaged format**

A LO is a content package.

**SCORM 1.2**

A LO contains SCORM 1.2 API features.

**2.4.8.2 Technical.Facet.Value - 4.8.2**

‘4.8.2 Technical.Facet.Value’ is intended to give the value of a technical facet of the learning object.

The value space for ‘4.8.2 Technical.Facet.Value’ element is a CELEBRATE Vocabulary. Information Model (Appendix A) permits only one ‘4.8.2 Technical.Facet.Value’ element per facet.

NOTE: The vocabulary values depend on chosen ‘4.8.1 Technical.Facet.Name’.

Vocabulary values for ‘Packaged format’:

**Application/zip**

A content package is in zip format.

Vocabulary values for ‘SCORM 1.2’:

**Enhanced**

A LO is enhanced when a SCORM 1.2 compatible player is available.

**Required**

A LO requires a SCORM 1.2 compatible player.

**2.4.9 Educational.Learning Resource Type - 5.2**

‘5.2 Educational.Learning Resource Type’ is intended to indicate the potential educational use(s) or type(s) of the LO.

The value space for ‘5.2 Educational.Learning Resource Type’ element is a CELEBRATE Vocabulary. Information Model (Appendix A) permits eight different ‘5.2 Educational.Learning Resource Type’ elements.

It should be noted that many LOs have features from more than one of the following categories. Guides and glossaries are information resources and exploration LOs can contain drill and practice elements. **Templates can be tagged as tools or guides and the use of free keywords for further description is recommended.** One or more (up to eight) values from a CELEBRATE Vocabulary should be selected for this element. Elements are ordered so the first value is a most dominant kind.

There is no information concerning to whom a LO is intended in this element. '5.5 Educational.Intended End User Role' is intended to indicate the typical user of the LO.

Vocabulary values:

### **Assessment**

Assessment and evaluation items. Exams and tests.

Any LO whose primary purpose is the evaluation of the user's actions or input or to support teacher design or development of such materials. Used e.g. for assess learner performance or self-assessment.

### **Drill and practice**

Simple exercises and games.

Exercises (drills) that perform skill training are very condition and action specific. They usually contain only simple IF-THEN logic rules. Many 'educational' games belong to this category if they concentrate on specific skills.

### **Exploration**

Simulations and experiments.

Simulations are imitating the behaviour of some situation or by means of a suitably analogous situation or apparatus. Experiments are actions or operations undertaken in order to discover something unknown, to test a hypothesis, or establish or illustrate some known truth.

### **Glossary**

Dictionaries and vocabularies.

Collection of specialized terms and their meanings usually arranged in some stated order.

### **Guide**

Manuals and tutorials.

Manuals provide guidance on the particular topic (e.g. roadmap, hints, etc.) and are usually also intended to be kept at hand for reference. Tutorials are resources that provide guided, practical information about a specific subject.

### **Information resource**

Pictures, texts, videos, presentations, collections and databases.

Any presentation or informative content that is 'raw' material for learning.

### **Open activity**

Artistic projects and creative exercises.

Projects and exercises that are not very confined or limited. Many more complicated games that require more than simple logic belong to this category.

### **Tool**

Editors and other kind of programs for producing something.

Editors can process e.g. text or pictures and they can be used for creating and editing other LOs. Tools can also perform calculations or conversions.

## **2.4.10 Educational.Learning Context - 5.6**

‘5.6 Educational.Learning Context’ is intended to indicate the institutional environment or the level of education appropriate for use of the LO.

The value space for ‘5.6 Educational. Learning Context’ element is a CELEBRATE Vocabulary. Information Model (Appendix A) permits 12 different ‘5.6 Educational. Learning Context’ elements.

This vocabulary should be used in conjunction with element ‘5.7 Typical Age Range’ in order to express the full context. For example the value “Compulsory education” will be interpreted differently in different countries but is meant to indicate the regular schooling and other education after kindergarten and before higher education. In user interfaces the terms applicable in each country should be used and/or alternative vocabularies that map to this vocabulary could also be used.

One or more (up to 12) values from a CELEBRATE Vocabulary should be selected for this element.

Vocabulary values:

**Pre-school**

A kindergarten or nursery school for children of preschool age. (OED)

**Compulsory education**

Regular schooling and other education after kindergarten and before higher education.

**Special education**

Designed or provided for persons who have special educational needs which prevent them from receiving (wholly) mainstream education. This value can be selected together with any other values in this vocabulary in order to express special need in any context.

**Vocational education**

Training or education that is pertaining or relating to a vocation or occupation.

**Higher education**

Education provided by a college or university.

**Distance education**

Instructional delivery that does not constrain the student to be physically present in the same location as the instructor.

**Adult / continuing education**

The further education of those over ordinary school age. Adult / continuing education is not related to job training in this context.

**Professional development**

Training or education that is related to improving professional skills.

**School libraries / documentation centre**

School libraries/documentation centres are places where the information skills are taught and the access to learning services, books, and multimedia resources in a school environment are organized.

**Educational administration**

Management and administration of educational and training institutions.

**Policy making**

Makers of policy decisions. This value is intended to higher levels than local institutions management.

**2.4.11 Educational.Typical Learning Time - 5.9**

‘5.9 Educational.Typical Learning Time’ is intended to indicate how long it will likely take a learner or other user to use the LO.

Value space for ‘5.9 Educational.Typical Learning Time’ element is described in detail in paragraph 2.2.2 Data Types and there can be only one value.

This element is especially useful for audio and video clips. Because the actual value is in Duration data type form, user interfaces should give users a more friendly view on this data. To avoid manual input, values for this element should be captured from or supplied by an electronic system whenever possible.

#### **2.4.12 Educational.Description - 5.10**

‘5.10 Educational.Description’ is intended to provide a textual description of educational uses of the LO.

‘5.10 Educational.Description’ is a LangString (see paragraph 2.2.2 Data Types) element which provides a possibility to define the used language. Information Model (Appendix A) permits ten different ‘5.10 Educational.Description’ elements and data type LangString ten different languages for each individual element. Each description can be up to 1000 character long.

There can be multiple values ‘5.10 Educational.Description’ element but they must be each in a different language.

NOTE: This element is for describing the *use* of a LO. A description of a LO and its content should be provided in ‘1.4 General.Description’.

#### **2.4.13 Educational.Learning Principles - 5.12**

‘5.12 Educational.Learning Principles’ is intended to provide information about what kind of learning principles the LO is supposed to support.

NOTE: ‘5.12 Educational.Learning Principles’ is an extension element to the LOM element set.

The value space for ‘5.12 Educational.Learning Principles’ element is a CELEBRATE Vocabulary. Information Model (Appendix A) permits 13 different ‘5.12 Educational.Learning Principles’ elements.

The learning principles presented here are based on the ideas of the foundation paper (Erno Lehtinen, draft). The aim is to present the most important learning principles, not a complete list of all possible activities that support learning processes. Learning principles are very close to *the goals of learning*. Learning principles emphasize certain learning activities and these activities support especially certain goals.

NOTE: it is not the aim that every principle is used in every LO - it is not even possible. A LO can use one or more of these principles, depending on the aims and the content.

One or more (up to 9) values from a CELEBRATE Vocabulary should be selected for this element.

Vocabulary values:

### **Prior knowledge**

There is a considerable unanimity among all modern learning theories that learning is based on previously acquired knowledge and skills. However, learning is not a simple cumulative process in which all the new contents and skills components can be added to the prior ones. Prior knowledge has a much more fundamental significance in the human knowledge construction process, because prior knowledge structures and conceptions are actively involved in the information processing. For example previous knowledge structures (mental models, mental presentations) tend to focus human perception and interpretation of perceived information, act on constructing new knowledge structures (or modifying the older ones) and make sense about the world around, as well as impact on procedures related to storing and retrieving from memory. In other words, when new information is provided, learners try to interpret it in the context of their already existing representations.

#### *Guidelines to use in designing LOs*

Because the activation of learners' prior knowledge has a significant role in the learning of new content, it's important to bear that in mind in the design of LO. Here are presented some means to activate prior knowledge and some suggestions how these can be applied in the design of a LO.

- ***Wake the learner to think what she or he already knows about the content being learned.*** This awakening can be made in the form of questions, which make learners think about relevant content. These questions should provoke learners' interests in the issues being learned, and therefore the nature of the questions should be thought-provoking, not pre-test such measurement of the level of the learners' prior knowledge
- ***Help the learner to evaluate the limitations of her/his own understanding on the given issue.*** The prior knowledge can also be activated by presenting information to learners that challenges their thinking. In the LOs this information can be provided e.g. in the form of animations, videos, pictures or just plain text, but the main point is that this information must touch on learners thinking. A good way to do this is to present information that conflicting (but scientifically proven) with the typical mental models of learners of that target age/group.
- ***Help to reflect how the issue being learned is connected to the other related issues she/he already knows.*** A good way to achieve this is to anchor the content being learned into problems and contexts that spring directly from learners' everyday experience. When the context of learning is familiar to the learners, it is easier for them to bring up ideas related to learned issues because the cues provided by the LO are known to them. The common thing in all of these means is the importance of waking up the learners' motivation toward learned issues, in addition to activating their thinking.

For example if we apply these means into understanding the spherical model of the earth for young pupils, we can activate their concrete experiences and prior knowledge by stating the questions like “do you know why sun sets in the evening?” or “can you explain why there are different seasons during a year?”. Secondly, pupils can be made to face the limitations of their own thinking by presenting them an animation of e.g. earth’s circulation around its own axis and around the sun, which are typically contradictory than the conceptions of children of that age. Thirdly, the whole approach of the LO can be constructed in a way that it guides learners to discover issues being learned by solving problems that are familiar to them. For example, the issues are presented to learners in a form of challenges like “why is it colder in Finland in winter than in summer time?” or “what time of day is it in Australia when we in Finland wake up in the morning?”

### **Conceptual change**

In a number of subjects, especially in sciences, the learners’ interpretations of scientific information are often constrained by deeply entrenched presuppositions about the way the world operates. Sometimes these faulty assumptions can hinder the learning of new content. Due to learners’ misconceptions it may be difficult for them to understand some new information, because it violates their presuppositions. Often learners try to reconcile the new information with these faulty presuppositions without giving them up (e.g. ignoring, rejecting or excluding the new information) or changing them only partially. Instead of that kind of assimilation, learners need to go through a process of conceptual change in which their presuppositions and beliefs are gradually revised. Conceptual change means that learners’ pre-instructional conceptual structures have to be fundamentally restructured and reformulated in order to allow understanding of the intended knowledge, this requires for specific stimulation. In order to revise their preconceptions learners need to become aware of their presuppositions and explanatory frameworks which affect their interpretations, that is, they have to develop their metaconceptual awareness.

#### *Guidelines to use in designing LOs*

There are number of ways to support the process of conceptual change. Here are presented some means to support conceptual change and some suggestions how these can be applied in the design of LO.

- **Activate learners’ prior knowledge** about the issue at hand. In order to make conceptual change possible first hand, the learners need to become aware of their limited interpretations and understanding about new information. This can be accomplished by making them confront some data that challenges their current beliefs (e.g. young learners are shown animations that earth moves around the sun, not vice versa). In this way the gaps in their thinking can be shown to them and they can become aware of what they need to learn.
- **Challenge learners’ thinking** by asking questions and/or presenting conflicting data or multiple perspectives. One promising way to produce such confrontation is to present competing predictions of other peers to the learner. In other words, multiple perspectives are presented (instead of a single right one) which can challenge learner’s thinking.

- ***Give learners an opportunity to express themselves and get feedback on their action.*** It's important that learners can express their own ideas on the content being learned, and then compare them to those of others. In the design of LOs or LO packages this can be implemented for example by using tools like mind map, whiteboard, discussion forums or chat. Afterwards learners should be given an opportunity to obtain feedback and compare their own products with others' products or with the sample of example products.
- ***Give learners a chance to interact with the content.*** The stimulation to learn new concepts and reformulate prior ones can be accomplished by using interactive tools (e.g. simulations) with which learners can manipulate abstract concepts, test their own assumptions about them and see the consequences of their own actions.
- ***Present content by using multiple representations and link them together.*** The understanding of content being learned may benefit from using multiple representations and the potential offered by hypermedia. By using multiple representations the abstract concepts can be made more concrete and easier to understand (e.g. the same chemical reaction can be presented with chemical formulas, graphs of molecules, animation of that reaction, video of scientist causing this reaction etc.). The concepts and different representations can also be linked together to explicate the interconnection between them.
- ***Provide scaffolding throughout the process.*** As stated earlier, conceptual change needs scaffolding, which can be provided either by teacher, more advanced peers or even by the LO. The main point in scaffolding is that it doesn't give straight answers and solutions to learners, but engages them with thinking and only subtly leads them to the preferred direction. If the scaffolding is included in the design of the LO, it can be made in a form of activating questions or advices to reflect the work done. The implementation of intelligent tutoring system inside the LO is not a realistic option.

### **Expert models and guidance**

In a learning process, learners acquire more advanced understanding of the phenomena under study, if they can reflect their performance against an ideal performance, which we can regard as an expert's performance, or even better, of several experts' performance. This works as a model for the learners. Typically a teacher or a textbook has given the model, but they are often too limited, given as a fact, without arguments or explanations about the solution. A model of an expert should be explained and presented so that the learners can find the differences to their own performance and understanding.

Similarly, expert guidance and scaffolding during the learning process provide learners support that enables them to deal with more challenging tasks than they could otherwise handle.

#### *Guidelines to use in designing LOs*

- Show ***how different experts think*** about the topic, e.g. explanations in text, interviews, and texts of historical fragments.

- Give *expert models* e.g. in video clips, pictures or voice, in which *the critical points* are shown.
- If the LO consists of tasks, show also *how an expert would solve the task and why*.
- *Provide support, just-in-time guidance and modelling of appropriate action to the learners (scaffolding)*. Scaffolding can either be provided by a teacher or by the LO. In the LO the scaffolding can mainly be done in a form of activating questions and summaries, or hints and recommendations, which prompt learners to reflect their own learning and ways of working with the LO. Modelling of appropriate progression can also be made e.g. in a form of tutorial which can show what kind of discovery processes experts do with the experimenting tools (simulation).

### Complexity of the content

Too often learning contents are presented without the real life's roughness, just as clean models or simplified truths. For learning this is a wrong approach because it doesn't help the learner to recognize the phenomenon in real life and the connection between the model and the phenomenon may not be understood.

Authenticity is a way of facing the complexity of the content. It means that the learning process, content, activities and tools emphasize knowledge and understanding in real life situations. These are typically ill defined and there are several ways of solving the problem, or several perspectives to think about the problem. It is also essential that the content is not thought too narrow-minded but it combines all necessary domains.

#### *Guidelines to use in designing LOs*

Facing the complexity can be brought in to a LO in several means:

- *Support authentic problems*, which are not ready-made problems, but wide and they offer various approaches to some phenomenon, and represent the information in a way that raises questions
- *Help to understand the complexity of a problem*. Accept several ways of can be defining a problem, and solutions as well as the processes. Help to understand that there are even problems, which cannot be solved.
- *Help to relate the content to other LOs and materials*,
- *Help to relate the learning in the previous work* of the domain, e.g. by saving and reusing former student products
- *Support content and activities that are authentic also to the learner* and close e.g. his/her age, culture and thinking.

### Multiple representations

Learning often involves the acquisition and use of complex systems of symbolic expressions represented in different media. Appropriate representations are important elements in any learning and construction process, but the problem of relevant

external representations is highlighted when complex concepts and skills are the content of learning. Deeper learning in many situations requires the ability to manipulate, connect, and understand the meaning and interrelationship of different kinds of external representations. However, such skills are difficult to acquire. Students often fail to understand the relationship that exists between symbolic expressions and the situations to which they refer. It is typical that the concrete external representation used by the teacher is considered to be the complete concept. When students are not encouraged to pay attention to the abstract concepts and operations "behind" the concrete facts and algorithmic routines, they try to learn the subject matter by imitation and memorization of the mechanical procedures and symbolic expressions.

By providing multiple representations of the same phenomena in different contexts and externalising the relationships between different models we can facilitate students' thinking. Computers can be very helpful in this, since technological representational tools can help the students to externalise their idiosyncratic and informal hypothesis and to compare this hypothesis with scientific concepts and culturally shared definitions.

#### *Guidelines to use in designing LOs*

- ***Simultaneous representations of the same phenomena in multiple formats:*** Text, digital video, images, or immersive virtual realities, etc. differ from one another. They all have representational properties that are more suitable in one context than in other. By simultaneously using many media one can better clarify the properties of a phenomenon. Different media thus complement one another.
- ***Externalise the informal representations.*** Link graphs and symbolic representations to the qualitative representations formed by experts, as well as literal aspects of the situation to which they refer. E.g. chemical equations and graphs of chemical changes are represented simultaneously with animations of the reaction at the molecular level. This facilitates understanding of abstract concepts by integrating them with a visual representation of a normally invisible process.
- ***Top-down and bottom-up representations:*** Novices are frequently constrained by the surface features of the problem and fail to see / understand the relevant conceptual deep structure. To address this issue we should make explicit how structural dimensions of knowledge (i.e., abstract domain concepts) apply in various cases or problem contexts. Furthermore, we should also provide multiple cases which work under the same rules. With these inter-case hyperlinks we can connect the surface features of a case or problem with the conceptual deep structure represented by the abstract domain concepts.

#### **Collaboration**

Cognitive research indicates that advancement of learning can be substantially elicited by relying on socially distributed cognitive resources, emerging through social

interaction between the learners, and collaborative efforts to advance shared understanding. In a shared problem-solving process, agents who have partial but different information about the problem in question appear both to improve their understanding through social interaction. Through social interaction, contradictions, inconsistencies, and limitations of students' explanations become available because it forces them to perceive conceptualisations from different points of view. Deep conceptual understanding is also fostered through explaining a problem to other inquirers. In order to explain one's view to his or her peers, an individual student has to commit himself or herself cognitively to some ideas, explicate his or her beliefs, as well as organize and reorganize his or her knowledge.

A challenge in developing virtual learning objects and tools, is to develop tools that help a partially or completely virtual community, or people working asynchronously, to manage their collaborative activities, and utilize knowledge and other things produced by their fellow students. The tools may involve shared active representations and dynamic visualizations that allow the participants to interact through various modalities, such as visual or conceptual communication.

A crucial aspect of collaborative learning is to guide students to pose questions or problems that direct their work. It appears that themes and questions that arise from the students' own interests have a special value in collaborative learning. By encouraging students to systematically create and build together their explanations for problems being investigated, the participants can be guided to trust their own voices rather than merely rely on the teacher's cognitive authority. A critical condition for progress in collaborative work is that the teacher deliberately guides students in improving their conceptions by evaluating each other's productions and building on the shared knowledge base.

#### *Guidelines to use in designing LOs*

- One collaborative learning object can be ***a meaningful, asynchronous discourse tool*** (knowledge building area) that has built-in supports. The support can be, for instance, in the form of guiding learners to categorize their computer entries (posting to the database on learning environment in question) according to essential aspects of work. The discourse tool can also include templates, examples or instructions for labelling the postings or organizing the collaborative process, such as: What do I still need to know? Can I explain what I mean with this?
- A collaborative learning object, for building knowledge or for fostering social awareness and community feeling, can also be ***a synchronous tool***: chat function, writing template, graphical tool or "white board" that makes it possible for a group of students to author or edit collaboratively the same shared artefact at the same time.
- Even though there are no collaborative tools or functions in a LO, ***the learning tasks, and the recommendations for carrying them out***, can be designed to encourage, and even require collaborative effort of a group of learners, such as a joint research task or a school journal.

## Visualisation of thinking

Students often face difficulties in monitoring their own learning processes. They find it difficult to remember or distinguish between different phases of their work (reasoning), which then causes problems in correcting their reasoning when they for example fail to complete some task in a desired manner. Students also often find it hard to keep more than one complex hypothesis activated at a time. By providing appropriate visualisation tools we can diminish these problems. For example a graphical (e.g. tree-like) representation can work as a cognitive map for a user to explore the steps of her/his reasoning process more easily, and allow her/him to navigate back and forth whenever needed without disturbing the actual problem solving process. The graphical representation projected on the student screen can also serve as a shared point of reference which can help group of students to better focus on the task in hand. It can also help teacher to monitor and more adequately support students' problem solving.

*Guidelines to use in designing LOs*

- ***Provide tools (LOs) which record every action*** (e.g. decision) ***made by a student and represent that action graphically*** (e.g. tree-like concept map).
- The tool could also include a feature for ***student notes*** etc, which can make student's thinking even more visible.
- ***Work of individual student should be made accessible for everyone:*** monitoring of the progress made by others helps students to evaluate her/his own work.
- The tool should also ***allow students to commenting*** on the different phases of each other's work.
- ***Track the changes feature*** -- the tool could also be organized in such manner that the same representation would simultaneously show the work (modifications) of different participants (individuals or/and groups) on the same task (e.g. object).

Concept maps, modelling of the process, advanced visualisation & design tools are typically tools that help to visualize thinking processes.

## Analogical reasoning

Solving of complex problems and making sound decisions are difficult processes for each of us. Studies of problem solving reveal that people often don't retrieve their relevant knowledge at appropriate times. And furthermore, even if one can retrieve appropriate knowledge from memory there may be obstacles in implementing this knowledge in novel-appearing problems and situations. Thus having solved one problem does not offer much help in solving an analogous problem when the two problems come from very different context. One of the biggest problems in knowledge transfer is that people tend to access previous knowledge that bears surface, rather than structural, similarity to the problem at hand. Often these surface features of the problem are constraining and can prevent to recognize relevant conceptual deep structure.

How can we facilitate knowledge transfer which is based on the structural, not superficial, similarities between different problems? The answer is to encourage analogical reasoning, that is, to draw a comparison between two or more problem situations. If successful analogical transfer relies on perceived similarities between current problems and stored experiences, perhaps the abstraction of general principles during learning can form the basis for a perception of similarities in new problem situations involving the same principles. People seem to draw such abstractions readily when explicitly asked to compare. However, often this kind of comparison does not occur automatically, and the encouragement to compare is important. The abstraction of common structures can be achieved by focusing on shared aspects between example problems with different surface features. After constructing abstractions of common structures of example problems, these abstractions can be used retrieved and applied in future. Furthermore, this kind of analogical comparison can inform students which aspects of the problem are relevant and which are not.

### *Guidelines to use in designing LOs*

Support for analogical reasoning is based on example problems/contexts, which are authentic-like and relevant to the learners. Therefore the used examples of problems are very important in designing of LOs, and those should be presented in a way that motivates learners. The most important guidelines and steps to apply them in the designing of LO are as follows:

- ***Present several examples of problems situations/contexts to the learners***, which have a) same deep structure and surface features, b) same deep structure, but different surface structures, c) different deep structure, but same surface features, and d) different deep structure and surface features. These examples of problem situations can be presented either simultaneously or sequentially (bear in mind the limitations of human information processing). This can be done for example with animations or video clips presenting different problems to the learners (e.g. If we take an example from chemistry, learners can discover molecular changes in chemical reactions (evaporation, melting etc.) with different materials. At the surface level, all the materials behave generally in the same way when heated, but e.g. the boiling point differs between different materials).
- ***Facilitate the comparison by asking explicitly the learners to compare the examples***. It is very effective to present motivating questions, which requires the learners to compare previously represented examples (e.g. do the molecular structures of example matters differ (and in what way), are the molecular changes different etc.). Comparison can also be facilitated by pointing out some interesting differences or similarities to learners which they barely see without prompting (e.g. note that this matter has one extra carbon atom here etc.).
- ***Encourage the learners to find out similarities and differences between different examples***. This can also be made in a form of questions which especially require finding similarities and differences (e.g. in what way these matters are different from each others etc.)
- ***Highlight the relevant deep structure of example problems***. Important aspects of examples can be highlighted by using the visualization power of modern technology. Relevant features of example problems can be emphasized visually (e.g. pointing with an arrow on some important actions in molecular

changes) or verbally (e.g. explaining narratively what is going on in the example chemical process). All the time it is important that example problems are compared with each others

- **Facilitate the ownership of working**, that is, to give the learners an opportunity to solve the problem by themselves with their own methods. There should be tools available with which learners can make their own discoveries and experimentations with example problems. Especially highly interactive simulations can be appropriate means for students-led discoveries.
- **Provide support, just-in-time guidance and modelling of appropriate action to the learners (scaffolding)**. Scaffolding can either be provided by a teacher or by the LO. In the LO the scaffolding can mainly be done in a form of activating questions and summaries, which prompt learners to reflect their own learning and ways of working with the LO. Modelling of appropriate progression can also be made e.g. in a form of tutorial which can show what kind of discovery processes experts do with the experimenting tools (simulation).
- **Facilitate the ownership of working**, that is, to give the learners an opportunity to solve the problem also by themselves with their own methods. There should be tools available with which learners can make their own discoveries and experimentations with example problems. Especially highly interactive simulations can be appropriate means for students-led discoveries.

## Skill training

A skill is defined as learned ability of associating an optimal action with the task process state or its characteristics. Skill training is based on repetition and reinforcement that fosters the adaptation of a new skill or enables and improves specific task performance. In practice, exercises (drills) that perform skill training are very condition and action specific. They usually contain only simple IF-THEN logic rules that make them easy to implement.

Although contemporary learning research doesn't favor the idea of skill training, there are still many domains, in which fundamental skills are critical to acquire before more advanced activities can occur. Further, there are certainly basic skills that can be trained very easily and efficiently with computers. Foreign language vocabulary, arithmetic facts, reading and basic calculations are obvious examples.

### Guidelines to use in designing LOs

- A drill should **focus on one or two well-defined skills** rather than on several simultaneously.
- A drill should **produce immediate, easy and brief responses** on user actions.
- A drill should **provide feedback regarding user's performance**.
- A drill should **remediate** those **skills that users do not perform well**.
- The **user should be able to change** the difficulty level / complexity and presentation speed of **the drill items**.

## Metacognition

Metacognition is thinking about thinking, using the knowledge of cognition in order to control and supervise cognitive operations (metacognitive control processes). The basic metacognitive strategies are:

1. Connecting new information to former knowledge.
2. Selecting thinking strategies deliberately.
3. Planning, monitoring, and evaluating thinking processes.

A learner uses metacognitive strategies to define a problem situation and to search for alternative solutions. He/she tailors this search for information to constraints of time and energy. He/she monitors, controls and judges his/her thinking. He/she evaluates and decides when a problem is solved to a satisfactory degree or when the demands of daily life take a temporary or permanent higher priority.

Learning how to learn, and developing a repertoire of thinking processes that can be applied to solve problems imply metacognitive behaviour. Metacognitive skills are mostly needed when habitual responses are not successful. Guidance in recognizing, and practice in applying metacognitive strategies, will help learners to successfully solve problems throughout their lives. It's crucial to assist learners in becoming aware of their own thinking processes. When learners are aware of their learning strategies, they will begin to transfer learning strategies to new situations.

#### *Guidelines to use in designing Los*

1. Establish process goals, in addition to content goals, in order to make learners discover that understanding and transferring thinking processes improves learning;
2. Focus student attention on how tasks are accomplished;
3. Make learners identify "what they know" and "what they don't know" about the topic.
4. Give learners the opportunity to reflect upon their thinking, make note of their awareness of ambiguities and inconsistencies, and comment on how they have dealt with difficulties (learning log), both in a context of an individual and of cooperative learning.
5. Stimulate learners to estimate time requirements, to organize materials that are provided, to schedule the procedures necessary to complete the activity
6. Include the possibility for learners to review their activity:
  - a. identifying the cognitive strategies used (for instance by checklists focusing on cognitive processes);
  - b. evaluating their success/failure, discarding inappropriate strategies, identifying those valuable for future use, and seeking promising alternative approaches.

### **2.4.14 Rights.Cost - 6.1**

'6.1 Rights.Cost' is intended to indicate if the use of the LO requires any payment.

The value space for '6.1 Rights.Cost' element is a LOM Vocabulary. The information Model (Appendix A) permits only one '6.2 Rights.Cost' element.

NOTE: If the value of this element is “Yes”, in element ‘6.3 Rights.Description’ has to be more information about the cost, i.e. then it is a mandatory element.

Vocabulary values:

**Yes**

Use of a LO requires payment.

**No**

Use of a LO requires no payment.

## **2.5 Optional Elements**

All other elements than above described mandatory and recommended elements are considered as optional. Optional elements are described in full element set table (Appendix A).

## **2.6 Vocabularies**

In this section the vocabularies used in the CELEBRATE application profile are discussed.

### **2.6.1 Format - 4.1**

All the MIME types based on IANA registration (see RFC2048:1996) are acceptable . Underneath follows a recommended minimum set for CELEBRATE.

application/base64
application/binary
application/java
application/macbinhex40
application/msexcel
application/msword
application/pdf
application/postscript
application/ppt
application/rtf
application/sdp
application/smil
application/uue
application/x-compressed
application/x-gzip-compressed
application/x-pn-realmedia
application/x-shockwave-flash
application/x-stuffit
application/x-zip-compressed

application/zip
audio/basic
audio/midi
audio/mp3
audio/mpeg
audio/x-pn-realaudio
audio/x-pn-realaudio-plugin
audio/x-wav
image/bmp
image/gif
image/jpeg
image/png
image/tiff
image/x-wmf
model/vrml
text/html
text/plain
text/richtext
text/xml
video/avi
video/mpeg
video/x-pn-realvideo
video/x-pn-realvideo-plugin
video/quicktime

### 2.6.2 Learning Resource Type - 5.2

There are many LOs not belonging exactly in one category and in those cases one can choose multiple terms from a vocabulary.

Assessment
Drill and practice
Information resource
Glossary
Guide
Exploration
Open activity
Tool

### 2.6.3 Intended End User Role - 5.5

Author
Counselor
Learner
Manager
Parent

Teacher
Other

#### 2.6.4 Context - 5.6

Pre-school
Compulsory education
Special education
Vocational education
Higher education
Distance education
Adult / continuing education
Professional development
School libraries / documentation centre
Educational administration
Policy making
Other

This vocabulary should be used in conjunction with element ‘5.7 Typical Age Range’ in order to express the full context. The value: ‘Compulsory education’ will be interpreted differently in different countries but is meant to indicate the regular schooling after kindergarten and before higher education. Implementors of the CELEBRATE application profile should in their user interface use the terms applicable in their country and even consider alternative vocabularies that map to the above vocabulary.

#### 2.6.5 Typical Age Range - 5.7

Typical Age Range is expressed as a range Minimum-Maximum age in years

Either minimum or maximum value can be set to U (undefined) meaning that then the range is extended in that way. E.g. ‘10-U’ means from year 10 up; ‘U-12’ means 12 years and younger.

#### 2.6.6 Learning Principles - 5.12

Prior knowledge
Conceptual change
Expert models and guidance
Complexity of the content
Multiple representations
Collaboration
Visualisation of thinking
Analogical reasoning
Skill training

Metacognition
---------------

### 2.6.7 Kind - 7.1

Value 'Preview' has been added to the LOM Vocabulary. It is intended to indicate that there is preview feature available and it is further specified in the '7.2 Relation.Resource' element.

IsPartOf
HasPart
IsVersionOf
HasVersion
IsFormatOf
HasFormat
References
IsReferencedBy
IsBasedOn
IsBasisFor
Requires
IsRequiredBy
Preview

### **2.6.8 Classification – 9**

In CELEBRATE, there has to be at least one element ‘9.1 Purpose’ that equals ‘Discipline’. When ‘9.1 Purpose’ equals ‘Discipline’ ‘9.4 Keyword’ element is used to store keywords from the ELR Thesaurus. In this case 9.2 and 9.3 are not used and the LangString language of ‘9.4 Keyword’ is ‘x-T-Celeb’ (the CELEBRATE Token Language).

## **3 Bindings**

### **3.1 *For LOM elements***

Currently the IMS LOM binding is used. Later<sup>1</sup> the binding which is now under balloting of IEEE will be adopted.

### **3.2 *For Vocabulary descriptions***

Currently a provisional binding is used. Later<sup>2</sup> the binding of the IMS VEDEX group will be adopted.

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<sup>1</sup> Expected still in 2003

<sup>2</sup> Expected still in 2003



## Appendix A: The CELEBRATE Metadata Full Element Set

CELEBRATE METADATA FULL ELEMENT SET v1.0 (Based on IEEE Learning Object Metadata Information Model)									
Nr	Name	Description	Size	Obligation	Order	Value space	Data type	Note	Example
1	General	This category groups the general information that describes this learning object as a whole.	1	Mandatory parent	Unspecified	-	-	-	-
1.1	Identifier	A globally unique label that identifies this learning object.	Smallest permitted maximum: 10 items	Mandatory parent	Unordered	-	-	-	-
1.1.1	Catalog	The name or designator of the identification or cataloging scheme for this entry. A namespace scheme.	1	Mandatory	Unspecified	Repertoire of ISO/IEC 10646-1:2000	CharacterString (smallest permitted maximum: 1000 char)	-	"CELEBRATE", "ISBN", "ARIADNE", "URI"
1.1.2	Entry	The value of the identifier within the identification or cataloging scheme that designates or identifies this learning object. A namespace specific string.	1	Mandatory	Unspecified	Repertoire of ISO/IEC 10646-1:2000	CharacterString (smallest permitted maximum: 1000 char)	-	"DB123456", "2-7342-0318", "LEAO875", "http://foo.org/1234"
1.2	Title	Name given to this learning object.	1	Mandatory	Unspecified	-	LangString (smallest permitted maximum: 1000 char)	-	("en", "Animal sounds from conifer forest")



1.3	Language	The primary human language or languages used within this learning object to communicate to the intended user.	Smallest permitted maximum: 10 items	Mandatory	Unordered	<ol style="list-style-type: none"> <li>1. use a 2 letter code from ISO 639-1.</li> <li>2. use a 3 letter code from ISO 639-2 only if there isn't 2 letter code.</li> <li>3. Add the ISO Country code [ISO3166] when necessary, separated by a dash.</li> <li>4. use IANA registered language tags, prefixed with i-</li> <li>5. use SIL Ethnologue 3-letter codes, prefixed with x-E-</li> <li>6. make up a name for token languages prefixed with x-T-7. make up a name, prepended with x- for user defined languages.</li> <li>8. 'x-none' is used when appropriate.</li> </ol>	CharacterString (smallest permitted maximum: 100 char)	<p>This element corresponds with the Dublin Core element DC.Language.</p> <p>If it is not possible to identify any language for learning object, as in a picture, then the appropriate value for this data element would be "x-none".</p>	"fr", "en-GB"
1.4	Description	A textual description of the content of this learning object.	Smallest permitted maximum: 10 items	Mandatory	Unordered	-	LangString (smallest permitted maximum: 2000 char)	<p>This element corresponds to the Dublin Core element DC.Description.</p> <p>NOTE: Only one description per language.</p>	("en", "This is a collection of animal sounds recorded in conifer forest at different seasons")
1.5	Keyword	A keyword or phrase describing the topic of this learning object.	Smallest permitted maximum: 10 items	Recommended	Unordered	-	LangString (smallest permitted maximum: 1000 char)	-	("en", "animal sounds") ("en", "lynx")
1.6	Coverage	The time, culture, geography or region to which this learning object applies.	Smallest permitted maximum: 10 items	-	Unordered	-	LangString (smallest permitted maximum: 1000 char)	This element corresponds with the Dublin Core element DC.Coverage.	("en", "Northern hemisphere")



1.7	Structure	Underlying organizational structure of this learning object.	1	Recommended	Unspecified	atomic collection networked hierarchical linear	Vocabulary	atomic: an object that is indivisible (in this context). collection: a set of objects with no specified relationship between them. networked: a set of objects with relationships that are unspecified. hierarchical: a set of objects whose relationships can be represented by a tree structure. linear: a set of objects that are ordered according to "previous"/"next" relationships.	-
1.8	Aggregation Level	The functional granularity of this learning object.	1	-	Unspecified	1 - 4	Vocabulary (enumerated)	1: the smallest level of aggregation, e.g., raw media data or fragments. 2: a collection of level 1 learning objects, e.g., a lesson. 3: a collection of level 2 learning objects, e.g., a course. 4: the largest level of granularity, e.g., a set of courses that lead to a certificate. NOTE 1:--Level 4 objects can contain level 3 objects, or can recursively contain other level 4 objects.	-
2	Life Cycle	This category describes the history and current state of this learning object and those entities that have affected this learning object during its evolution.	1	-	Unspecified	-	-	-	-
2.1	Version	The edition of this learning object.	1	-	Unspecified	-	LangString (smallest permitted maximum: 50 char)	-	("en", "1.2.alpha"), ("fi", "toinen luonnos")



2.2	Status	The completion status or condition of this learning object.	1	-	Unspecified	draft final revised unavailable	Vocabulary	When the status is "unavailable" it means that the learning object itself is not available. The word 'pending' is suggested to be used instead of 'unavailable' in user interface.	-
2.3	Contribute	Those entities (i.e., people, organizations) that have contributed to the state of this learning object during its life cycle (e.g., creation, edits, publication).	Smallest permitted maximum: 30 items	Recommended parent	Ordered	-	-	This data element is different from 3.3: Meta-Metadata.Contribute. Contributions should be considered in a very broad sense here, as all actions that affect the state of the learning object.	-
2.3.1	Role	Kind of contribution.	1	Mandatory if element 2.3 is used	Unspecified	author publisher unknown initiator terminator validator editor graphical designer technical implementer content provider technical validator educational validator script writer instructional designer	Vocabulary	Minimally, the Author(s) of the learning object should be described.	-



2.3.2	Entity	The identification of and information about entities (i.e., people, organizations) contributing to this learning object. The entities shall be ordered as most relevant first.	Smallest permitted maximum: 40 items	Mandatory if element 2.3 is used	Ordered	vCard, as defined by IMC vCard 3.0 (RFC 2425, RFC 2426).	CharacterString (smallest permitted maximum: 1000 char)	<p>If Role (2.3.1) is "author", then the entity is typically a person and this element corresponds with the Dublin Core element DC.Creator.</p> <p>If Role equals "publisher", then the entity is typically an organization and this element corresponds with the Dublin Core element DC.Publisher.</p> <p>If Role is not equal to "author" or "publisher", then this element corresponds with the Dublin Core element DC.Contributor.</p>	-
2.3.3	Date	The date of the contribution.	1	-	Unspecified	-	DateTime	-	"2003-03-13"
3	Meta-Metadata	<p>This category describes this metadata record itself.</p> <p>This category describes how the metadata instance can be identified, who created this metadata instance, how, when, and with what references.</p>	1	Recommended parent	Unspecified	-	-	This is not the information that describes the learning object itself.	-
3.1	Identifier	A globally unique label that identifies this metadata record.	Smallest permitted maximum: 10 items	-	Unordered	-	-	-	-
3.1.1	Catalog	The name or designator of the identification or cataloging scheme for this entry. A namespace scheme.	1	-	Unspecified	Repertoire of ISO/IEC 10646-1:2000	CharacterString (smallest permitted maximum: 1000 char)	-	"ARIADNE", "URI"



3.1.2	Entry	The value of the identifier within the identification or cataloging scheme that designates or identifies this learning object. A namespace specific string.	1	-	Unspecified	Repertoire of ISO/IEC 10646-1:2000	CharacterString (smallest permitted maximum: 1000 char)	-	"KUL532", "http://foo.org/desc/1234"
3.2	Contribute	Those entities (i.e., people, organizations) that have affected the state of this metadata during its life cycle (e.g., creation, validation).	Smallest permitted maximum: 10 items	Recommended parent	Ordered	-	-	This data element is concerned with contributions to the metadata. Data element 2.3: Lifecycle.Contribute is concerned with contributions to the learning object.	-
3.2.1	Role	Kind of contribution.	1	Mandatory if element 3.2 is used	Unspecified	creator validator	Vocabulary	Exactly one instance of this data element with value "creator" should exist.	-
3.2.2	Entity	The identification of and information about entities (i.e., people, organizations) contributing to this metadata. The entities shall be ordered as most relevant first.	Smallest permitted maximum: 10 items	Mandatory if element 3.2 is used	Ordered	vCard, as defined by IMC vCard 3.0 (RFC 2425, RFC 2426).	CharacterString (smallest permitted maximum: 1000 char)	-	-
3.2.3	Date	The date of the contribution.	1	Mandatory if element 3.2 is used	Unspecified	-	DateTime	-	"2003-03-13"
3.4	Metadata Schema	The name and version of the authoritative specification used to create this metadata instance.	Smallest permitted maximum: 10 items	-	Unordered	Repertoire of ISO/IEC 10646-1:2000	CharacterString (smallest permitted maximum: 30 char)	If multiple values are provided, then the metadata instance shall conform to multiple metadata schemas.  NOTE: This element is not supposed to be exposed to the users.	"CELEB_MDv1.0"



3.5	Language	Language of this metadata instance. This is the default language for all LangString values in this metadata instance. If a value for this data element is not present in a metadata instance, then there is no default language for LangString values.	1	Recommended	Unspecified	See 1.3:General.Language For this data element, "none" shall not be an acceptable value.	CharacterString (smallest permitted maximum: 100 char)	This data element concerns the language of the metadata instance. Data element 1.3: General.Language concerns the language of the learning object.	"en"
4	Technical	This category describes the technical requirements and characteristics of this learning object.	1	Recommended parent	Unspecified	-	-	-	-
4.1	Format	Technical datatype(s) of (all the components of) this learning object.	Smallest permitted maximum: 40 items	Recommended	Unordered	MIME types based on IANA registration (see RFC2048:1996) Note: "non-digital" is not acceptable in CELEBRATE	CharacterString (smallest permitted maximum: 500 char)	This element corresponds with the Dublin Core element DC.Format. This data element shall be used to identify the software needed to access the learning object.	"image/ gif", "application/x-director", "text/ xml"
4.2	Size	The size of the digital learning object in bytes (octets). The size is represented as a decimalvalue (radix 10). Consequently, only the digits "0" through "9" should be used. The unit is bytes, not Mbytes, GB, etc.	1	Recommended	Unspecified	ISO/IEC 646:1991, but only the digits "0".. "9"	CharacterString (smallest permitted maximum: 30 char)	This data element shall refer to the actual size of this learning object. If the learning object is compressed, then this data element shall refer to the uncompressed size.	"44000"



4.3	Location	A string that is used to access this learning object. It may be a location (e.g., Universal Resource Locator), or a method that resolves to a location (e.g., Universal Resource Identifier). The first element of this list shall be the preferable location.	Smallest permitted maximum: 10 items	Mandatory	Ordered	Repertoire of ISO/IEC 10646-1:2000	CharacterString (smallest permitted maximum: 1000 char)  See also chapter 2.2.1.2 Technical.Location – 4.3	This is where the learning object described by this metadata instance is physically located.	"eln:digitalbrain:test" "http://host/id"
4.4	Requirement	The technical capabilities necessary for using this learning object. If there are multiple requirements, then all are required, i.e., the logical connector is AND.	Smallest permitted maximum: 40 items	-	Unordered	-	-	This element needs further examination in context of CELEBRATE. Required SCORM version is a one example of possible additions.	-
4.4.1	OrComposite	Grouping of multiple requirements. The composite requirement is satisfied when one of the component requirements is satisfied, i.e., the logical connector is OR.	Smallest permitted maximum: 40 items	-	Unordered	-	-	-	-
4.4.1.1	Type	The technology required to use this learning object, e.g., hardware, software, network, etc.	1	-	Unspecified	operating system browser	Vocabulary	-	-
4.4.1.2	Name	Name of the technology required to use this learning object	1	-	Unspecified	if Type='operating system', then: pc-dos ms-windows macos unix multi-os none if Type='browser' then : any netscape communicator ms-internet explorer opera amaya	Vocabulary	The value for this data element may be derived from 4.1:Technical.Format automatically, e.g., "video/mpeg" implies "multi-os".	-



4.4.1.3	Minimum Version	Lowest possible version of the required technology to use this learning object.	1	-	Unspecified	Repertoire of ISO/IEC 10646-1:2000	CharacterString (smallest permitted maximum: 30 char)	-	"4.7"
4.4.1.4	Maximum Version	Highest possible version of the required technology to use this learning object.	1	-	Unspecified	Repertoire of ISO/IEC 10646-1:2000	CharacterString (smallest permitted maximum: 30 char)	-	"7.0"
4.5	Installation Remarks	Description of how to install this learning object.	1	-	Unspecified	-	LangString (smallest permitted maximum: 1000 char)	-	("en", "Launch the self-extracting executable and follow the instructions on screen")
4.6	Other Platform Requirements	Information about other software and hardware requirements.	1	-	Unspecified	-	LangString (smallest permitted maximum: 1000 char)	-	("en", "microphone"), ("en", "Java 2 RE, http://java.sun.com/j2se/")
4.7	Duration	Time a continuous learning object takes when played at intended speed.	1	-	Unspecified	-	Duration	This data element is especially useful for sounds, movies or animations.	"PT1H30M", "PT50S"
4.8.	Facet	A technical facet. of a learning object	Smallest permitted maximum: 15 items	Recommended parent	Unordered	-	-	A facet can be used for classifying technical requirements. It is likely that the vocabulary in 4.8.1 will be extended	-
4.8.1	Name	The name of a technical facet of the learning object	1	Mandatory if element 4.8 is used	Unspecified	packaged format SCORM 1.2	CELEBRATE Vocabulary	-	-
4.8.2	Value	The value of a technical facet of the learning object	1	Mandatory if element 4.8 is used	Unordered	If Name= 'packaged format', then: application/zip  If Name= 'SCORM 1.2', then: enhanced required:  Only one value is allowed	CELEBRATE Vocabulary	-	-
4.8.3	Description	A textual description of the technical facet of the learning object	1	-	Unspecified	-	LangString (smallest permitted maximum: 2000 char)	NOTE: Only one description per language.	-



5	Educational	This category describes the key educational or pedagogic characteristics of this learning object.	Smallest permitted maximum: 100 items	Mandatory parent	Unspecified	-	-	-	-
5.1	Interactivity Type	Definition of a LO according to the interactivity type.	1	-	Unspecified	active expositive mixed	Vocabulary	<p>"active": LO that directly induces productive action by the learner. An active learning object prompts the learner for semantically meaningful input or for some other kind of productive action or decision, not necessarily performed within the learning object's framework.</p> <p>"expositive": LO that displays information but does not prompt the learner for any semantically meaningful input.</p> <p>"mixed": LO that blends the active and expositive interactivity types.            NOTE:--Activating links to navigate in hypertext documents is not considered to be a productive action.</p>	<p>Active LOs:</p> <ul style="list-style-type: none"> <li>· Assessment</li> <li>· Drill and practice</li> </ul> <p>Expositive LOs:</p> <ul style="list-style-type: none"> <li>· Guide</li> <li>· Glossary</li> <li>- Information resource</li> </ul> <p>Mixed LOs:</p> <ul style="list-style-type: none"> <li>· Information resource with exploration elements</li> </ul>
5.2	Learning Resource Type	Specific kind of learning object, The most dominant kind first.	Smallest permitted maximum: 8 items	Mandatory	Ordered	assessment drill and practice exploration glossary guide information resource open activity tool	CELEBRATE Vocabulary	See chapter 2.3 Mandatory Elements.	-



5.3	Interactivity Level	The degree of interactivity characterizing this learning object. Interactivity in this context refers to the degree to which the learner is supposed to take an active part in dealing with the learning object.	1	-	Unspecified	very low low medium high very high	Vocabulary	Inherently, this scale is meaningful within the context of a community of practice.	Learning objects with 5.1: Educational.InteractivityType="active" may have a high interactivity level (e.g., a simulation environment endowed with many controls) or a low interactivity level (e.g., a written set of instructions that solicit an activity). Learning objects with 5.1: Educational.InteractivityType="expositive" may have a low interactivity level (e.g., a piece of linear, narrative text produced with a standard word processor) or a medium to high interactivity level (e.g., a sophisticated hyperdocument, with many internal links and views).
5.4	Semantic Density	The degree of conciseness of a learning object. The semantic density of a learning object may be estimated depending on the relation between the amount of information provided and the size, span or duration of the LO	1	-	Unspecified	very low low medium high very high	Vocabulary	Inherently, this scale is meaningful within the context of a community of practice. The semantic density of a learning object is independent of its difficulty. It is best illustrated with examples of expositive material, although it can be used with active resources as well.	
5.5	Intended End User Role	Role of principal user(s) for which this learning object was designed, most dominant first.	Smallest permitted maximum: 7 items	Mandatory	Ordered	author counselor learner manager parent teacher other	CELEBRATE Vocabulary	See chapter 2.3 Mandatory Elements.	-



5.6	Context	The principal environment within which the learning and use of this learning object is intended to take place.	Smallest permitted maximum: 12 items	Recommended	Unordered	pre-school compulsory education special education vocational education higher education distance education adult / continuing education professional development school libraries / documentation centre educational administration policy making other	CELEBRATE Vocabulary	See chapter 2.4 Recommended Elements.	-
5.7	Typical Age Range	Age of the typical intended user.	1	Mandatory	Unordered	Typical Age Range is expressed as a range Minimum-Maximum age in years	CELEBRATE Vocabulary	Either minimum or maximum value can be set to U (undefined) meaning that then the range is extended in that way.  See also chapter 2.3 Mandatory Elements.	"10-12" "7-U" "U-12"
5.8	Difficulty	How hard it is to work with or through this learning object for the typical intended target audience.	1	-	Unspecified	very easy easy medium difficult very difficult	Vocabulary	-	-
5.9	Typical Learning Time	Approximate or typical time it takes to work with or through this learning object for the typical intended target audience.	1	Recommended	Unspecified	-	Duration	See chapter 2.4 Recommended Elements.	"PT1H", "P5D"
5.10	Description	Comments on how this learning object is to be used.	Smallest permitted maximum: 10 items	Recommended	Unspecified	-	LangString (smallest permitted maximum: 1000 char)	See chapter 2.4 Recommended Elements.  NOTE: only one description per language.	-
5.11	Language	The human language(s) used by the typical intended user of this learning object.	Smallest permitted maximum: 10 items	-	Unordered	See 1.3:General.Language	CharacterString (smallest permitted maximum: 100 char)	-	"de", "fr", "it"



5.12	Learning Principles	What kind of learning principles this learning object is suppose to support.	Smallest permitted maximum: 9 items	Recommended	Unordered	prior knowledge conceptual change expert models and guidance complexity of the content multiple representations collaboration visualisation of thinking analogical reasoning skill training metacognition	CELEBRATE Vocabulary	See chapter 2.4 Recommended Elements.  NOTE: This is an extension to LOM element set.	-
6	Rights	This category describes the intellectual property rights and conditions of use for this learning object.	1	Mandatory parent	Unspecified	-	-	-	-
6.1	Cost	Whether use of this learning object requires payment.	1	Recommended	Unspecified	yes no	Vocabulary	See chapter 2.4 Recommended Elements.	-
6.2	Copyright and Other Restrictions	Whether copyright or other restrictions apply to the use of this learning object.	1	Mandatory	Unspecified	yes no	Vocabulary	If some restrictions are specified here, in element 6.3: Description has to be more information about those restrictions.  See chapter 2.3 Mandatory Elements.	-
6.3	Description	Comments on the conditions of use of this learning object.	1	Mandatory if 6.2 equals 'yes'	Unspecified	-	LangString (smallest permitted maximum: 1000 char)	See chapter 2.3 Mandatory Elements.  NOTE: Only one description per language.	("en", "See copyright notice: <a href="http://foo.org/rights.html">http://foo.org/rights.html</a> ")
6.4	CELEBRATE Digital Rights	Permissions of use of this learning object.	1	Mandatory	Unspecified	In current phase of CELEBRATE project, all accesses have to be granted, and the value of this element is a standard expression provided by Brokerage System	-	See chapter 2.3 Mandatory Elements.  NOTE: This is an extension to LOM element set.	-



7	Relation	This category defines the relationship between this learning object and other learning objects, if any.	Smallest permitted maximum: 100 items		Unordered	-	-	To define multiple relationships, there may be multiple instances of this category. If there is more than one target learning object, then each target shall have a new relationship instance.  This element needs further examination in context of CELEBRATE. Other language versions of the LO are examples of needed addition.	-
7.1	Kind	Nature of the relationship between this learning object and the target learning object identified by 7.2: Relation.Resource.	1		Unspecified	Based on Dublin Core: IsPartOf HasPart IsVersionOf HasVersion IsFormatOf HasFormat References IsReferencedBy IsBasedOn IsBasisFor Requires IsRequiredBy Preview	CELEBRATE Vocabulary	This element loosely corresponds with the Dublin Core element DC.Relation.  NOTE: 'Preview' added to the LOM vocabulary	-
7.2	Resource	The target learning object that this relationship references.	1	-	Unspecified	-	-	-	-
7.2.1	Identifier	A globally unique label that identifies the target learning object.	Smallest permitted maximum: 10 items	-	Unordered	-	-	-	-
7.2.1.1	Catalog	The name or designator of the identification or cataloging scheme for this entry. A namespace scheme.	1	-	Unspecified	Repertoire of ISO/IEC 10646-1:2000	CharacterString (smallest permitted maximum: 1000 char)	-	"CELEBRATE", "ISBN", "ARIADNE", "URI"



7.2.1.2	Entry	The value of the identifier within the identification or cataloging scheme that designates or identifies this learning object. A namespace specific string.	1	-	Unspecified	Repertoire of ISO/IEC 10646-1:2000	CharacterString (smallest permitted maximum: 1000 char)	-	"DB123456", "2-7342-0318", "LEAO875", "http://foo.org/1234"
7.2.2	Description	Description of the target learning object.	10	-	Unspecified	-	LangString (smallest permitted maximum: 1000 char)	NOTE: Only one description per language.	-
8	Annotation	This category provides comments on the educational use of this learning object, and information on when and by whom the comments were created.	Smallest permitted maximum: 30 items	-	Unordered	-	-	This category enables educators to share their assessments of learning objects, suggestions for use, etc.  This element needs further examination in context of CELEBRATE. User annotation of the LOs is one possible future need.	-
8.1	Entity	Entity (i.e., people, organization) that created this annotation.	1	-	Unspecified	vCard, as defined by IMC vCard 3.0 (RFC 2425, RFC 2426).	CharacterString (smallest permitted maximum: 1000 char)	-	-
8.2	Date	Date that this annotation was created.	1	-	Unspecified	-	DateTime	-	"2003-13-03"
8.3	Description	The content of this annotation.	1	-	Unspecified	-	LangString (smallest permitted maximum: 1000 char)	NOTE: Only one description per language.	-
9	Classification	This category describes where this learning object falls within a particular classification system.	Smallest permitted maximum: 40 items	Mandatory parent	Unspecified	-	-	If 9.1: Purpose equals 'Discipline', then this category corresponds with the Dublin Core element DC.Subject.  See also chapter 2.3 Mandatory Elements.	-



9.1	Purpose	The facets taken into account for classifying this learning object.	1	Mandatory	Unspecified	discipline idea prerequisite educational Objective accessibility restrictions educational Level skill Level security Level competency	Vocabulary	There has to be at least one element 9.1: Purpose that equals 'discipline'.  See also chapter 2.3 Mandatory Elements.	-
9.2	Taxon Path	A taxonomic path in a specific classification system. Each succeeding level is a refinement in the definition of the preceding level.	Smallest permitted maximum: 15 items	-	Unordered	-	-	There may be different paths, in the same or different classifications, which describe the same characteristic.  This element should not be used when element 9.1: Purpose equals 'discipline'.	-
9.2.1	Source	The name of the classification system.	1	-	Unspecified	-	LangString (smallest permitted maximum: 1000 char)	This data element may use any recognized "official" taxonomy, or any user-defined taxonomy.  A tool may provide the top-level entries of a well-established classification (LOC, UDC, DDC, etc.).	-
9.2.2	Taxon	A particular term within a taxonomy. A taxon is a node that has a defined label or term. A taxon may also have an alphanumeric designation or identifier for standardized reference. Either or both the label and the entry may be used to designate a particular taxon.	Smallest permitted maximum: 15 items	-	Ordered	-	-	An ordered list of taxons creates a taxonomic path, i.e., "taxonomic stairway": this is a path from a more general to more specific entry in a classification.	-



9.2.2.1	Id	The identifier of the taxon, such as a number or letter combination provided by the source of the taxonomy.	1	-	Unspecified	Repertoire of ISO/IEC 10646-1:2000	CharacterString (smallest permitted maximum: 100 char)	-	-
9.2.2.2	Entry	The textual label of the taxon.	1	-	Unspecified	-	LangString (smallest permitted maximum: 500 char)	-	-
9.3	Description	A textual description of learning object relative to its stated purpose.	1	-	Unspecified	-	LangString (smallest permitted maximum: 2000 char)	This element should not be used when element 9.1: Purpose equals 'discipline' in order to avoid confusion with 1.4: General.Description.  NOTE: Only one description per language.	-
9.4	Keyword	Contains keyword description of learning objective relative to its stated purpose.	Smallest permitted maximum: 40 items	Mandatory if 9.1 equals 'discipline'	Unordered	-	LangString (smallest permitted maximum: 1000 char)	When element 9.1: Purpose equals 'discipline', the source of keywords is ELR Thesaurus.  NOTE: When element 9.1: Purpose equals 'discipline', element for free text keywords is 1.5: General.Keyword.  See also chapter 2.3 Mandatory Elements.	-

## LangString

Nr	Name	Description	Size	Value Space	Data type	Example
1	LangString	A datatype that represents one or more character strings. A LangString value may include multiple semantically equivalent character strings.	Smallest permitted maximum: 10 items	-	-	-



		such as translations or alternative descriptions.				
1.1	Language	Human language of the character string.	1	See 1.3:General.Language NOTE: "x-none" (accepted value in 1.3) is not acceptable in this element.	CharacterString (smallest permitted maximum: 100 char)	-
1.2	String	Actual character string..	1	-	CharacterString	-

### DateTime

Nr	Name	Description	Size	Value Space	Data type	Example
1	DateTime	A point in time with accuracy at least as small as one second.	1	YYYY[-MM[-DD[Thh[:mm[:ss[.s[TZD]]]]]]] where: YYYY = four-digit year MM = two-digit month DD = two-digit day of month hh = two digits of hour (00 through 23) mm = two digits of minute (00 through 59) ss = two digits of second (00 through 59) s = one or more digits representing a decimal fraction of a second TZD = time zone designator ("Z" for UTC or +hh:mm or -hh:mm) At least the four digit year must be present. If additional parts of the DateTime are included, the character literals "-", "T", ":", and "." are part of the character lexical representation for the datetime. If the time portion is present, but the time zone designator is not present, the time zone is interpreted as being UTC.	CharacterString (smallest permitted maximum: 200 char)	"2003-05-16", "2003-06-06T14:00:15"
2	Description	Description of the date.	1	-	LangString (smallest permitted maximum: 1000 char)	-

### Duration

Nr	Name	Description	Size	Value Space	Data type	Example
1	Duration	An interval in time with accuracy at least as small	1	P[yY][mM][dD][T[hH][mM][s[.sS]]] where: y = number of years (integer, > 0	CharacterString (smallest permitted	"PT1H30M"



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		as one second.		<p>m = number of months (integer, &gt; 0)          d = number of days (integer, &gt; 0)          h = number of hours (integer, &gt; 0)          n = number of minutes (integer, &gt; 0)          s = number of seconds or fraction of seconds(integer, &gt; 0)</p> <p>The character literal designators "P", "Y", "M", "D", "T", "H", "M", "S" must appear if the corresponding nonzero value is present.</p> <p>If the value of years, months, days, hours, minutes or seconds is zero, the value and corresponding designation (e.g., "M") may be omitted, but at least one designator and value must always be present. The designator "P" is always present. The designator "T" shall be omitted if all of the time (hours/minutes/seconds) are zero. Negative durations are not supported.</p>	maximum: 200 char)	
2	Description	Description of the duration.	1	-	LangString (smallest permitted maximum: 1000 char)	-



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## **Appendix B: Mapping of metadata schemes**

This appendix describes mappings of the LOM to other metadata schemes.

The first is the mapping of the LOM to the European Learning Resource Metadata Element Set (ELR MES) which is a result of the ETB project. This metadata element set (MES) is an extension of the Dublin Core (DC) MES for the field of education. The ELR brokerage system has currently more than 12000 resources described and is the most important resource repository for school education.



## ***B.1 Mapping to ELR application profile***

The European Learning Resource (ELR) profile was developed in the ETB project.

### *IEEE 1484.12.1-2002, Learning Objects Metadata (LOM)* mapping with ELR MES

ETB Element	ETB Description	LOM Element	LOM Description	Notes
<b>DC.Contributor</b>	Definition: An entity responsible for making contributions to the content of the resource. Type: Element Comment: The entity can be individuals or organisations See also: - ETB Obligation: Optional	Lifecycle.Contribute.Entity [2.3.2]	"Persons or organisations contributing to the resource (includes creation, edits and publication). If [Lifecycle.Contribute.]Role (2.3.1) is not equal to Author or Publisher, then this element corresponds with the Dublin Core element DC.Contributor. If the entity is an organisation, then it is typically a university department, company, agency, institute, etc. under whose responsibility the contribution was made."	
<b>DC.Coverage</b>	Definition: The extent or scope of the content of the resource. Type: Element Comment: Coverage will typically include spatial location (a place name or geographic coordinates), temporal period (a period label, date, or date range) or jurisdiction (such as a named administrative entity). See also: - ETB Obligation: Optional	General.Coverage [1.6]	"The spatial or temporal characteristics of the intellectual content of the resource."	



<p><b>DC.Creator</b></p>	<p>Definition: An entity primarily responsible for making the content of the resource.          Type: Element          Comment: The entity can be either individuals or organisations.          See also: -          ETB Obligation: Optional</p>	<p>Lifecycle.Contribute.Entity [2.3.2]</p>	<p>"Persons or organisations contributing to the resource (includes creation, edits and publication). If [Lifecycle.Contribute.]Role (2.3.1) is Author, then the entity is typically a person and this element corresponds with the Dublin Core element DC.Creator. If the entity is an organisation, then it is typically a university department, company, agency, institute, etc. under whose responsibility the contribution was made."</p>	
<p><b>DC.Date</b></p>	<p>Definition: A date associated with an event in the life cycle of the resource.          Type: Element          Comment: Typically, Date will be associated with the creation or availability of the resource.          See also: -          ETB Obligation: Optional</p>	<p>Lifecycle.Contribute.Date [2.3.3]</p>	<p>"The date of the contribution." [NOTE: IEEE dates consist of two components: (1) 'DateTime' "expressed as per ISO8601 standard" and (2) 'Description' expressed as a textual "[d]escription of the date ... [e.g.,] circa 1300 BC, Fall Semester 1999"]</p>	
<p><b>DC.Description</b></p>	<p>Definition: An account of the content of the resource.          Type: Element          Comment: -          See also: -          ETB Obligation: Mandatory</p>	<p>General.Description [1.4]</p>	<p>"A textual description of the content of the resource."</p>	
<p><b>DC.Format</b></p>	<p>Definition: The physical or digital manifestation of the resource.          Type: Element          Comment: Typically, Format may include the media-type or dimensions of the resource.          Format may be used to determine the software, hardware or other equipment needed to display or operate the resource. Examples of dimensions include size and duration.          See also: -          ETB Obligation: Optional</p>	<p>Technical.Format [4.1]</p>	<p>"Technical data type of the resource."</p>	



<p><b>DC.Identifier</b></p>	<p>Definition: An unambiguous reference to the resource within a given context.          Type: Element          Comment: Encoding Scheme for this element is Uniform Resource Identifier (URI).          See also: -          ETB Obligation: Mandatory</p>	<p>Technical.Location          [4.3]</p>	<p><b>Technical.Location:</b> "A location or a method that resolves to a location of the resource. Preferable Location first."</p>
<p><b>DC.Language</b></p>	<p>Definition: A language of the intellectual content of the resource.          Type: Element          Comment: Encoding Scheme for this element is ISO 639-1.Tags for the identification of languages.          See also: -          ETB Obligation: Mandatory</p>	<p>General.Language          [1.4]</p>	<p>"The human language of the resource. LanguageID =Langcode('-Subcode)*, with Langcode a two-letter language code as defined by ISO639 and Subcode a country code from ISO3166."</p>
<p><b>DC.Publisher</b></p>	<p>Definition: An entity responsible for making the resource available.          Type: Element          Comment: The entity can be individuals or organisations          See also: -          ETB Obligation: Optional</p>	<p>Lifecycle.Contribute.Entity          [2.3.2]</p>	<p>"Persons or organisations contributing to the resource (includes creation, edits and publication). If [Lifecycle.Contribute.]Role equals Publisher, then the entity is typically an organisation and this element corresponds with the Dublin Core element DC.Publisher. If the entity is an organisation, then it is typically a university department, company, agency, institute, etc. under whose responsibility the contribution was made."</p>
<p><b>DC.Relation</b></p>	<p>Definition: A reference to a related resource.          Type: Element          Comment: Recommended best practice is to reference the resource by means of a string or number conforming to a formal identification system.          See also: -          ETB Obligation: Optional</p>	<p>Relation          [7]          [7.1 &amp; 7.2.2]</p>	<p>"Features of the resource in relationship to other resources." [NOTE: 'Relation' in IEEE 1484 LOM is a <i>category</i> or <i>group</i> of metadata elements and does not directly map to DC. An unqualified mapping would probably be 'Relation.Resource.Description' [7.2.2] with 'Relation.Kind' [7.1] added for a qualified mapping with a 'scheme' taken from a controlled vocabulary.]</p>



<b>DC.Rights</b>	<p>Definition: Information about rights held in and over the resource.          Type: Element          Comment: This can be a rights management statement, an identifier that links to a rights management statement, or an identifier that links to a service providing information about rights management for the resource.          Encoding Scheme for this element is Uniform Resource Identifier (URI). It is also possible to write in free text.          See also: The controlled vocabulary created by ETB at <a href="http://etb.eun.org/voc/rights.doc">http://etb.eun.org/voc/rights.doc</a>          ETB Obligation: Optional</p>	Rights [6]	<p>“Conditions of use of the resource. Intent is to reuse results of ongoing work in the Intellectual Property Right and e-commerce communities. This category currently provides the absolute minimum level of detail only.” [NOTE: ‘Rights’ in IEEE 1484 LOM is a <i>category</i> or <i>group</i> of metadata elements and does not directly map to DC. An unqualified mapping would probably be ‘Rights.Description’.]</p>	
<b>DC.Source</b>	<p>Definition: A reference to a resource from which the present resource is derived.          Type: Element          Comment: Encoding Scheme for this element are Uniform Resource Identifier (URI).          See also: -          ETB Obligation: Optional</p>	Relation [7]	<p>“Features of the resource in relationship to other resources.” [NOTE: ‘Relation’ in IEEE 1484 LOM is a <i>category</i> or <i>group</i> of metadata elements and does not directly map to DC. A mapping for ‘DC.Source’ would probably be ‘Relation.Description’ with a ‘Relation.Kind’ of <i>IsBasedOn</i> added for a qualified element (term selected from the Dublin Core best practices list as enumerated in the IEEE documentation).]</p>	
<b>DC.Subject</b>	<p>Definition: The topic of the content of the resource.          Type: Element          Comment: Encoding Scheme for this element is ETB Thesaurus.          See also: Thesaurus on the ETB site          ETB Obligation: Mandatory</p>	Classification [9.1]; [9.4]	<p><b>Classification:</b> “Description of a characteristic of the resource by entries in classifications.” NOTE: For Subject keywords 9.1 should be filled with ‘discipline’, 9.4 would take the keywords</p>	
<b>DC.Title</b>	<p>Definition: A name given to the resource.          Type: Element          Comment: -          See also: -          ETB Obligation: Mandatory</p>	General.Title [1.2]	<p>“Name given to the resource. The title can be an already existing one or it may be created by the indexer ad hoc.”</p>	



<p><b>DC.Type</b></p>	<p>Definition: The nature or genre of the content of the resource.          Type: Element          Comment: Encoding scheme for this element is the ETB Type Vocabulary. Available at <a href="http://etb.eun.org/voc/type.doc">http://etb.eun.org/voc/type.doc</a>          See also: -          ETB Obligation: Optional</p>	<p>Educational.LearningResourceType          [5.2]</p>	<p>“Specific kind of resource, most dominant kind first.</p>	<p>vocabulary is different. Alternatively another Classification in [9] could be considered.</p>
<p><b>DC.Audience</b></p>	<p>Definition: The intended users of the resource.          Type: Element          Comment: The encoding scheme for this element is ETB UserLevel.          See also: -          ETB Obligation: Mandatory          Comment: Controlled list of Audience Vocabulary  <a href="http://etb.eun.org/voc/audience.doc">http://etb.eun.org/voc/audience.doc</a></p>	<p>IntendedEndUserRole          [5.5]           Context          [5.6]</p>	<p>“Normal user of the resource, most dominant first. [R]estricted vocabulary: {Teacher, Author, Learner, Manager}. A learner works with a resource in order to learn something. An author creates or publishes resource. A manager manages the delivery of the resource, e.g., a university or college. The document for a manager is typically a curriculum.”</p>	<p>See further for the mapping of the vocabularies</p>
		<p>TypicalAgeRange          [5.7]</p>	<p>“Age of the typical user.”</p>	
<p><b>Subject Keywords</b></p>	<p>Definition: The topic of the content of the resource.          Type: Element          Comment: Free text.          See also: -          ETB Obligation: Optional</p>	<p>General.Keywords          [1.5]</p>	<p><b>General.Keywords:</b> “Keywords describing the resource. It is <i>strongly</i> recommended not to use this element for characteristics that can be described by other elements [e.g., a <i>subject</i> ‘Purpose’ in ‘Classification’].”          NOTE: In CELEBRATE [1.5] is used for free text keywords.</p>	
<p><b>ETB User Comments</b></p>	<p>Type: Element          Comment: Free text without a controlled list of words. URL pointing to a dynamic database within EUN Native Repository where users can insert the comments and experiences.          See also: -          ETB Obligation: Optional</p>			<p>Could be mapped to annotation [8] but CELEBRATE prefers not to have user comments automatically included into the metadata. Comments can be given to resources on the EUN Demo Portal</p>



<b>Learning Situation</b>	Definition: A reduced version of GEM LearningSituation Vocabulary Type: Element Comment: GEM LearningSituation Vocabulary See also: GEM vocabulary see below <a href="http://etb.eun.org/voc/pedagogical.doc">http://etb.eun.org/voc/pedagogical.doc</a> ETB Obligation: Optional			Maybe could be mapped to 5.12 of the CELEBRATE application profile
<b>Aggregation.Level</b>	Definition: The functional size of the resource Type: Element Comment: IMS Learning Resource Meta-data Information Model, Version 1.2 Final Specification ,Restricted range: 1 - 4 See also: see below, <a href="http://etb.eun.org/voc/aggregation.doc">http://etb.eun.org/voc/aggregation.doc</a> ETB Obligation: Optional	General.AggregationLevel [1.8]	"The functional size of the resource. [A single value] 0..3"	

Maps directly
Maps well
Could be mapped
Does not map



## Mapping of vocabularies from CELEBRATE to ELR

The mapping of vocabularies is limited to those vocabularies which are mandatory either in ELR or in CELEBRATE.

### *Mapping from CELEBRATE - Intended User Role (5.5) to ELR - Audience Type*

Author	other
Counsellor	guidance
Learner	pupil, student <sup>3</sup>
Manager	other
Parent	parents
Teacher	teacher
Educator	educator
Other	other

### *Mapping from CELEBRATE - Context (5.6) to ELR - Audience Type*

Pre-school education <sup>4</sup>	
Compulsory education <sup>5</sup>	
Special education	Special education
Vocational education	Vocational education
Higher education	Higher education
Distance education	Distance education
Adult / continuing education	Adult / continuing education
Teacher education	Teacher education
School libraries, documentation centre	School libraries, documentation
Educational administration	Educational administration
Policy making	Political decision-maker
Other	Others

<sup>3</sup> If context is higher education

<sup>4</sup> If age [IEEE 5.7] is not filled out in CELEBRATE, then age is put to '4 to 5 years'

<sup>5</sup> If age [IEEE 5.7] is not filled out in CELEBRATE, then age is put to '6 to 8 years; 9 to 11 years, 12 to 15 years; 16 to 18 years'



## Mapping of vocabularies from CELEBRATE to ELR

The mapping of vocabularies is limited to those vocabularies which are mandatory either in ELR or in CELEBRATE.

### *Mapping from ELR - Audience Type to CELEBRATE - Intended User Role (5.5)*

pupil	Learner <sup>6</sup>
student	Learner <sup>7</sup>
guidance	Counsellor
parents	Parent
teacher	Teacher
educator	Educator
other	Other

### *Mapping from ELR – Audience.Entity to CELEBRATE - Context (5.6)*

<sup>8</sup>	Pre-school education
<sup>9</sup>	Compulsory education
Special education	Special education
Vocational education	Vocational education
Higher education	Higher education
Distance education	Distance education
Adult / continuing education	Adult / continuing education
Teacher education	Teacher education
Guidance	Guidance
School libraries, documentation	School libraries, documentation centre
Educational administration	Educational administration
Political decision-maker	Policy making
Others	Other

<sup>6</sup> If no context is specified, add context: Compulsory education

<sup>7</sup> If no context is specified, add context: Higher education

<sup>8</sup> If no Audience.Entity is specified but Audience.Age contains ‘less than 4 years’ or ‘4 to 5 years’

<sup>9</sup> If no Audience.Entity is specified but Audience.Age contains ‘6 to 8 years’ or ‘9 to 11 years’ or ‘12 to 15 years’ or ‘16 to 18 years’