Reference Manual for Edubox-EML/XML binding
1.0/1.0 (Beta version)
Reference Manual for Edubox-EML/XML binding 1.0/1.0 (Beta version)
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Introduction

This is the BETA version of the Edubox-EML/XML binding 1.0/1.0 reference manual. This version will be replaced soon by the authorised manual.

The publication date of this version is 15 december 2000.

This reference manual accompanies the publication of EML 1.0 as implemented by the Edubox 1.0 system. It aims is to provide a reference framework for understanding and applying EML both as a modelling language and an XML application. To this end,

- it describes the construction of EML as a modelling strategy for didactical components and strategies.
- it explains the XML binding of these concepts by introducing elements and attributes. These are connected not only on the basis of the content model (the EML scheme), but also on the basis of concepts.

Readers of this manual (see Who should use this reference manual? [11]) should be aware of the highly networked nature of the manual, which follows the well-known hypertext metaphor of a deck of cards (as further explained in Structure of the reference manual [11]).

The reference manual offers two outline views on EML, plus a complete description of the XML language binding (elements and attributes). The outline views are intended to offer a 'conceptual framework' for understanding the different XML constructions that implement the EML.

- The first is a structural view (Structural outline [12]), which breaks down the conceptual model of EML part-by-part following the natural buildup of an EML specification. This structure is defined irrespective of a language binding. The study of the structural outline may well start at the Unit of study root element (see Structural outline - Structure of a unit of study [14]).
- The second is a view on aspects of the EML (Conceptual outline [13]), by identifying different 'features', i.e. underlying concepts that cannot, or should not, be associated with one particular part of the structural design. The study of the conceptual outline may well start at the description of EML as a metamodel (see Conceptual outline - EML as a metamodel [20]).

References to the corresponding XML bindings are placed according to the topic description. General information on XML as the preferred markup language is available elsewhere (XML binding [14]).

Who should use this reference manual?

This reference manual is intended for authors of EML materials and developers of tools on EML content. The reader is expected to be familiar with the goals of EML, and its general setup.

XML is the language of choice for binding the EML concepts into a syntactical form. The reference manual offers this binding. However, to understand this, the reader must be familiar with the technical references in the form of content models, attribute declarations et cetera. A very short introduction to XML can be found in XML binding - Short introduction to XML [36].

Where XML is concerned, the manual aims to provide clarity concerning the definition and relation of elements and attributes. The descriptions provided here must be taken as authoritative in that sense.
Structure of the reference manual

EML design, concepts, terms, elements, attributes, and examples are interconnected in many different ways. One could, however, describe each one separately. This results in the following buildup of the reference manual.

The reference manual consists of a set of 'cards', each containing a coherent piece of information. The cards are interconnected, allowing a knowledge network on EML to be constructed. The following 'card' types are distinguished:

- **Topics.** Short description of an aspect of EML, with references to the bindings to XML elements and attributes. Topics outline the actual structure of EML.
  - *Conceptual outline*, which introduces the fundamental aspects of EML (*Conceptual outline [13]*)
  - *Structural outline*, which introduces the high-level compositional structures of EML (*Structural outline [12]*) Note that only the conceptual outline has references to the XML constructions that implement the EML.
- **XML binding:** *Elements*. Descriptions of separate XML element types, with content models, attribute declarations, context etc.
- **XML binding:** *Attributes*. Description of an XML attribute with definition, explanation, and references to the elements on which the attribute is declared.
- **XML binding:** *Examples*. An XML fragment of an EML construction where the use of one element(s) of attributes) is demonstrated.
- **Glossary.** A glossary of terms.

A reference may occur from within any topic to any topic.

Structural outline

This outline follows the buildup of the unit of study (*Structural outline - Structure of a unit of study [14]*) , the main component of the EML. The unit of study thus offers an alternative entry to the EML description and XML binding.

The following aspects can be defined in EML (not all are required):

- The unit of study (*Structural outline - Structure of a unit of study*)
- Metadata for retrieval and reuse (*Structural outline - Metadata [15]*)
- The different learner and staff roles, including their personal properties e.g. skills, prior knowledge, portfolio's and preferences (*Structural outline - Roles [15]*)
• The learning objectives and prerequisites (Structural outline - Learning-objectives and prerequisites [16])

• The activities to be performed by the learners and staff in order to learn or to facilitate learning (Structural outline - Activities [17])

• The resources needed to perform the activities (Structural outline - The environment [18]).

• Predefined sequences and alternations of the activities (Structural outline - Activities [17]).

• Coupling activity sequences to roles (Structural outline - Play [19]).

• The conditions under which certain roles perform certain activities, and under which certain objects or content types are visible or hidden in the unit of study (Structural outline - Conditions [19]).

Alternatively, the reference manual also offers a conceptual outline, see Conceptual outline [13].

Conceptual outline

The following aspects of EML are represented as part of the conceptual outline.

• EML as a metamodel (Conceptual outline - EML as a metamodel)

• General structure (Conceptual outline - General structure)
  • Declaration versus instantiation (Conceptual outline - Declaration versus instantiation [21])
  • Components (Conceptual outline - Components)
  • Construction of units of study (Conceptual outline - Creating the unit of study [23])
  • Lifecycle (Conceptual outline - Lifecycle)

• Activity structure (Conceptual outline - Activities as the fundament of teaching )

• Methods (Conceptual outline - Methods)
  • Activity structure (Conceptual outline - Activity structure)
  • Play (Conceptual outline - Play [27])
  • Conditions (Conceptual outline - Conditions)
  • Notification (Conceptual outline - Notification)

• Learning or working environment (Conceptual outline - Environments for the performance of an activity [29])

• Roles, dossiers, personalisation (Conceptual outline - Roles, dossiers and personalisation [30])
  • Actors and roles (Conceptual outline - Actors and roles)
  • Dossiers and properties (Conceptual outline - Dossiers and properties [31])
  • Personalisation (Conceptual outline - Personalisation)

• Start- and end-levels (Conceptual outline - Objectives and prerequisites [32])

• Tests and other interactions (Conceptual outline - Self-tests and interaction modelling [33])
• Textual structures (Conceptual outline - Recording textual information)
• Reuse and retrieval (Conceptual outline - Reuse and retrieval)
• Medium specific aspects (Conceptual outline - Medium-specific aspects [36])

Alternatively, the reference manual also offers a structural outline, see Structural outline [12].

XML binding

EML has an XML binding, and therefore is an XML application. The following topics deal with the XML binding.

• Short introduction to XML as a markup language (XML binding - Short introduction to XML [36])
• Global element structure of EML as an XML application XML binding - Global element structure of EML [37]
• Element listing XML binding - Element listing
• Attribute listing XML binding - Attribute listing [37]
• XML example listing XML example listing

Note that in the conceptual outline (Conceptual outline [13]) references are made to the XML constructions that implement the EML. Such references are not part of the structural outline (Structural outline [12]).

Structural outline - Structure of a unit of study

In EML we define units of study. These may be freely defined as a complete curriculum, a course, workshop, or a smaller part, depending on the specific function of the particular unit of study. The generic buildup of the unit of study is as follows.

Unit-of-study.

• **Metadata.** Information on the object, mainly for retrieval purposes (Structural outline - Metadata [15]).

• **Roles.** The roles of actors that may occur in the unit of study (Structural outline - Roles [15]).

• **Learning-objectives (optional).** The objectives of the unit of study (Structural outline - Learning-objectives and prerequisites [16]).

• **Prerequisites (optional).** The conditions under which one should start the unit of study (Structural outline - Learning-objectives and prerequisites [16]).

• **Content (optional).** The 'ingredients' of a unit of study. This is one or more of
  • **Environments.** Learning/working environments for the unit of study (Structural outline - The environment [18])
  • **Activities.** A collection of indivisible tasks (Structural outline - Activities [17])

• **Method.** The way the activities are presented and performed in sequence. This is a sequence of the following:
  • **Activity-structure (zero or more).** Fixed sequences or choices of activities (Structural outline - Activity structure [18]).
• **Play (one or more)**. The assignment of activities to roles (*Structural outline - Play [19]*)

• **Conditions (zero or more)**. Conditional implementation of the activities (*Structural outline - Conditions [19]*)

As can be seen from the above, parts of the structural design are optional. By actualising parts of the design a particular ‘type’ of study unit is created. For example, we can model a curriculum as well as a course by a unit of study: both define metadata, roles, objectives and prerequisites, and a play. Apart from this, a curriculum contains references to units of study that represent courses. It may also refer to other curricula. A course defines and/or references individual activities and environments.

Note that comments (personal notes by the creator of the unit in question) may appear at various places in the EML design. For clarity these have been left out of the structural outline.

**Structural outline - Metadata**

Several elements in the EML, including the unit of study, have metadata assigned to them. Metadata describes the information being modelled. The descriptive elements that it contains may be used in searching repositories of components. Only a title is required; all other metadata elements are specified as required by the application.

Metadata

• **Title**. The title of the object, followed by any mix of
  - **Creator**. E.g. Author
  - **Description**. A short description.
  - **Keywords**. Terms taken from a controlled vocabulary for effective retrieval.
  - **Copyright**. Description of copyright, year, and owner.
  - **Study-load**. Units to express the study-load in terms of, for example, study-points or study-hours.
  - **Object-type**. Generic type indication of the object, e.g. ‘curriculum’
  - **Supplied**. Specifies if the object is supplied in the environment.
  - **Contributor**. A contributor to the object specification.
  - **History**. Registration of changes made in time.
  - **Status**. Current status of the object.
  - **Creation-date**. Date the object was created
  - **Date-last-change**. Date the object was last changed.
  - **Min-completion-time**. Minimum time for completing the object.
  - **Max-completion-time**. Maximum time for completing the object.
  - **Meta**. Generic model for other metadata specifications.

Some metadata is typically assigned to activities, while other metadata is inherent to knowledge objects. The metadata ‘package’ has been defined in a generic way and all metadata has a sensible interpretation for all objects on which it is available.
Structural outline - Roles

Roles. This defines:

- **Learner.** Description of learner roles, with properties set up for actors in that role. This is a sequence of
  - **Information-for-role (optional).** The role description, followed by a mix of
    - **Property.** A named value stored in the dossier of the "actor" [242].
    - **Property-group.** A group of properties.
  - **Role (zero or more).** A more precise specification of a learner role (a "subrole")
    - This follows the model for learner roles.
- **Staff (optional).** Description of a staff role.
  - This also follows the model for learner roles.
- **General-properties (optional).** Properties that are defined for all actors in all roles.
  - This is a mix of properties and property groups, as described for Learner.

The element `<Roles>` [180] is used to specify the actors that play a role in a unit of study. There is always a 'learner'. To invoke a learning process one or more activities are assigned to the learner. Any other actor, e.g. teacher, expert, tutor or assessor, who is assumed to interact with the learner to facilitate or support the learning process, must be specified as a unique role. These actors can be members of the educational institute (and thus play a staff role) or other learners (playing a learner role).

Properties and property-groups can be defined for each role. These properties and property-groups are the building-blocks for the dossier belonging to (persons in) a specific role. They particularly help to personalise (parts of) the unit of study.

Properties can have different value types, e.g. 'boolean', 'integer', 'text' or 'file'. Read and write rules can be defined for each property.

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Structural outline - Learning-objectives and prerequisites

One or more learning objectives can be defined for each unit of study or activity within the unit of study. Each learning objective consists of at least a description (the actual learning objective) and a characterisation of the objective (knowledge, insight, competence et cetera).

**Learning-objectives.** This is a mix of learning objectives or references to these.

- **Learning-objective.** A single objective. This is described by a sequence of
  - **Metadata (optional).** Information on the object (Structural outline - Metadata [15]).
  - **Objective-description.** Textual description of the objective.
  - **Objective-type.** Type of objective, e.g. 'insight', 'skill' et cetera.
  - **Only-for-learner (optional).** Indicates that the learning only applies to specific learner roles.
  - **Performance-property (optional).** Provides the possibility to define entry and target levels for the learning objective considered.

The prerequisites element has a similar buildup to that of the learning objectives. Prerequisites can
be used to express the necessary requirements for starting a unit of study or, more specifically, an activity within a unit of study. These prerequisites can take the form of statements concerning:

- prior knowledge, in terms of knowledge, insight, attitude, or competence;
- situational factors, e.g. owning specific hardware or other devices;
- other prerequisites.

The function of the optional element prerequisite-property is - analogous to the element performance-property within learning-objective - to define entry and target levels.

**Structural outline - Activities**

Activity is the central item within the Content. Activities form the essential parts for describing the didactical scenario throughout a unit of study. By default the order in which activities have been placed within Content is the order in which activities are presented to the learner. However, this order can be overruled within the method section and e.g. adjusted according to the characteristics of different types of learners.

The main perspective for specifying activities is the perspective of the learner. These learner-activities can be completed separately, and have one or more learning objectives. Activities can be characterised according to the chosen didactical model, e.g. assignment, task or lesson.

In addition to learner activities, learner supporting activities can also be defined. These activities can be assigned to specific (staff and learner) roles, such as teacher, assessor, and peers, who interact in some way with the learner to facilitate his/her learning process. The approach taken ('method') is described in a separate section (see *Structural outline - Methods for interaction* [18]).

**Activity.** An activity is designed as a sequence of

- **Metadata.** Information on the activity (*Structural outline - Metadata* [15])
- Objectives and prerequisites of this activity (*Structural outline - Learning-objectives and prerequisites* [16])
- **Environment.** The (additional) objects required in the environment of this activity (*Structural outline - The environment* [18])
- **Activity-description.** Complete description of the activity, holding:
  - An introduction (optional).
  - What should be done.
  - How should it be done (optional).
  - With whom should it be done (optional).
  - When should it be done (optional).
  - Why should it be done (optional).
  - Hints on how to go about it (optional).
  - Specification for when the activity is completed, and recording this in dossier.
  - Feedback on completion of the activity (optional).

Two elements within the activity structure need more attention: Activity-description (*Activity-description* [39]) and Environment (*Environment* [83]).

- Activity-description is a wrapper for describing what a learner should actually do and
defining when the activity is completed.

- The element Environment defines the learning environment in which the activity should take place (see *Structural outline - The environment* [18]).

### Structural outline - The environment

The element Environment defines the learning environment in which the activity should take place. This learning environment can be built and structured completely in accordance with the didactical model considered. The learning environment may contain the following objects:

**Environment.** This is a sequence of

- **Metadata.** Followed by one or more of the following:
  - **Knowledge-object** e.g. books, articles, readers.
  - **Announcement-object** e.g. for providing news.
  - **Communication-object** e.g. for mail or conferencing.
  - **Tool-object** e.g. software applications.
  - **Questionnaire-object** e.g. for providing tests or forms.
  - **Role-information-object** e.g. for providing a view on the dossier.
  - **Personal-object** e.g. for adding personal notes or personal hyperlinks.
  - **Index-search-object** e.g. for providing a fine-tuned search engine.
  - **Environment Inclusion of separate environments.**

### Structural outline - Methods for interaction

Once an EML specification is loaded into the 'player' (e.g. Edubox 1.0), the units of study become interactive objects. Interaction in this context is a personal and didactics-driven process. It includes the selection of activities to be performed (in a particular environment), as well as a way of representing these activities and objects in the environment to learners or staff members. There are three main parts of the EML method section:

Methods for interaction are defined using (a combination of)

- activity structures i.e. predefined interaction patterns ("*Structural outline - Activity structure* [18]).
- plays, activities to be performed in turn by actors in roles ("*Structural outline - Play* [19]).
- conditions, formalised in expressions that are evaluated ("*Structural outline - Conditions* [19]).

These concepts are described further in "*Conceptual outline - Methods* [26]."

### Structural outline - Activity structure

Different sequences of activities can be defined within *activity structures*. The learner must choose a path through a set of activities, where some have been specified in sequence ("do this and that"), and others have been introduced as equivalent alternatives ("do this or that").
The general structure is as follows.

**Activity-structure.** A sequence of
- Metadata *(optional).* Information on this predefined structure *(Structural outline - Metadata [15])*
- Any of:
  - **Activity-sequence.** A sequence of activities or structures.
  - **Activity-selection.** A choice between activities or structures.

These concepts are described further in *Conceptual outline - Activity structure* [27].

**Structural outline - Play**

*Plays* allow new sequences of activities to be devised, i.e. they allow the roles interact with each other in a predefined way. Play is especially suited for didactical models such as games or simulations. The element Continue within the Play section allows the designer to define the conditions under which the next part of the play can take place.

The general structure of a play is as follows.

**Play.** Is a sequence of
- Metadata, information on this play *(Structural outline - Metadata [15]).*
- One or more sequences of:
  - **Role-ref,** the role to which the activity, structure or unit of study is assigned *(Structural outline - Roles [15]).*
  - Any of the following references:
    - Reference to an activity *(Structural outline - Activities [17])
    - Reference to an activity structure *(Structural outline - Activity structure [18])
    - Reference to a unit of study *(Structural outline - Structure of a unit of study [14])
  - **Continue (optional).** Determines when the play may continue (e.g. by testing a condition).

These concepts are described further in *Conceptual outline - Play* [27].

**Structural outline - Conditions**

By specifying *conditions* certain learner roles are assigned to specific activities, activity-structures or plays. These conditions are defined in if-then-else expressions.

The general structure of the conditions element is as follows.

**Conditions.** A sequence of
- Metadata *(optional).*
- One or more sequences of:
• A condition. This is an expression that tests roles, properties, system ('run') information, etc.

• An action to take if the condition succeeds. This is one of the following:
  • Show an activity(structure), play, or content type.
  • Hide an activity(structure), play, or content type.

• An alternative action to take when condition fails.

These concepts are described further in Conceptual outline - Conditions [28].

‘Notification’ mechanisms can be designed based on conditional specifications. Notification is explained in more detail in Conceptual outline - Notification [28].

A special feature of the conditions part is that it allows one to specify rules for access and showing or hiding marked text parts. There are several places within the content section where (blocks of) text can be given a content-type, for example 'introduction', 'example', or 'paragraph'. These content-types can be freely chosen and can be of a different nature, depending on the designer's intention.

Content-typing is part of a personalisation strategy. This is explained further in Conceptual outline - Personalisation [32].

Conceptual outline - EML as a metamodel

EML offers an instructional 'metamodel' that is neutral to the different approaches to learning and instruction. Neutral, as EML gives educational designers the opportunity to specify and implement their own didactical models. However, there are some axioms about learning that provide the fundamentals of EML.

• a person learns by performing activities Conceptual outline - Activities as the fundament of teaching [25] in an environment Conceptual outline - Environments for the performance of an activity [29] and getting feedback from that environment

• an environment consists of a set of objects and/or human beings Conceptual outline - Actors and roles [30] that are related in a particular way

• when a person has learned he/she is able (a) to perform new activities or perform activities better or faster in similar environments or (b) perform the same activities in different environments (transfer)

• a person can be encouraged to perform certain activities when:
  • the activities can be performed by this person
  • the required environment is made available
  • the person is motivated to perform

• what has been posed here with respect to a single person, also applies to a group of persons or an organisation

These axioms refer to the way people learn. In comparison, instruction is defined as 'a process that aims at accomplishing and measuring learning results'.

It can be concluded from the axioms that instruction should consist of providing students with a coherent series of activities, including specific learning environments, so that learning can actually take place. Assessment of what has been learned may consist of providing students with specific activities, which enable them to show that the learning objectives have been achieved.

EML is set up to be neutral when responding to instructional design questions such as
• which type of learning objectives are to be obtained;
• which kind of activities (observe, study, analyse, forecast, describe, et cetera) are to be performed to invoke learning;
• how the specified activities relate to each other;
• which type of feedback should be provided;
• how the (learning) environment should be arranged;
• what support structures, teacher and other staff member activities should be arranged;
• where and how assessment should take place;
• how students can be encouraged to perform activities.

Conceptual outline - General structure

Some aspects identify general issues in EML specifications. Firstly, EML declares aspects of the didactical model, but does not instantiate them. Instantiation is typical for a "run" [243]. This characterisation has an effect on all aspects of EML. See Conceptual outline - Declaration versus instantiation [21].

Secondly, an EML specification uses components, or building blocks, which are collected in a complete unit of study or subcomponent. Several parts of EML may be modelled as reusable components, and referenced for seamless integration into other components. See Conceptual outline - Components [22].

Next, a unit of study is the result of an authoring process. What steps can be discerned in this, how do the different parts of a unit of study relate? See Conceptual outline - Creating the unit of study [23] for more information.

Finally, EML specifications are created, used, archived and deleted - in short, they have a lifecycle which affects the EML specification. See Conceptual outline - Lifecycle [24].

Conceptual outline - Declaration versus instantiation

EML offers a metamodel for didactical specifications. In an EML specification one cannot record the didactical aspects for a particular person or groups, or for specific delivery channels. This 'actualisation' of the EML specification takes place at instantiation time, during the "run" [243]. EML is 'neutral' with respect to

• Place
• Time
• Person
• Medium

In order to achieve this, the following EML constructions have been devised.

• EML defines roles instead of actual persons Conceptual outline - Actors and roles [30]
• Information is filtered out in response to the current status of the actors Conceptual outline - Personalisation [32]
• Activities are declared, but only a selection is presented based on choices made and activity results.
Conceptual outline - Components

EML is based on the notion of components, or building blocks, that are assembled into new configurations and thus compile new educational units. Components are separate units that can be developed independently. They can be reused in different applications.

This concerns:

- **Unit of study** <Unit-of-study> i.e. a course, module, curriculum or any other didactical organisation intended.

- **Environments**: the material part of the environment in which activities are performed <Environment> [83]. Roles are not part of this, only specific objects, namely:
  - Containers of explicit content, 'knowledge objects' <Knowledge-object> [125].
  - Questionnaires <Questionnaire-object>, interactions <Interactions> [117] and tests <Test-group> [208].
  - Objects for setting up communication channels <Announcement-object> [46], <Communication-object> [62], specifying possible search mechanisms <Index-search-object> [112], practical working tools <Personal-object> [159], <Tool-object> [214], and for showing personal information <Role-information-object> [178].

- **Individual sections** <Section> within any textual structure.

- **The representation of a single activity** <Activity> [39]

- **Standard objectives and prerequisite specifications** <Learning-objective> [127], <Prerequisite> [162]

All other constructions are not part of the repository (they are not 'components' in that respect) and are therefore reusable only within the component in which they are located.

Components have the following features:

- **EML version** EML-version=, the version of EML that this component was defined in (current version is "1.0").

- **Version** Version=, component version number, i.e. assigned in the editing phase.

- **Identifier** Id= [233], a name that identifies the component uniquely in the current EML specification. This identifier is mapped onto a worldwide unique identifier once it is made part of a repository.

- **Worldwide unique identifier** Worldwide-unique-id= [240], a name that identifies the component uniquely in all possible repositories.

- **Reusability** Reusability=, a formal registration of the fact that the object is inherently reusable (or not).

- **Type** Type= [238], a subtype name of this component.

- **Link name** Link-name=, a short 'title' of the component for representation purposes.

All reusable components may be referenced. This reference then represents the component available elsewhere for immediate inclusion at the point of reference ("inclusion reference" [243]) <Unit-of-study-ref> [217], <Environment-ref>, <Announcement-object-ref> [47], <Knowledge-object-ref> [126], <Test-group-ref>, <Index-search-object-ref> [113], <Personal-object-ref> [160], <Role-information-object-ref>, <Tool-object-ref> [214],
Components are collected (assembled) into larger components. A repository of components therefore forms the basis for creating complete didactical modules.

This also means that reusable components must be independent of a particular discourse or semantic context; these components may occur in a different context and therefore must not reference anything that is not guaranteed to be available in all contexts.

Conceptual outline - Creating the unit of study

The role of the student is essential in the building of units of study: EML defines a student-oriented specification scheme. Constructing a unit of study typically entails the following steps (of course the flow implied is not normative; EML specifications will be constructed in an interactive way).

The following introduces a ‘conceptual’ strategy and should not be interpreted as a strict guideline for building units of study.

- Start with the determination of the start- and end-levels <Prerequisites> [164], <Learning-objectives> [128]. This level may be indicated as 'Skill', 'Knowledge', 'Insight' et cetera. One may also include a reference to a level defined elsewhere <Prerequisite-ref> [164], <Learning-objective-ref>. One can also indicate what learner-roles these levels have defined <Only-for-learner> [152].

- Determine how a number of activities must be worked through <Method> [137]. This always takes the form of a 'scenario' <Play> [161], that is the heart of the 'play', the unit of study. Within a scenario one may implement fixed sequences of activities, offer a choice, and combinations of these <Activity-structure> [42]. Determining a scenario and constructing activities (next step) are usually done at the same time.
• Define the activities that are referenced in the scenario <Content> [66]/<Activity> [39]. In these, record
  • which start- and end-levels exist for these activities <Objectives> [147],<Prerequisites> [164].
  • what objects in the environment are needed for that particular activity <Environment> [83],
  • which (inherent) activities or units of study does it include, or a description of the activity <Activity-description> [39] itself, in terms of:
    • what has to be done <What>,
    • how and when this should be done <How> [98],<When> [225],<Hint> [97],
    • with whom this should be done <With-whom> [229],
    • when this should be done <When> [225]
    • why this should be done <Why> [228]
    • a hint on how to go about implementing this (<Hint> [97])
    • when the activity is finished <Completed> [64], and
    • what feedback should be given on finishing the activity <Feedback-description> [87].

• Determine which objects in the environment are needed for the entire set of activities. <Content> [66]/<Environment> [83]. More than one activity may use the same objects. It is natural to declare environments first, and then reference these for each activity.

• An activity may require that other actors are assigned supportive activities. Define new roles for the unit of study, if it does not concern an original 'learner' role <Roles> [180],<Role> [177],<Learner> [127],<Staff> [194]. The role has a type Type= [238] e.g. 'student', 'control-group', 'assessor', 'teacher'. A role may be played by a group or an individual. Dossier entries per role ("property" [243]) may be defined <Property> [168]. These may be assigned an initial value <Value> [221]. As a result of these new activities the scenario must be extended by those activities <Method> [137].

• Determine what parts of the specification must be shown or hidden for specific actors, or under what conditions the activity sequence may be continued <Conditions> [65]. The conditions will be evaluated constantly during the implementation of the unit of study <If> [99],<Then> [212],<Else> [79]. If there are no conditions, then all units of study are equal for all actors. Conditions are therefore the basis for personalisation Conceptual outline - Personalisation [32].

• Finally, set the units of study <Unit-of-study> [216]. Ensure that a type is set, for example, 'course' Type= [238], determine whether it is reusable Reusability= [237] and assign metadata to it <Metadata> [136]. This encompasses, e.g. the title, creator of the unit of study, and keywords.

Comments can always be placed alongside the formal specifications <Comment> [60], <Comment-inline> [62]; comment is only visible to the EML author and editor.

Conceptual outline - Lifecycle

EML components are created, used and finally removed, and therefore evolve through a lifecycle. This concerns
• the actual components as they are available in a run (in their physical form, e.g. in a database). An EML specification does not manage this, and a particular publication of the component cannot be referenced.

• the intention of the component. This is the component, irrespective of it’s physical delivery. EML can reference a particular phase in the component’s intended lifecycle.

For example, a book may be ‘published’ in several editions. A reference to that book requires the indication of what edition is intended. However, one cannot reference a particular ‘print edition’ (several print editions have the same edition number).

In EML an object may be a version that is replaced by another version in other contexts. The versioning information is specified as:

• The version of the object Version= [239] (newer objects replace older ones).

• The version of EML itself EML-version= [232] (an object complies with a previous version of EML).

In referencing an object for reuse, the version of the object must be identified (see also Conceptual outline - Reuse and retrieval [35]). Which version should be used (Use-version= [240]) and what kind of changes to that version are allowed (Version-use= [240])? The version identifier of a component consists of three parts, which one may express as "A.B.C"

• "A" is a major update.

• "B" is the number of the minor update of "A".

• "C" is the number of a version holding bug fixes on "A.B".

There is also a 'current version', which is the last version published.

Conceptual outline - Activities as the fundament of teaching

The fundament of EML is the specification of didactical components in the form of activities that are performed by specific persons in specific roles in a specific environment. This concept is elaborated upon here, so that all main components of the design are clear.
Composition of the unit of study - The activities (A) are central to the unit of study. They are performed by someone in a specific role, in a suitable environment. Within the environment we find objects and actors. Several environments can share objects and/or actors (content). The activities are sequenced such that the intended goals are achieved (method). The dossier is adapted as a result of (intermediate) activity results, or the need to save intermediate information. The dossier serves as a repository of (mainly personal) properties.

The unit of study (Unit-of-study) is the most elaborate component in the design, and may be seen as a collection of activities (Activity) that are assigned to one or more persons that play a particular role (Roles) within a particular environment (Environment). The activities are also arranged in a sequence such that several alternative 'paths' can be followed through them (Method).

An activity (Activity) is primarily a description of something a person or group must do, and how it should be done (i.e. the flow and construction of activities (Activity-structure), (Play), (Conditions)). An activity itself is not bound to a role, but is assigned to it within a unit of study (Play). However, activities are bound to a role category 'learner' or 'staff' through the definition of objectives. Apart from this, an activity is a coherent work unit. This means that one cannot alter the sequence of subactivities (if these exist) as defined within that activity; these subactivities cannot be reused in other activities. This is different from the unit of study, in which complete activities are assembled into paths (Activity-structure) or 'learning games' (Play).

An activity may be taken to be 'completed' (Completed) when the following conditions are met:

- The actor decides (User-choice) ('I have finished this activity').
- A particular property is set, or set to a specific value (When-property-value-is-set) (for example, the property "activity-1-complete" is set to True).
- The activity does not need to be completed (and is therefore optional) (Unrestricted).

The unit of study and activity presuppose (optionally) both a particular start-level (Prerequisites) and end-level (Learning-objectives), (Objectives) of the person in a role (usually, but not exclusively, the student).

Units of study are complex objects. This means that they can be built up of sub-units: courses consist of modules, curricula consist of paths, et cetera.

Conceptual outline - Methods

The term method is used to denote the complete or partial automation of the study process, during which didactical components, information and activities are being transferred from one person or group of persons to the other, as determined by a series of procedural rules. The exact implementation of the methods within a unit of study constitutes a 'didactical model'. Subsequently there is no 'inherent didactical' model in EML, but the tools are provided to specify and implement any didactical model. The heart of the method is the registration of activities and the sequencing of those activities (Method), a step-by-step guide through the didactical process.

More generally, EML is set up to support all known didactical premises:

- which type of learning-objectives are to be obtained;
- which kind of activities (observe, study, analyse, forecast, describe, et cetera) are to be performed to invoke learning;
- how the specified activities relate to each other;
- which type of feedback should be provided;
• how the (learning- or working-) environment should be arranged;
• what support structures, teacher and other staff-member activities should be arranged;
• where and how assessment should take place;
• how students can be encouraged to perform activities.

Conceptual outline - Activity structure

A coherent sequence of previously defined activities is modelled in a so-called activity-structure
(Activity-structure) (Activity) [39], (Activity-ref), (Unit-of-study), (Unit-of-study-ref). This model is used to construct the didactical scenario (Play) [161]. The activity structure is a sequence or a selection:

• **Sequence** (Activity-sequence): a fixed sequence of activities. One activity (A1) is a prerequisite for the other activity (A2). Thus the conditional relationship (A1, A2) is modelled: first do A1, then do A2.

• **Selection** (Activity-selection): a number of alternative activities; the student may decide which activity is performed. Thus the alternative (A3 | A4) is modelled: do A3 or A4.

Within these two models one or more activities, sequences or selections are referenced. This way activity-relations e.g. (A1, A2, (A3 | A4 | (A5, A6)), A7) can be modelled, see figure.

The alteration of sequences and selections of activities. The same sequence is covered by both plays 1 and 2; however these plays choose a different path. By design both paths are valid and equally well suited to achieving the objectives.

Conceptual outline - Play

A *play* (Play) [161] describes the scenario of a unit of study, or a coherent part of a scenario. This may be compared to scenes in a play; per scene a description is given on what actors must do (single activities and sequences of activities) (Activity) [39], (Activity-structure) [42]. The
conditions under which a possible following scene/scenario can start may be explicitly specified.

Whether or not a scenario is completed is determined by the fact that the last activity is completed, or a condition is met, or an actor determines that the task is completed.

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Conceptual outline - Conditions

'Conditions' are used to offer a personal setup of the learning material. Conditions should be processed such that these have the upper hand when the conditions are met, so that a change is made in the activity schedule of the actor. Based on these conditions, a new play can therefore be started (for example, start activities when a conditional activity is completed).

Within conditions we evaluate expressions, which may be any of the following:

- calculations (SUM, SUBTRACT, MULTIPLY, DIVIDE)
- predefined relations (ROLE-REF, USERS-IN-ROLE, TIME-UNIT-OF-STUDY-STARTED, TIME-ACTIVITY-STARTED, CURRENT-TIME, COMPLETE)
- new relations (IS, IS-NOT, AND, OR, GREATER-THAN, LESS-THAN, NO-VALUE)

In the latter case properties, activities, explicit values or expressions (as described) are being tested.

An action is performed according to the success or failure of the condition. The action is to show or hide a text object, activity, activity-structure, play, or unit of study, based on the 'representation class' of that object. See Conceptual outline - Recording textual information. Also, a different (embedded) condition may be tested.

Activities, activity-structures, plays, and units of study that do not comply with the conditions are invisible.

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Conceptual outline - Notification

The notification mechanism entails sending a message to an "actor" specifying the next activity to be performed by the actor. Notifications may occur when a property is set. These determine:

- Who should receive the message (by referencing the role).
- Which activity should be performed by that actor.
- An optional short description of the subject of the activity.

This usually takes the form of a message displayed in the actor's in-box, or a message shown on a handheld device containing, for example, a reference to the activity that should be performed.

Notifications are therefore used in a 'narrow' sense. Within a play, some kind of notification also occurs, when an actor is notified of an activity that he/she must perform. However, this is not their immediate choice, but the result of an activity that is completed, which requires the next activity to be started.
A notification without an associated "follow up" activity is considered to be just a "notice".

Conceptual outline - Environments for the performance of an activity

An activity is always implemented in a particular environment \(<\text{Environment}>\) [83]. This is taken as a 'workspace' or 'context' in which certain objects (and the communication with persons) are made available, such as books, communication devices, and searching aids. An environment has a specific type \(\text{Type}=\) [238], e.g. 'working material', 'office', 'laboratory', 'Internet pack', 'instruments' et cetera Environments are bound to activities \(<\text{Activity}>\) [39]/ \(<\text{Environment}>\) [83] or are introduced as components independent of a particular activity \(<\text{Content}>\) [66]/ \(<\text{Environment}>\) [83], such that reuse of the environment is feasible Conceptual outline - Reuse and retrieval [35]. Environments may contain sub-environments (e.g. buildings have sections, and sections have corridors and rooms.). The environment of an activity is the grand total of all environments that are defined for that activity.

The environment is not equivalent to the learning environment. A learning environment is expressed as a unit of study and is bound to a learner, not a facilitator. The environment for activities (by learner or facilitator) is bound to that specific activity or a set of activities within the overall environment.

The following is recorded in an environment:

- **Primary sources of knowledge.** A knowledge object \(<\text{Knowledge-object}>\) [125] is the equivalent of a book article, report or similar. It consists of sections and subsections, and may refer to objects inside or outside the environment (see also Conceptual outline - Recording textual information [34]).

- **Communication channels.** This has two distinct forms:
  - An object used to send a message to other actors in the form of an 'announcement'. \(<\text{Announcement-object}>\) [46]
  - An object that is the representation of a communication channel \(<\text{Communication-object}>\) [62]: electronic mail \(<\text{Receive-mail}>\) [176], \(<\text{Send-mail}>\) [184], synchronous communication \(<\text{Synchronous-conference}>\) [205] and asynchronous communication \(<\text{Asynchronous-conference}>\) [51]. An external program may be introduced which then takes over communication aspects \(<\text{External-program}>\) [85].

- **Role-information.** The information that is linked to a role (showing properties Conceptual outline - Dossiers and properties [31]) can be recorded in a separate object \(<\text{Role-information-object}>\) [178].

- **Search capabilities.** The way in which information (contained in the current parts of the unit of study) can be retrieved is recorded in a separate object \(<\text{Index-search-object}>\) [112], Conceptual outline - Reuse and retrieval.

- **Instruments.**
  - An instrument that is accessible through HTTP, HyperText Transfer Protocol (for example, an applet) \(<\text{Tool-object}>\) [214].
  - An object for personal use \(<\text{Personal-object}>\). Three variants are available: a notebook \(<\text{Personal-notebook}>\) [159], a list of Internet references \(<\text{Personal-hyperlinks}>\) [159], and a home page \(<\text{Personal-homepage}>\) [158].
  - A questionnaire. This may function as a self-test \(<\text{Questionnaire-object}>\) [174], Conceptual outline - Self-tests and interaction modelling [33].
People perform activities. In EML a "person" [243] is 'abstracted', that is: at instantiation time a person is placed in a role [Conceptual outline - Actors and roles] (thus becoming an "actor" [242]), then only the role can be used in further specifications. The role can be played by several persons in the same "run" [243] (and, of course, in separate runs). The same person may also play several roles. During the 'performance' of the actor all kinds of registrations take place, e.g. preferences, test results, uploaded materials, acquired levels of skill et cetera. These registrations are personal, i.e. they concern an individual actor. Therefore each person has a personal dossier [Conceptual outline - Dossiers and properties]. During a run a person's dossier is both read and written, so that the learning process is personalised [Conceptual outline - Personalisation].

The unit of study, as expressed in EML, may be interpreted from different perspectives, just like the script of a theatrical play. The author defines roles [Role] without assigning particular persons to them. During the rehearsals and performance the roles are actually played. We distinguish:

- Person - an actual person. The term is independant of the function within a run. Where persons are named, groups may be intended.
- Actor - a person(-group) that plays a role in a run.
- Role - a set of activities to be performed by one person.; the role is played by an actor in a run. Only roles are described in EML, not persons and actors.

A run is the specific education that is based on a didactical model. A run is the instantiation of the more general setup recorded in EML specifications, i.e. the moment when the education actually takes place. During the instantiation both environments [Conceptual outline - Environments for the performance of an activity] and activities [Conceptual outline - Activity structure] are associated with a person. The intake (when available) makes clear who can play a certain role. The 'game' as this is modelled in EML is completely personalised, i.e. tailored to the level, requirements and limitations of the actor.

Teaching is directed toward a person who learns (for example, student, chairman, moderator) [Learner]. All other actors suport the learning process (for example, teacher, assessor, expert) [Staff]. Activities apply to both 'classes' of actors. Goals are therefore either general objectives or learning objectives [Objectives].

A dossier is available for each role, in which all role-specific aspects are recorded. Person-specific properties exist. The various roles have certain access rights to parts of the dossier.

Actors are linked to activities in a 'play' or conditional specification [Play]. This is the only way people can perform activities.

The design of a role covers the following aspects.

- Determine whether this is a learning or supporting role [Learner], [Staff].
- Determine the number of persons that can play the role Max-persons= [235], Min-persons= [235], Match-persons= [234].
- Describe the role [Information-for-role] such that actors know what is expected of them.
- When information for a particular role information needs to be recorded, a property should be declared [Property], [Property-group], [Conceptual outline - Dossiers]
and properties [31].

- One may also define more specific, or 'sub-roles' <Learner> [127]/ <Role>, <Staff> [194]/ <Role> [177]. Properties of the more general role are inherited by the more specific roles. For example, the leader of a working group is a student who is learning about leadership issues.

Apart from this, properties can also be assigned to a unit of study, however these properties are not associated with a particular role but rather with the run <General-properties> [94]. A typical example is the starting date of the unit of study.

Information on roles (an actor's own role or that of other actors) may be queried <Role-information-object> [178]. Certain authorisation constraints apply here.

Conceptual outline - Dossiers and properties

Building the dossier - roles have a dossier, containing properties of the actor or group of actors within a role. The actor performs an activity that results in some kind of output, which is then recorded as a property in the dossier. Meanwhile other actors are notified of this event. These actors will in turn perform activities that result in output, recorded as a property in their own dossier, and/or as changes in the student's dossier.

Everyone who plays a role in EML has a dossier. Dossier information is available as a set of singular 'properties' <Property> [168] or as groups of properties <Property-group> [169].

Properties for persons in a role are declared when that role is created. These will typically receive their value during the run. A person (again within a particular role) may also have properties that are not associated with a run, but are person-related and are therefore retained throughout all runs of all units of study that she/he is involved in.

There is also a dossier that is shared by all actors in a role within a particular unit of study. The set of properties within that dossier typically concerns information that is role-independent but should not be recorded in the unit of study. An example is a list of Internet search systems (URLs). This list will be compiled as a property-group, with a separate property for each URL.

Properties are defined, changed, and shown:

- Define with initial value. A property <Property> [168] or property group <Property-group> [169] is declared and typed, and may be assigned a start value. The property type may be Boolean, String, Real, Integer, Date, URL, Text, or File <Boolean> [56], <String>
After a value. Part of the information is set in the intake (if available), and part is set during the run. For example:
- as a result of completing an activity
- as a result of answering a question
- when a preference is set in the intake

Query/show. Property values can be inserted in the text and queried through a role-related information object. Within the activity description, completion can be determined by checking if a property value is set.

Conceptual outline - Personalisation

Defining roles and recording properties of roles may affect the way the teaching is delivered. The specifications in the current dossier influence the way a person looks at the information. This we call personalisation. The following levels of personalisation exist:

- macro-personalisation: Individual agreements regarding didactical arrangements within the complete education process.
- meso-personalisation: Individual agreements on activities within units of study / personal arrangement of the tasks (activity sequence and selection)
- micro-personalisation: Options for methods of delivery or presentation (showing/hiding information).

Personalisation is founded on an actor's profile, which is set up during the intake or during a run. This is recorded in the dossier and includes aspects of previous knowledge, preferences, agreements et cetera.

- Conditions determine when to show information and when to hide it. Within conditions one may use if/then/else constructions in order to publish the information differently for each profile.
- Within a play personalisation is also possible, namely by assigning roles to activities.
- A construction may be associated with a particular processing category: rules that record if the information is shown or hidden based on preference settings. For example: "Case study".
Objectives and prerequisites - Entry- and exit-levels can be defined for an activity. During the intake the prerequisites are determined with which each actor must comply, and the actor sets his/her individual goals. These values are recorded in the dossier. The study process is then implemented, after which one can determine (for example, through self-assessment) whether or not certain objectives have been achieved.

Entry- and exit-levels are set for all activities. These levels are described both formally and informally. Based on these levels a selection can be made from possible activities or units of study when a didactical component is compiled.

Some objectives concern the learner, others concern staff members. Learning objectives are described, typed, and linked to a role of a learning actor (for whom the objective was set). It is possible to refer to an objective defined elsewhere. These prerequisites may take the form of statements concerning:

- prior knowledge, in terms of knowledge, insight, attitude, or competence;
- situational factors, for example, owning specific hardware or other devices;
- other prerequisites.

Here too a description and typing is required, and a role is linked. It is possible to refer to a prerequisite defined elsewhere.

Implementation of an activity results in a change in the actor (the actor 'learns', 'judges' et cetera). The registration of this change takes place in the dossier of the actors playing the same role. To this end a property value is tested, and a role is linked. The entry- or exit-level is reached when that property has received a certain value.

- First one determines which property is to be 'monitored', using an existing or newly defined property.
- Next one determines what the target value is, and, for a new property, its initial value when the activity is started.

This approach models all automatic arrangements of entry- and exit-levels. In addition, within metadata a determination of the study load may be recorded (for example, the number of study hours). This is most clearly valid when a study catalogue is compiled. This value does not affect the dossier.

Conceptual outline - Self-tests and interaction modelling

Questions have been modelled in EML which may be used for FAQ structures or self-assessments (complete formal tests cannot be modelled well, as no administrative context or handling of formal tests is modelled). There are two modes of use:
• Intermediate questions: a series of questions within a text, such as in a self-assessment
  <Interactions> [117],

• Complete assessments, i.e. sparatly compiled and reusable questionnaires
  <Questionnaire-object> [174], <Test-group>

The general construction of questions is relatively straightforward. A question is formulated
  <Question> [172], and a template for answering the question is provided. Hints <Hint> and
feedback information <Feedback> [86] may also be provided. When the result of the interaction is
recorded, a property can be set to 'success' or 'failure' <Score> [180].

The following question types have been modelled in EML; information is added to the template for
interaction per question.

• Multiple choice question <Multiple-choice-question> [139]: one correct and some
  incorrect answers.

• Multiple response question <Multiple-response-question> [140]: several correct and
  incorrect answers.

• True/false question, i.e. determine which of a set of statements is true <True-false-
  question> [215]: a list of statements and an indication of how to present the question
  (right/wrong, true/false et cetera)

• Sequence question, i.e. place items in correct order <Sequence-question> [185]: two or
  more answer items.

• Matching question, i.e. determine what items in first set relate to items in second set
  <Matching-question> [133]: supply a set of valid item-pairs.

• Short answer question, i.e. supply a short answer <Short-answer-question> [187]:
  alternative patterns for a possible answer supplied.

A variant question is the question/answer pair that models an FAQ entry <Question-answer>
  [173]. This form only provides for the question and answer, plus a rule on how to present the
answer <Answer-options> [49].

Conceptual outline - Recording textual information

Much of the information is recorded in regular or special textual structures. This covers
descriptions, explanations, content, questions et cetera. The following forms are typically used in
any place within regular textual constructions:

• High-level discourse levels, modelled as sections <Section> [182], that can be nested
  freely, and reused as a whole.

• Paragraph-level objects, that is
  • objects that take part in the structuring of text blocks such as (highlighted) paragraphs
    <P> [157], <Special> [192], lists <List> [132], and code samples
    <Code-line>.
  • objects that can be placed between such paragraph-level objects, i.e. glossary
    entries <Lemma> [129], bibliographical references <Literature> [133], figures
    <Figure> [88], formulae <Formula> [91], tables <Table> [205], and audio and
    video clips <Audio> [51], <Video> [222].
  • Objects that may occur within the 'running text' (e.g. within a paragraph itself), include
    • emphasised and highlighted phrases <Emphasis> [80], <Special-inline> and
      terms <Term> [207].
• cross-referencing constructions, i.e. bookmarks <Bookmark> [55], cross-references <EML-ref> [79] and references to Internet locations <Internet-ref> [118].

• Figures and formulae (<Figure-source> [88], <Formula-source>).

Conceptual outline - Reuse and retrieval

In compiling EML specifications it is presumed that a set of reusable components is available. By referring to these components one may use them in completely new contexts. For example: a manual <Knowledge-object> [125] may be used in various learning units <Unit-of-study> [216]. To this end a reference is created to that object, which is uniquely identifiable. When several objects are reusable as a group (for example, some manuals and a glossary) one may define a complete working environment <Environment> in which these have been collected; this environment itself is, in turn, reusable as a whole.

In order to be able to refer to an object (or other fragment within an EML specification) it must have a unique name. This name functions as a worldwide unique identifier Worldwide-unique-id=[240] and may be based on a local and temporal identifier assigned by the creator Id=[233].

In EML reuse has the following forms:

• Inclusion. Existing components and other reusable specifications are used in different spots ('inclusion'). These objects have an associated referencing counterpart <Activity-ref> [40], <Announcement-object-ref> [47], <Communication-object-ref> [63], <EML-ref> [79], <Element-to-index-on> [79], <Environment-ref>, <Index-search-object-ref> [113], <Knowledge-object-ref> [126], <Learning-objective-ref>, <Personal-object-ref> [160], <Prerequisite-ref>, <Questionnaire-object-ref> [175], <Role-information-object-ref> [179], <Test-group-ref> [209], <Test-item-ref> [209], <Tool-object-ref> [214]. The use of this reference is taken as an inclusion of the referred object in the context where the reference has been made. This means that the set of such objects must be managed well (retrieval, version management).

• Internal reference. Using references the user may be directed to information available elsewhere in the EML specification (cf. 'cross-reference'). This always occurs from within the running text Conceptual outline - Recording textual information [34], for example a task description or the section text. One may reference

• objects outside the running text, i.e. figures <Figure> [88], formulae <Formula>, tables <Table> [205], lemmas <Lemma> [129], sections <Section> [182].

• objects that are part of the running text. This concerns inline formulae <Formula> [91] and bookmarks <Bookmark> [55].

All objects that can be referenced have an identifier Id=[233], all that can be referenced from outside a component also have an worldwide unique identifier Worldwide-unique-id. Internal references are placed within the text by using a specially devised generic reference point <EML-ref> [79].

• External reference. Within EML one may also refer to external information, i.e. information not modelled using EML concepts or constructions. This always takes the form of a URL <Internet-ref> [118].

As previously stated, a reference system requires tight management of the repository of reusable components. This has some consequences for EML.

Each object that may be reused is assigned a set of descriptors (<Metadata> [136]). This includes the title, author, description, keywords, creation date et cetera <Title> [213], <Subtitle> [200], <Creator> [72], <Description> [75], <Keywords> [125], <Copyright> [68], <Study-load> [199], <Extra-meta> [86], <Object-type> [151], <Supplied> [204], <Contributor> [68], <History> [98], <Status> [197], <Creation-date> [72], <Date-last-change> [74], <Min-completion-
The metadata specifications are used to select components:

- from the repository, as maintained by the management system, when the unit of study is created.
- during the run, when the available information is searched (i.e. in the current environment). The rules for retrieval may be recorded in the environment <Index-search-object> [112]. One therefore determines which search techniques must be offered (full text?, indexed? <Search> [181]) and (when indexed <Index> [102]) on what objects an index must be precompiled:
  - Specific constructions, through an identifier <Element-to-index-on> [79]
  - Type of construction <Type-to-index-on>
  - Class of construction <Content-type-reference> [67]
  - Objects <Object-to-index-on>

The moment an object is reused the need for version management arises, i.e.:

- Which construction version is being used? Version= [239], EML-version=
- Which version is referenced? Use-version= [239]
- Which adaptions on that version are accepted? Version-use= [240]
- Is the version reusable by nature? Reusability= [237]

See also Conceptual outline - Lifecycle [24].

Conceptual outline - Medium-specific aspects

EML specifications are intended to be used in an interactive computer environment. Notably, EML specifications are loaded into a 'player' that sets up this environment. However, this does not mean that all information described in EML must be available in electronic form. For example, a book may be created in EML and made available in print or braille. Such component types are designed such that they are not medium-specific.

TO DO: hier Medium specific aspects.

The medium-independent nature of EML is expressed in the following aspects.

XML binding - Short introduction to XML

XML is a meta-language, i.e. using XML new languages (or "applications") may be defined. The syntax of these languages, in terms of delimiters, lexical tokens, and such, is predefined and therefore fixed; the specification is available at http://www.w3.org/TR/REC-xml. The actual components of the languages may differ. These components are known as elements, attributes, and entities.

Elements are logical constructs that define parts of a document. An XML document may be interpreted as a hierarchy of elements, each of which represents a typed portion of that document. Elements have a type, may have attributes, and may have content. Element content, in turn, may consist of elements or data, or a mix of these. An example is a chapter (element) with a title (subelement) and sub paragraphs (subelements), that in turn have textual content.
Attributes are named values that are associated with an element. For a chapter element this could be a chapter number, or the name of the author.

Entities are data portions that make up an XML document. They are part of the physical model of XML. An example is a complete chapter that this stored in a file, which is then, together with several other chapters, merged into a book by declaring it to be an entity, and referencing it at the right location. Entities may be typed, such that the encoding of the data is made explicit. For example, an entity may be XML (and therefore processable by an XML system), but also in CompuServe Graphic Interchange Format, Adobe's Postscript, or any other notation.

The structure of an XML document may be subject to rules that are expressed as a schema. The XML standard introduces the DTD to this end. An a DTD one specifies, among other, what elements may occur in what contexts, and what attributes can be specified on particular elements. Systems that read and process the XML document may apply these rules to the document, thus validating their content, before processing it. The schema (the DTD) is the heart of any XML application as it is a formal way of specifying what documents comply with the rules of the language. A complete application also includes documentation, examples, and tools.

EML is a language by which to express how a unit of study, or parts of it, is composed. EML/XML binding is an application of XML, 'binding' the EML to the syntax of XML. The schema of EML/XML is distributed as a DTD. The reference manual is part of the EML/XML application.

The Edubox system implements a subset of EML/XML binding. It also uses specific modules that are not an integral part of EML/XML binding. This concerns the modules:

- Metadata
- Figures and formulae
- Table
- Bibliographic references

The schema of Edubox-EML/XML binding is distributed as a DTD too. This reference manual is part of the Edubox application, which is formally known as Edubox-EML/XML binding 1.0/1.0.

XML binding - Global element structure of EML

This section presents the EML 1.0 XML binding as a set of elements, organised as a tree. Only the essential parts are shown; less important elements are shown in the element descriptions referenced in this overview. This section therefore offers an overview and elaborates on the 'table of contents' to the individual element descriptions.

This section will be completed later.

XML binding - Element listing

This provides a complete listing of all elements in EML.

- Omitted from print version

XML binding - Attribute listing

This provides a complete listing of all attributes in EML.

- Omitted from print version
XML example listing

This provides a complete listing of all examples provided in the reference manual.

- Not yet available

Element: Access-code

CONTENT

- Sequence of
- Characters

This element has no attributes

OCCURS IN <Synchronous-conference> [205]

The code (login) through which access to the conference can be obtained. Leaving out this code means that anyone can have access to the conference. The code must take a form accepted by the receiving system, for example, 8 characters, case sensitive.

Element: Access-count

CONTENT

- Empty

This element has no attributes

OCCURS IN <Monitor-access-time> [138]

A choice item. See the parent element for a description.

Element: Access-date-first-access

CONTENT

- Empty

This element has no attributes

OCCURS IN <Monitor-access-time> [138]

A choice item. See the parent element for a description.

Element: Access-date-last-access

CONTENT

- Empty

This element has no attributes

OCCURS IN <Monitor-access-time> [138]
Element: Activity

**CONTENT**

- **Sequence of**
  - *Optional* <Metadata>
  - *Optional* <Objectives>
  - *Optional* <Prerequisites>
  - *Optional* <Environment>
  - <Activity-description>

**ATTRIBUTES**

- **Reusability**= Enumeration Reusable Not-reusable (implied Not-reusable)
- **Version**= Singular CDATA (implied 1.0.0)
- **Link-name**= Singular CDATA (required)
- **Id**= Singular ID (implied)
- **Worldwide-unique-id**= Singular CDATA (implied)
- **EML-version**= Singular CDATA (fixed 1.0)
- **Default-visibility**= Enumeration Show Hide (implied Show)
- **Type**= Singular CDATA (implied)

**OCCURS IN** <Content> [66]

The element <Activity> [39] is the smallest working unit within EML. An activity may be seen as a 'stimulus' to invoke behavior by an actor. Activities may take on different forms, for example a 'task' or an 'assignment'.

Element: Activity-description

**CONTENT**

- **Sequence of**
  - *Optional* <Introduction>
  - <What> [224]
  - *Optional* <How>
  - *Optional* <With-whom>
  - *Optional* <When>
  - *Optional* <Why>
• Optional <Hint>
• <Completed> [64]
• Optional <Feedback-description>

**ATTRIBUTES**

- **Type**= Singular CDATA (implied)

**OCCURS IN** <Activity> [39]

The element <Activity-description> [39] is a container or "wrapper" [241] for the elements that make up the specific description of the <Activity> [39]. Most importantly, the description includes the elements <What> (what to do) and <Completed> [64] (when to finish).

**Attribute: Type**

The **Type** [238] attribute names the type of activity, for example 'task' or 'assignment'.

**Element: Activity-ref**

**CONTENT**

- **Empty**

**ATTRIBUTES**

- **Id-ref**= Singular IDREF (implied)
- **Version-use**= Enumeration Current-version Bugfixes-allowed Small-updates-allowed Major-updates-allowed (implied Bugfixes-allowed)
- **Ref-worldwide-unique-id**= Singular CDATA (implied)
- **Use-version**= Singular CDATA (implied 1.0.0)


An "inclusion reference" [243] to an <Activity> [39].

**Element: Activity-selection**

**CONTENT**

- **Sequence of**
  - Optional <Comment>
  - Optional <Information>
  - Zero or more <Environment-ref>
  - Any of One or more
• <Activity-ref>[40]
• <Unit-of-study-ref>
• <Activity-sequence>
• <Activity-selection>[40]

**ATTRIBUTES**

- **Number-to-select**= Singular CDATA (implied)
- **Link-name**= Singular CDATA (required)

**OCCURS IN** <Activity-selection>[40] <Activity-sequence> <Activity-structure>[42]

This element represents a number of alternative activities or activity structures. The actor must choose between the activities and complete them. The number of activities in the selection is specified in the **Number-to-select** attribute.

An activity is completed when the criterium in the <Completed>[64] subelement of <Activity>[39] is met.

**Attribute: Number-to-select**

The number of activities to select.

**Element: Activity-sequence**

**CONTENT**

- **Sequence of**
  - Optional <Comment>
  - Optional <Information>
  - Zero or more <Environment-ref>
  - Any of One or more
    - <Activity-ref>[40]
    - <Unit-of-study-ref>
    - <Activity-sequence>
    - <Activity-selection>[40]

**ATTRIBUTES**

- **Link-name**= Singular CDATA (required)

**OCCURS IN** <Activity-selection>[40] <Activity-sequence> <Activity-structure>[42]

This element represents a number of activities that must be completed in sequence.

An activity is completed when the criterium in the <Completed>[64] subelement of <Activity>[39] is met.
Element: Activity-structure

**CONTENT**

- Sequence of
  - Optional <Metadata>
  - Any of
    - <Activity-sequence>
    - <Activity-selection>

**ATTRIBUTES**

- **Id**= Singular ID (implied)
- **Default-visibility**= Enumeration Show Hide (implied Show)

**OCCURS IN** <Method>[137]

The element <Activity-structure>[42] is a "wrapper"[241] and allows one to specify one or more new, alternative activity structures within a <Unit-of-study>[216]. These structures may be built using basic activities that have been described in the <Content>[66] section of the EML specification. This means that the coherence of an activity-structure defined within <Content>[66] cannot be broken.

Activity-structures may be plotted using sequences (<Activity-sequence>[41]) and/or selections (<Activity-selection>). During a sequence the activities and possible units-of-study are placed in a particular order. A selection describes a set of activities and possible units-of-study, from which a choice can be made. Sequences and selections of activities may be combined.

Activity-structures are assigned to one or more roles using <Conditions>[65]. This allows the order of the activities as specified in <Content>[66] to be overruled. Without this assignment the sequence of activities as found in <Content>[66] is assumed.

Element: Activity-structure-ref

**CONTENT**

- Empty

**ATTRIBUTES**

- **Id-ref**= Singular IDREF (implied)

**OCCURS IN** <Hide>[96] <Play>[161] <Show>[187]

An "inclusion reference"[243] to an <Activity-structure>[42] defined elsewhere in the same unit of study.

Element: Additional-information

**CONTENT**

- Any of Zero or more
This element has no attributes

**OCCURS IN** <Article> [49] <Book> [54] <Chapter> [57]

Any additional information that is not part of the strict bibliographic description.

This element is part of the APA bibliographic reference model, see <Literature> [133].

**Element: All-persons-in-role**

**CONTENT**

- **Sequence of**
  - **One or more** <Role-ref>

This element has no attributes

**OCCURS IN** <Bc> [53] <Cc> [56] <Send-to> [184]
Specifies that all actors, taken from a list, should receive the e-mail. The list of roles is specified by role references in content `<Role-ref>`.

**Element: And**

**CONTENT**

- **Sequence of**
  - **Any of**
    - `<Role-ref>`
    - `<Is>`
    - `<Is-not>`
    - `<And>`
    - `<Or>`
    - `<Not>`
    - `<Sum>`
    - `<Subtract>`
    - `<Multiply>`
    - `<Divide>`
    - `<Greater-than>`
    - `<Less-than>`
    - `<Users-in-role>`
    - `<No-value>`
    - `<Time-unit-of-study-started>`
    - `<Time-activity-started>`
    - `<Current-time>`
    - `<Complete>`

- **Any of One or more**
  - **Any of**
    - `<Role-ref>`
    - `<Is>`
    - `<Is-not>`
    - `<And>`
    - `<Or>`
    - `<Not>`
This element has no attributes


This element determines whether two expressions both succeed. For example, it tests whether two properties both have a particular value.

The element is an operand in an expression, see *Conceptual outline - Conditions* [28]. Within expressions, this element produces a value of type *boolean*.

**Element: And-less-than**

**CONTENT**

- Sequence of
  - Characters

This element has no attributes

**OCCURS IN** <Process-score-automatically> [166]

This element deals with the fact that a score within a <Questionnaire-object> [174] is less than a value set in content. See also <Process-score-automatically> [166].

**Element: Animated-conference**

**CONTENT**

- Empty

This element has no attributes

**OCCURS IN** <Medium> [135]
A "choice item" [242]. See the parent element for a description.

Element: Announcement-object

CONTENT

• **Sequence of**
  • *<Metadata>* [136]
  • *Optional* <Receive-announcements>
  • *Optional* <Create-announcements>
  • *Optional* <Modify-announcements>
  • *Optional* <Archive-announcements>
  • *Optional* <Delete-announcements>

ATTRIBUTES

• **EML-version**= Singular CDATA (fixed 1.0)
• **Link-name**= Singular CDATA (required)
• **Reusability**= Enumeration Reusable Not-reusable (implied Not-reusable)
• **Type**= Singular CDATA (implied)
• **Version**= Singular CDATA (implied 1.0.0)
• **Id**= Singular ID (implied)
• **Worldwide-unique-id**= Singular CDATA (implied)

OCCURS IN <Environment> [83]

An announcement object is a formal registration showing what kind of messages may be sent to, or received from, other actors by the person to which the object is assigned. It includes the following parts:

• <Receive-announcements>: the actor may receive announcements sent out by other announcement-objects, that are referenced in turn (through <Announcement-object-ref> [47]). If not specified, receive all announcements.

• <Create-announcements>: announcements can be created by persons in roles that are referenced by the embedded <Role-ref> [179]. If not specified, no announcements can be created.

• <Modify-announcements>: announcements can be modified (et cetera). If not specified, no announcements can be modified.

• <Archive-announcements>: announcements can be archived (et cetera). If not specified, no announcements can be archived.

• <Delete-announcements>: announcements can be deleted (et cetera) If not specified, no announcements can be deleted.

At least one type of announcement use must be specified.
**Attribute: Type**

Typical types are: 'News', 'Learning materials', 'Announcement', *et cetera*

**Element: Announcement-object-ref**

*CONTENT*

- *Empty*

*ATTRIBUTES*

- **Id-ref** = Singular IDREF (implied)
- **Version-use** = Enumeration Current-version Bugfixes-allowed Small-updates-allowed Major-updates-allowed (implied Bugfixes-allowed)
- **Ref-worldwide-unique-id** = Singular CDATA (implied)
- **Use-version** = Singular CDATA (implied 1.0.0)

*OCCURS IN* `<Environment>` [83] `<Receive-announcements>` [176]

An *"inclusion reference"* [243] to an `<Announcement-object>` [46].

**Element: Answer**

*CONTENT*

- *Any of Zero or more*
  - `<P>` [157]
  - `<Emphasis>` [80]
  - `<List>` [132]
  - `<Figure>` [88]
  - `<Formula>` [91]
  - `<Table>` [205]
  - `<Lemma>` [129]
  - `<Code-line>` [59]
  - `<Literature>` [133]
  - `<Audio>` [51]
  - `<Video>` [222]
  - `<Special>` [192]
  - `<View-property-value>`
  - `<View-property-group-values>`
  - `<Set-property-value>` [186]
This element has no attributes

OCCURS IN: <Question-answer> [173]

The answer within a <Question-answer> [173] element.

Element: Answer-item

CONTENT

- Any of Zero or more
  - <P> [157]
  - <Emphasis> [80]
  - <List> [132]
  - <Figure> [88]
  - <Formula> [91]
  - <Table> [205]
  - <Lemma> [129]
  - <Code-line> [59]
  - <Literature> [133]
  - <Audio> [51]
  - <Video> [222]
  - <Special> [192]
  - <View-property-value>
  - <View-property-group-values>
  - <Set-property-value>
  - <Set-property-group-values>
  - <Interactions> [117]
  - <Internet-source> [119]
  - <Section> [182]
Element: Answer-options

**CONTENT**
- Any of
  - <Hide-answer>
  - <Show-answer>
  - <User-control>

This element has no attributes

OCCURS IN <Question-answer>

The options by which the <Question-answer> element may be shown. This is expressed in a choice list:
- <Hide-answer>: by default, do not show the answer.
- <Show-answer>: by default, show the answer.
- <User-control>: by default, let the user control the visibility: he/she explicitly states that the answer must be shown or hidden.

Element: Archive-announcements

**CONTENT**
- Sequence of
  - One or more <Role-ref>

This element has no attributes

OCCURS IN <Announcement-object>

This element is used as a "choice item". See the parent element for a description.

Announcements can be archived by persons in roles that are referenced by the embedded <Role-ref>.

Element: Article

**CONTENT**
• Sequence of
  • One or more <Article-author>
  • <Year> [230]
  • <Article-title> [51]
  • <Journal> [124]
  • <Volume> [224]
  • Optional <Issue>
  • <Pages> [157]
  • Optional <Additional-information>

ATTRIBUTES
  • Id= Singular ID (implied)

OCCURS IN <Literature> [133]
An article bibliographic entry.
This element is part of the APA bibliographic reference model, see <Literature> [133].

Element: Article-author

CONTENT
  • Sequence of
    • <Author-name> [53]
    • <Initials-prefix> [117]

This element has no attributes

OCCURS IN <Article> [49]
The author of an article.
This element is part of the APA bibliographic reference model, see <Literature> [133].

Element: Article-ref

CONTENT
  • Empty

ATTRIBUTES
  • Id-ref= Singular IDREF (implied)

OCCURS IN <Literature> [133]
A reference to an article bibliographic entry.
This element is part of the APA bibliographic reference model, see <Literature> [133].

Element: Article-title

CONTENT

- Sequence of
  - Characters

This element has no attributes

OCCURS IN <Article> [49]

The title of an article.

This element is part of the APA bibliographic reference model, see <Literature> [133].

Element: Asynchronous-conference

CONTENT

- Sequence of
  - <Participant> [158]
    - Optional <Observer>
  - <Conference-manager>
    - Optional <Moderator>

This element has no attributes

OCCURS IN <Communication-object> [62]

This element models an asynchronous conference as a communication strategy. Typical examples are News, Hypernews, FirstClass, NotesConferences, et cetera. Subelements define aspects of the conference such that the communication channel can be set up within a run.

Element: Attitude

CONTENT

- Empty

This element has no attributes

OCCURS IN <Objective-type> [148] <Prerequisite-type> [165]

A "choice item" [242]. See the parent element for a description.

Element: Audio

CONTENT
• **Sequence of**
  - *Optional* `<Metadata>`
  - `<Audio-type>` [52]
  - `<Internet-source>` [119]

**ATTRIBUTES**

- **Content-type** = Singular NM TOKENS (implied)
- **Ref-worldwide-unique-id** = Singular CDATA (implied)
- **Version-use** = Enumeration Current-version Bugfixes-allowed Small-updates-allowed Major-updates-allowed (implied Bugfixes-allowed)
- **Use-version** = Singular CDATA (implied 1.0.0)


A representation of a piece of audio.

**Element: Audio-conference**

**CONTENT**

- *Empty*

This element has no attributes

**OCCURS IN** `<Medium>` [135]

A "choice item" [242]. See the parent element for a description.

**Element: Audio-type**

**CONTENT**

- *Empty*

**ATTRIBUTES**

- **Nature** = Enumeration Life Streaming-file File (implied)
- **Type** = Enumeration Speech Music Source-sound Mix (implied)

**OCCURS IN** `<Audio>` [51]

The type of audio. The characteristics are expressed in the attributes of this element.
Attribute: Type

The attribute type can be:

- Speech; spoken matter.
- Music.
- Source-sound; an alternative sound, for example the sound of a car or animal.
- Mix; a mix of the previous.

Attribute: nature

The 'nature' of the object holding the audio fragment. This may be:

- Life
- Streaming-file
- File

Element: Author-name

 CONTENT

- Sequence of
  - Characters

This element has no attributes

OCCURS IN <Article-author> [50] <Book-author> [54] <Chapter-author> [58] <Editor-author> [78]

The name of the author.
This element is part of the APA bibliographic reference model, see <Literature> [133].

Element: Author-role

 CONTENT

- Sequence of
  - Characters

This element has no attributes

OCCURS IN <Book> [54] <Chapter>

The role of an author in the writing of a chapter.
This element is part of the APA bibliographic reference model, see <Literature> [133].
Element: Bc

CONTENT

- Sequence of
  - Optional `<Select-persons-in-role>`
  - Optional `<All-persons-in-role>`

This element has no attributes

OCCURS IN `<Send-mail>` [184]

This element follows a standard model for specifying how the mail is sent, in this case a 'blind carbon copy' of the mail. See `<Send-to>` [184] for an explanation.

Element: Book

CONTENT

- Sequence of
  - One or more `<Book-author>`
  - Optional `<Author-role>`
  - `<Year>` [230]
  - `<Book-title>` [56]
  - `<Place>` [160]
  - `<Publisher>` [172]
  - Optional `<Additional-information>`

ATTRIBUTES

- `Id=` Singular ID (implied)

OCCURS IN `<Literature>` [133]

A book bibliographic entry.

This element is part of the APA bibliographic reference model, see `<Literature>` [133].

Element: Book-author

CONTENT

- Sequence of
  - `<Author-name>` [53]
  - `<Initials-prefix>` [117]

This element has no attributes
**OCCURS IN** <Book> [54]

The author of a book.

This element is part of the APA bibliographic reference model, see <Literature> [133].

**Element: Bookmark**

**CONTENT**

- Any of Zero or more
  - **Characters**
    - <Bookmark> [55]
    - <EML-ref> [79]
    - <Internet-ref> [118]
    - <Emphasis> [80]
    - <Term> [207]
    - <View-property-value>
    - <Set-property-value>
    - <Comment-inline> [62]
    - <Special-inline> [193]
    - <Figure-source> [88]
    - <Formula-source> [92]

**ATTRIBUTES**

- **Id**= Singular ID (implied)
- **Worldwide-unique-id**= Singular CDATA (implied)
- **Version**= Singular CDATA (implied 1.0.0)
- **EML-version**= Singular CDATA (fixed 1.0)


This is a 'bookmark element', which assigns a bookmark name (an XML identifier) to a particular part of the text, for example a citation or example wrapped in a <Special-inline> [193] element. The bookmark can be referenced using an <EML-ref> [79].

Complete components should not be referenced using bookmarks, but rather by their identifier.
Element: Book-ref

CONTENT
• Empty

ATTRIBUTES
• Id-ref= Singular IDREF (implied)

OCCURS IN <Literature> [133]
A reference to a book bibliographic entry.
This element is part of the APA bibliographic reference model, see <Literature> [133].

Element: Book-title

CONTENT
• Sequence of
  • Characters

This element has no attributes

OCCURS IN <Book> [54] <Chapter>
The title of a book.
This element is part of the APA bibliographic reference model, see <Literature> [133].

Element: Boolean

CONTENT
• Sequence of
  • Characters

This element has no attributes

OCCURS IN <New-property> [142] <Property> [168] <Value> [221]
A boolean value. This is either 'true' or 'false'.

Element: Cc

CONTENT
• Sequence of
  • Optional <Select-persons-in-role>
  • Optional <All-persons-in-role>

This element has no attributes
This element follows a standard model for specifying how the mail is sent, in this case a 'carbon copy' of the mail. See <Send-to> for an explanation.

Element: Change-property-value

CONTENT

- Sequence of
  - <Property-ref>
  - <Property-value>
  - Zero or more <Notification>

This element has no attributes

OCCURS IN <Completed> <Process-score-automatically> <When-choice>

This element allows the value of a property <Property> defined for a specific role to be changed. The new value of the variable is defined in the element <Property-value>.

Element: Chapter

CONTENT

- Sequence of
  - One or more <Chapter-author>
  - Optional <Author-role>
  - <Year>
  - <Chapter-title>
  - One or more <Editor-author>
  - Optional <Author-role>
  - <Book-title>
  - Optional <Pages>
  - <Place>
  - <Publisher>
  - Optional <Additional-information>

ATTRIBUTES

- Id= Singular ID (implied)

OCCURS IN <Literature>

Reference to a single chapter within a book.
This element is part of the APA bibliographic reference model, see <Literature> [133].

Element: Chapter-author

CONTENT

• Sequence of
  • <Author-name> [53]
  • <Initials-prefix> [117]

This element has no attributes

OCCURS IN <Chapter> [57]

Author of a chapter.

This element is part of the APA bibliographic reference model, see <Literature> [133].

Element: Chapter-ref

CONTENT

• Empty

ATTRIBUTES

• Id-ref= Singular IDREF (implied)

OCCURS IN <Literature> [133]

A reference to a chapter bibliographic entry.

This element is part of the APA bibliographic reference model, see <Literature> [133].

Element: Chapter-title

CONTENT

• Sequence of
  • Characters

This element has no attributes

OCCURS IN <Chapter> [57]

The title of a chapter.

This element is part of the APA bibliographic reference model, see <Literature> [133].

Element: Choice

CONTENT
• Any of Zero or more
  • <P> [157]
  • <Emphasis> [80]
  • <List> [132]
  • <Figure> [88]
  • <Formula> [91]
  • <Table> [205]
  • <Lemma> [129]
  • <Code-line> [59]
  • <Literature> [133]
  • <Audio> [51]
  • <Video> [222]
  • <Special> [192]
  • <View-property-value>
  • <View-property-group-values> [223]
  • <Set-property-value>
  • <Set-property-group-values>
  • <Interactions> [117]
  • <Internet-source> [119]
  • <Section> [182]
  • <Section-ref> [183]
  • <Comment> [60]

ATTRIBUTES
  • Id = Singular ID (implied)

OCCURS IN <Prompt> [166]

A "choice item" [242] in a question that presents a set of possible answers (<Prompt> [166]).

Attribute: Id

The identifier of the "choice item" [242]. This identifier may be used within <When-choice> to identify the "choice item" in this particular question.

Element: Code-line

CONTENT
A single line of code in some markup, programming or other expression language.

**Attribute: Language**

A language identifier for the language used in the code example. Examples are: TeX, XML, ECMAscript.

**Element: Colspec**

**CONTENT**

- **Empty**

**ATTRIBUTES**

- **Align** = Enumeration Left Right Center Justify Char (implied Left)
- **Char** = Singular CDATA (implied)
- **Charoff** = Singular NMTOKEN (implied)
- **Colname** = Singular NMTOKEN (implied)
- **Colnum** = Singular NMTOKEN (implied)
- **Colsep** = Singular NMTOKEN (implied)
- **Colwidth** = Singular CDATA (implied)
- **Rowsep** = Singular NMTOKEN (implied)

**OCCURS IN** <Tfoot> [211] <Tgroup> [211] <Thead> [212]

This element is part of the CALS table model. Its application is controlled by the authoring tools used.

**Element: Comment**

**CONTENT**
• Any of Zero or more
  • <P> [157]
  • <Emphasis> [80]
  • <List> [132]
  • <Figure> [88]
  • <Formula> [91]
  • <Table> [205]
  • <Lemma> [129]
  • <Code-line> [59]
  • <Literature> [133]
  • <Audio> [51]
  • <Video> [222]
  • <Special> [192]
  • <View-property-value>
  • <View-property-group-values>
  • <Set-property-value>
  • <Set-property-group-values>
  • <Interactions> [117]
  • <Internet-source> [119]
  • <Section> [182]
  • <Section-ref> [183]
  • <Comment> [60]

This element has no attributes


A personal comment by the author of the component, not intended or used for any publication. The element occurs within structures such as metadata, role descriptions, activities et cetera.
Element: Comment-inline

CONTENT

- Any of Zero or more

  - Characters
  - <Bookmark> [55]
  - <EML-ref> [79]
  - <Internet-ref> [118]
  - <Emphasis> [80]
  - <Term> [207]
  - <View-property-value>
  - <Set-property-value>
  - <Comment-inline> [62]
  - <Special-inline> [193]
  - <Figure-source> [88]
  - <Formula-source> [92]

This element has no attributes


A personal comment by the author of the component, not intended or used for any publication. This element may occur in running text.

Element: Communication-object

CONTENT

- Sequence of

  - <Metadata> [136]

- Any of

  - Sequence of

    - Optional <Receive-mail>

    - Optional <Send-mail>

    - <Asynchronous-conference>
• <Synchronous-conference>
• <External-program>

ATTRIBUTES

• **EML-version**= Singular CDATA (fixed 1.0)
• **Link-name**= Singular CDATA (required)
• **Reusability**= Enumeration Reusable Not-reusable (implied Not-reusable)
• **Type**= Singular CDATA (implied)
• **Version**= Singular CDATA (implied 1.0.0)
• **Id**= Singular ID (implied)
• **Worldwide-unique-id**= Singular CDATA (implied)

**OCCURS IN** <Environment> [83]

This object defines a communication method and is one of the following:

• E-mail. The subelements identify the way the e-mail facility can be used:
  • Receiving mail, <Receive-mail>. The actors in a particular role may receive mail sent out by other communication objects, that are referenced in turn (through <Communication-object-ref> [63]). If not specified, receive all mail.
  • Sending mail, <Send-mail>. This element holds the basic framework for specifying mail messages.

• Asynchronous conference, through <Asynchronous-conference> [51]. Models communication through, for example, news groups.

• Synchronous conference, through <Synchronous-conference> [205]. Models communication through, for example, chatboxes and video conferencing.

Also, an external program (<External-program> [85]) may be specified that handles communication.

Attribute: Type

Typical types are: 'mail', 'news', 'audiographics', 'video conferencing'.

Element: Communication-object-ref

**CONTENT**

• Empty

**ATTRIBUTES**

• **Id-ref**= Singular IDREF (implied)
• **Version-use**= Enumeration Current-version Bugfixes-allowed Small-updates-allowed Major-updates-allowed (implied Bugfixes-allowed)
• **Ref-worldwide-unique-id**= Singular CDATA (implied)
• **Use-version** = Singular CDATA (implied 1.0.0)

**OCCURS IN** <Environment> [83] <Receive-mail> [176]


## Element: Competence

**CONTENT**

- **Empty**

  This element has no attributes

**OCCURS IN** <Objective-type> [148] <Prerequisite-type> [165]

A "choice item" [242]. See the parent element for a description.

## Element: Complete

**CONTENT**

- Any of
  - <Unit-of-study-ref>
  - <Activity-ref> [40]

  This element has no attributes


  This element checks if a particular <Unit-of-study> [216] or <Activity> [39] is completed. A task is completed when,

  * for activity, the <Completed> [64] subelement of <Activity-description> [39] evaluates to true.

  * for unit of study, when a predefined target value is reached (<Target-value> [206], part of the <Learning-objective> [127]).

  All performance properties must have reached their target values. This means that these must be specified and be set by the <Completed> [64] element.

  This element is an operand in an expression, see Conceptual outline - Conditions [28]. Within expressions, this element produces a value of type boolean.

## Element: Completed

**CONTENT**

- Sequence of
  - Any of
• <Unrestricted> [218]
• <User-choice> [219]
• <When-property-value-is-set>
  • **Zero or more** <Change-property-value>

*This element has no attributes*

**OCCURS IN** <Activity-description> [39]

The element `<Completed>` [64] is required within the `<Activity-description>` [39] element. This element describes when an activity is considered 'finished'. This may be decided on several grounds, as expressed by the subelements:

- `<Unrestricted>` [218]: The activity is always finished, independent of whatever action by the actor.
- `<User-choice>` [219]: The actor may decide if he/she has finished the activity. In a web interface this could be signalled by pressing a button or through dialogue.
- `<When-property-value-is-set>`: An activity is finished when a certain property is set. The property in the dossier is altered. Which property this concerns is specified by reference to that property (<Property-ref>). In practice this could be a property of type 'file' that represents an electronic report to be submitted by the student.

When an activity is finalised one or more properties *(Conceptual outline - Dossiers and properties [31]) may change in value. This is determined using the `<Change-property-value>` [57] element. The result of this may be, for example, that specific information is stored in the user's dossier, or that the user is presented with a new subsequent activity.

Alteration of a property occurs by referencing the property (<Property-ref> [170]) and determining what the (new) value of the property will be.

**Element: Conditions**

**CONTENT**

- **Sequence of**
  - **Optional** <Metadata>
  - **Sequence of One or more**
    - **Optional** <Comment>
      - `<If>` [99]
      - `<Then>` [212]
      - **Optional** <Else>

**ATTRIBUTES**

- **Id**= Singular ID (implied)

**OCCURS IN** <Method> [137]

This element contains the conditions under which certain elements are made accessible to certain actors.
Examples:

- When the entry level of a <Learner> [127] is high, start with assignment 4.

Conditions are specified using expressions. These expressions always take the form of "if-then-else" constructions.

The conditions are checked in the order in which they are entered in the EML specification.

When no roles have been defined within a condition, the condition applies to all roles.

When a condition applies to some <Activity> [39], <Activity-structure> [42] or <Unit-of-study> [216] which shows or hides these elements, this has precedence over conditions that apply to the <Play> [161].

Element: Conference-manager

CONTENT

- Sequence of
  - One or more <Role-ref>

This element has no attributes

OCCURS IN <Asynchronous-conference> [51] <Synchronous-conference> [205]

The actor who manages the conference, i.e. the person allowed to set the authorisations. The actor is identified by a reference to his/her role.

Element: Content

CONTENT

- Any of One or more
  - <Environment> [83]
  - <Activity> [39]
  - <Comment> [60]

This element has no attributes

OCCURS IN <Unit-of-study> [216]

This element functions as a "wrapper" [241] for all 'ingredients' of the <Unit-of-study> [216].

Element: Content-type

CONTENT

- Sequence of
This element has no attributes

OCCURS IN <Hide> [96] <Show>

This defines a named type of content. Elements may be assigned to this category (by setting their Content-type= attribute) and therefore assume the emphasis features specified in the <Type> [215] subelement of the <Content-type> element. Also, the fact that the user has control over collapse and expansion of the information structure is recorded (<With-collapse-and-expand-control> [229]).

Element: Content-type-reference

CONTENT

• Empty

ATTRIBUTES

• Content-type= Singular NMTOKEN (implied)

OCCURS IN <Index> [102]

This is a reference to a content type (through the Content-type= attribute), that determines which objects should be indexed. Any object that has the content type specified will be indexed.

Element: Continue

CONTENT

• Any of

  • <When-completed> [227]
  • <When-condition-true>
  • <Role-choice> [178]

This element has no attributes

OCCURS IN <Play> [161]

<Continue> [67] is taken as a 'halt' in the delivery of activities. All <Activity> [39], <Activity-structure> [42] and <Unit-of-study> elements that are valid for that role are shown up to the first <Continue> [67] encountered.

The determination that a scenario is finished is made as a result of evaluating one of the following conditions:

• The last activity is finished (<When-completed> [227]). This signal is set in the activity description itself (<Completed> [64], see <Activity> [39]).

• A condition is met (<When-condition-true>). When a condition is met for a proportion of the actors, for example, "when 80% of the students have delivered their reports". This is expressed in the <Users-in-role> [220] element.
• An actor determines if the task is completed (<Role-choice> [178]).

Element: Contributor

CONTENT

• Any of Zero or more
  • Characters
    • <Bookmark> [55]
    • <EML-ref> [79]
    • <Internet-ref> [118]
    • <Emphasis> [80]
    • <Term> [207]
    • <View-property-value>
    • <Set-property-value>
    • <Comment-inline> [62]
    • <Special-inline> [193]
    • <Figure-source> [88]
    • <Formula-source> [92]

ATTRIBUTES

• **Type**= Singular CDATA (implied)

**OCCURS IN** <Extra-meta> [86]

A metadata element.

Specifies a contributor to the creation of the object. The contributor is specified by name in content.

**Attribute: Type**

The type of contributor, for example: author, editor, suggestions, proofreading, *et cetera*

Element: Copyright

CONTENT

• **Sequence of**
  • *Optional* <Copyright-year>
  • *Optional* <Copyright-owner>
  • *Optional* <Copyright-statement>
This element has no attributes

OCCURS IN <Metadata> [136]

This element specifies the copyright aspects of the element: year, owner and the formal copyright statement itself.

Element: Copyright-owner

CONTENT

• Any of Zero or more
  • Characters
    • <Bookmark> [55]
    • <EML-ref> [79]
    • <Internet-ref> [118]
    • <Emphasis> [80]
    • <Term> [207]
    • <View-property-value> [224]
    • <Set-property-value>
    • <Comment-inline> [62]
    • <Special-inline> [193]
    • <Figure-source> [88]
    • <Formula-source> [92]

This element has no attributes

OCCURS IN <Copyright> [68]

The owner of the copyright. For example: "Open University of the Netherlands".

Element: Copyright-statement

CONTENT

• Any of Zero or more
  • <P> [157]
  • <Emphasis> [80]
  • <List> [132]
  • <Figure> [88]
  • <Formula> [91]
  • <Table> [205]
This element has no attributes

OCCURS IN <Copyright> [68]

The legal statement clarifying the nature of the copyright. For example: "All rights reserved.". An elaborate statement may also be used.

Element: Copyright-year

CONTENT

- Any of Zero or more
  - Characters
    - <Bookmark> [55]
    - <EML-ref> [79]
    - <Internet-ref> [118]
    - <Emphasis> [80]
    - <Term> [207]
    - <View-property-value>
    - <Set-property-value>
    - <Comment-inline> [62]
    - <Special-inline> [193]
This element has no attributes

OCCURS IN <Copyright> [68]

Year of the copyright.

Element: Correct-answer

CONTENT

Any of Zero or more

- <P> [157]
- <Emphasis> [80]
- <List> [132]
- <Figure> [88]
- <Formula> [91]
- <Table> [205]
- <Lemma> [129]
- <Code-line> [59]
- <Literature> [133]
- <Audio> [51]
- <Video> [222]
- <Special> [192]
- <View-property-value>
- <View-property-group-values>
- <Set-property-value>
- <Set-property-group-values>
- <Interactions> [117]
- <Internet-source> [119]
- <Section> [182]
- <Section-ref> [183]
- <Comment> [60]

This element has no attributes

OCCURS IN <Multiple-choice-question> [139] <Multiple-response-question> [140]
The correct answer to a question.

Element: Create-announcements

CONTENT

- Sequence of
  - One or more <Role-ref>

This element has no attributes

OCCURS IN <Announcement-object> [46]

This is a "choice item" [242]. See the parent element for a description.

Announcements can be created by persons in roles that are referenced by the embedded <Role-ref> [179].

Element: Creation-date

CONTENT

- Any of Zero or more
  - Characters
    - <Bookmark> [55]
    - <EML-ref> [79]
    - <Internet-ref> [118]
    - <Emphasis> [80]
    - <Term> [207]
    - <View-property-value>
    - <Set-property-value>
    - <Comment-inline> [62]
    - <Special-inline> [193]
    - <Figure-source> [88]
    - <Formula-source> [92]

This element has no attributes

OCCURS IN <Extra-meta> [86]

The date the object was created. This is an ISO date, which takes the form of YYYYMMDD. This does not include the time. See also <Date> [74].

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Element: Creator

CONTENT

- Any of Zero or more
  - Characters
    - <Bookmark> [55]
    - <EML-ref> [79]
    - <Internet-ref> [118]
    - <Emphasis> [80]
    - <Term> [207]
    - <View-property-value>
    - <Set-property-value>
    - <Comment-inline> [62]
    - <Special-inline> [193]
    - <Figure-source> [88]
    - <Formula-source> [92]

This element has no attributes

OCCURS IN <Metadata> [136]

The element <Creator> [72] contains information on the creators (authors, developers, et cetera) of the object. The element may be repeated on the same level, allowing several persons to be identified as 'creator'.

Element: Current-time

CONTENT

- Empty

This element has no attributes


Represents the current time. This is a time specification of the form HH:MM:SS, as defined in ISO 8601. The semicolons are optional.

Examples:

- Time specified by hours and minutes: hh:mmTZD (e.g. 19:20+01:00)
- Time in hours, minutes and seconds: hh:mm:ssTZD (e.g. 19:20:30+01:00)
- Time in hours, minutes, seconds and a decimal fraction of a second hh:mm:ss.sTZD (e.g. 19:20:30.45+01:00) where hh = two digits denoting hours (00 through 23) (am/pm NOT
allowed), mm = two digits denoting minutes (00 through 59), ss = two digits denoting
seconds (00 through 59), s = one or more digits representing a decimal fraction of a
second, TZD = time zone designator (Z or +hh:mm or -hh:mm).

This element is an operand in an expression, see Conceptual outline - Conditions [28]. Within
expressions, this element produces a value of type time.

Element: Date

CONTENT

• Any of Zero or more
  • Characters
    • <Value-list> [221]

This element has no attributes

OCCURS IN <Property> [168] <Value> [221]

A date. The value is specified in content, which may include several <Value-list> [221]s.

This is an eight-digit number in the form YYYYsMMsDD where separator s is optional, and can be '‐',
'/', and '_'. This format is defined in http://www.w3.org/TR/NOTE-datetime, a profile of ISO 8601.
In this scheme, the form '1994-11-05' corresponds to 5 November 1994.

This format is the general format for all dates in the EML.

Element: Date-last-change

CONTENT

• Any of Zero or more
  • Characters
    • <Bookmark> [55]
    • <EML-ref> [79]
    • <Internet-ref> [118]
    • <Emphasis> [80]
    • <Term> [207]
    • <View-property-value>
    • <Set-property-value>
    • <Comment-inline> [62]
    • <Special-inline> [193]
    • <Figure-source> [88]
    • <Formula-source> [92]

This element has no attributes
The date the object was last changed. See also <Date> [74].

**Element: Default-value**

**CONTENT**

- **Sequence of**
  - **Characters**

*This element has no attributes*

**OCCURS IN** <Value-list> [221]

A default value within a <Value-list> [221]. The default value is optional. The value must be of the type that is specified in the ancestor element, i.e. either <String> [198], <Integer> [117], <Real> [176] or <Date> [74], and must be in the list of <Possible-value> [162]s given within the same <Value-list>.

**Element: Delete-announcements**

**CONTENT**

- **Sequence of**
  - One or more <Role-ref>

*This element has no attributes*

**OCCURS IN** <Announcement-object> [46]

This element is a "choice item" [242]. See the parent element for a description.

Announcements can be deleted by persons in roles that are referenced by the embedded <Role-ref> [179].

**Element: Description**

**CONTENT**

- Any of Zero or more
  - <P> [157]
  - <Emphasis> [80]
  - <List> [132]
  - <Figure> [88]
  - <Formula> [91]
  - <Table> [205]
  - <Lemma> [129]
This element has no attributes

OCCURS IN <Lemma> [129] <Metadata>

The element <Description> [75] contains a general textual description of the element. A short, concise but complete description of form, content and use of the element.

This information is intended for use in presenting the element when it is retrieved from a larger set of elements.

Element: Divide

CONTENT

• Sequence of
  • Any of
    • <Property-ref> [170]
    • <Activity-ref> [40]
    • <Unit-of-study-ref>
    • <Value> [221]
    • Any of
      • <Role-ref> [179]
      • <Is> [120]
      • <Is-not> [122]
• <And> [44]
• <Or> [153]
• <Not> [143]
• <Sum> [202]
• <Subtract> [200]
• <Multiply> [140]
• <Divide> [76]
• <Greater-than> [95]
• <Less-than> [129]
• <Users-in-role> [220]
• <No-value> [145]
• <Time-unit-of-study-started>
• <Time-activity-started>
• <Current-time> [73]
• <Complete> [64]

• Any of
  • <Property-ref> [170]
  • <Activity-ref> [40]
  • <Unit-of-study-ref>
  • <Value> [221]
  • Any of
    • <Role-ref> [179]
    • <Is> [120]
    • <Is-not> [122]
    • <And> [44]
    • <Or> [153]
    • <Not> [143]
    • <Sum> [202]
    • <Subtract> [200]
    • <Multiply> [140]
    • <Divide> [76]
    • <Greater-than> [95]
This element has no attributes


This element calculates the division of the first child numerical operand and the second child numerical operand. For example, it divides the values of two properties.

The element is an operand in an expression, see Conceptual outline - Conditions [28]. Within expressions, this element produces a value of type number.

Element: Duration

CONTENT

• Sequence of
  • Characters

This element has no attributes

OCCURS IN <Synchronous-conference> [205]

The duration of a conference. This is the maximum number of days, hours, minutes and seconds that the conference may take. This quantity is expressed as a sequence of units, 'AsBmChDd' where A is the number of seconds, B is the number of minutes, C is the number of hours and D is the number of days. Intermediate spaces are allowed.

The element is optional: leaving out the duration means the conference may last any amount of time.

Element: Editor-author

CONTENT

• Sequence of
  • <Initials-prefix> [117]
  • <Author-name> [53]

This element has no attributes

OCCURS IN <Chapter> [57]
The editor or author of a book within a chapter bibliographic reference.

This element is part of the APA bibliographic reference model, see `<Literature>` [133].

**Element: Element-to-index-on**

**CONTENT**

- Empty

**ATTRIBUTES**

- `Id-ref=` Singular IDREF (implied)
- `Version-use=` Enumeration Current-version Bugfixes-allowed Small-updates-allowed Major-updates-allowed (implied Bugfixes-allowed)
- `Ref-worldwide-unique-id=` Singular CDATA (implied)
- `Use-version=` Singular CDATA (implied 1.0.0)

**OCCURS IN** `<Index>` [102]

This element identifies a particular element, and its subelements, that should be indexed. The element is identified by its global identifier.

**Element: Else**

**CONTENT**

- Any of
  - Any of
    - `<Show>` [187]
    - `<Hide>` [96]
  - Sequence of
    - `<If>` [99]
    - `<Then>` [212]
    - Optional `<Else>`

*This element has no attributes*

**OCCURS IN** `<Conditions>` [65] `<Else>` [79]

This element contains a set of actions to take when a condition succeeds, as explained for `<Then>` [212]. In addition, `<Else>` [79] may contain embedded conditions that allow for alternative situations to be checked (if, else if, else if, et cetera).

**Element: EML-ref**

**CONTENT**
Any of Zero or more

Characters

• <Bookmark> [55]
• <EML-ref> [79]
• <Internet-ref> [118]
• <Emphasis> [80]
• <Term> [207]
• <View-property-value>
• <Set-property-value>
• <Comment-inline> [62]
• <Special-inline> [193]
• <Figure-source> [88]
• <Formula-source> [92]

Attributes

• Id-ref= Singular IDREF (implied)
• Version-use= Enumeration Current-version Bugfixes-allowed Small-updates-allowed Major-updates-allowed (implied Bugfixes-allowed)
• Ref-worldwide-unique-id= Singular CDATA (implied)
• Use-version= Singular CDATA (implied 1.0.0)


This element references any element that has an identifier. A different way of expressing the reference can be chosen for each delivery strategy or medium. For example, an &EML-ref; [79] to a &Bookmark; [55] in web-based online delivery may be shown as a link, where the textual content of the EML-ref functions as the anchor. Alternatively, on paper, this may take the form of a reference to a page.

Element: Emphasis

Content

• Any of Zero or more

Characters

• <Bookmark> [55]
• <EML-ref> [79]
This element is used to emphasise certain words or phrases. This can be translated in the interface into: underline, bold, italics, character size, or any other presentation mode. When this element occurs between paragraphs it functions as a 'marker' in the information flow which heads the new information by supplying a small descriptive string. This functions as a 'section title' but is not associated with a particular text section; it simply marks a change in the nature of the information.

See also <Special> [192] and <Special-inline> [193].

Attribute: Type

The type of emphasis, for example, 'Sic' or 'Foreign'.

Attribute: Emphasis-level

The level of emphasis intended: low (1) or high (5).
Element: End-page

CONTENT

- Sequence of
  - Characters

This element has no attributes

OCCURS IN <Pages> [157]

The end-page of an article or chapter.

This element is part of the APA bibliographic reference model, see <Literature> [133].

Element: Entry

CONTENT

- Any of Zero or more
  - <P> [157]
  - <Emphasis> [80]
  - <List> [132]
  - <Figure> [88]
  - <Formula> [91]
  - <Table> [205]
  - <Lemma> [129]
  - <Code-line> [59]
  - <Literature> [133]
  - <Audio> [51]
  - <Video> [222]
  - <Special> [192]
  - <View-property-value>
  - <View-property-group-values>
  - <Set-property-value>
  - <Set-property-group-values>
  - <Interactions> [117]
  - <Internet-source> [119]
  - <Section> [182]
  - <Section-ref> [183]
\begin{itemize}
\item <Comment> [60]
\end{itemize}

**ATTRIBUTES**

\begin{itemize}
\item Colname= Singular NMTOKEN (implied)
\item Colsep= Singular NMTOKEN (implied)
\item Morerows= Singular NMTOKEN (implied)
\item Nameend= Singular NMTOKEN (implied)
\item Namest= Singular NMTOKEN (implied)
\item Rotate= Singular NMTOKEN (implied)
\item Rowsep= Singular NMTOKEN (implied)
\item Spanname= Singular NMTOKEN (implied)
\item Valign= Enumeration Top Middle Bottom (implied Bottom)
\item Align= Enumeration Left Right Center Justify Char (implied Left)
\item Char= Singular CDATA (implied)
\item Charoff= Singular NMTOKEN (implied)
\end{itemize}

**OCCURS IN** <Row> [180]

This element is part of the CALS table model. Its application is controlled by the authoring tools used.

**Element: Entry-value**

**CONTENT**

\begin{itemize}
\item Sequence of
\end{itemize}

\begin{itemize}
\item **Characters**
\end{itemize}

This element has no attributes

**OCCURS IN** <Performance-property> [158] <Prerequisite-property> [163]

This element specifies the entry value within the <Performance-property> [158] of a <Learning-objective> or <Prerequisite> [162].

**Element: Environment**

**CONTENT**

\begin{itemize}
\item Sequence of
\end{itemize}

\begin{itemize}
\item Optional <Metadata>
\item Any of One or more
\end{itemize}

\begin{itemize}
\item <Knowledge-object>
\item <Knowledge-object-ref>
\end{itemize}
• <Announcement-object>
• <Announcement-object-ref>
• <Communication-object>
• <Communication-object-ref>
• <Tool-object>[214]
• <Tool-object-ref>[214]
• <Questionnaire-object>
• <Questionnaire-object-ref>
• <Role-information-object>[178]
• <Role-information-object-ref>
• <Personal-object>[159]
• <Personal-object-ref>
• <Index-search-object>
• <Index-search-object-ref>
• <Environment>[83]
• <Environment-ref>[85]

**ATTRIBUTES**

- **EML-version**= Singular CDATA (fixed 1.0)
- **Link-name**= Singular CDATA (required)
- **Reusability**= Enumeration Reusable Not-reusable (implied Not-reusable)
- **Type**= Singular CDATA (implied)
- **Version**= Singular CDATA (implied 1.0.0)
- **Id**= Singular ID (implied)
- **Worldwide-unique-id**= Singular CDATA (implied)

**OCCURS IN** <Activity>[39] <Content>[66] <Environment>[83]

This element describes the (working-, learning-) environment for one or more (sub)activities. The environment contains all instruments, sources and sub-environments needed to perform the learning activities. Environments can be associated with the following activities.

- Within a unit of study, declare an environment at the content level (<Content>[66]/<Environment>[83]), and reference it within <Activity-sequence>[41] and <Activity-selection>[40]. This environment then covers all needs for all activities within the sequence or set.
- Declare an environment for each individual activity.
- For each individual activity, reference an environment declared elsewhere.
Attribute: Type
Typical types are: "instruments", "desk", "stage", "reference materials".

Element: Environment-ref

CONTENT
• Empty

ATTRIBUTES
• Id-ref= Singular IDREF (implied)
• Version-use= Enumeration Current-version Bugfixes-allowed Small-updates-allowed Major-updates-allowed (implied Bugfixes-allowed)
• Ref-worldwide-unique-id= Singular CDATA (implied)
• Use-version= Singular CDATA (implied 1.0.0)

OCCURS IN <Activity-selection>[40] <Activity-sequence> <Environment>[83]

A reference to an <Environment>[83] defined elsewhere.

Element: External-program

CONTENT
• Empty

ATTRIBUTES
• Url= Singular CDATA (required)

OCCURS IN <Communication-object>[62]

An external program that offers a communication channel. The program is expected to be accessible via a URL.

Attribute: Url

The URL of the program.

Element: External-questionnaire

CONTENT
• Empty

ATTRIBUTES
• Url= Singular CDATA (required)
• Link-name= Singular CDATA (required)
A questionnaire that is external to the EML specification, and is accessible via URL. The external questionnaire is an alternative resource for a questionnaire-object.

**Element: Extra-meta**

**CONTENT**
- Any of Zero or more
  - `<Object-type>` [151]
  - `<Supplied>` [204]
  - `<Contributor>` [68]
  - `<History>` [98]
  - `<Status>` [197]
  - `<Creation-date>` [72]
  - `<Date-last-change>`
  - `<Min-completion-time>`
  - `<Max-completion-time>`
  - `<Meta>` [135]

*This element has no attributes*

**OCCURS IN** `<Metadata>` [136]

This element shows more specific meta-information on the item with which the containing `<Metadata>` [136] is associated, for example the date when the item was created. Common metadata is explicitly modelled by subelements of `<Metadata>` [136]; less common aspects may be recorded in separate `<Extra-meta>` elements.

**Element: Face-to-face-conference**

**CONTENT**
- Empty

*This element has no attributes*

**OCCURS IN** `<Medium>` [135]

A "choice item" [242]. See the parent element for a description.

**Element: Feedback**

**CONTENT**
- Any of Zero or more
This element has no attributes


Specifies feedback information that depends on the outcome of a question posed.

This element is a recurring part of the global design of questions within EML, see *Conceptual outline - Self-tests and interaction modelling* [33].

**Element: Feedback-description**

**CONTENT**

- **Sequence of**
  - <General-feedback>
  - **Optional** <Comment>
This element offers a way to elaborate on the feedback that is given after finishing an activity. Using the `<General-feedback>` [93] subelement general feedback can be given to everyone after the activity has been completed.

Element: Figure

CONTENT

- Sequence of
  - `<Figure-source>` [88]
- Optional `<Figure-text>`

ATTRIBUTES

- **Id**= Singular ID (implied)


A Figure. The subelement `<Figure-text>` [89] specifies the caption. `<Figure-source>` [88] specifies the encoded source of the figure, which is an "IML" [242] source.

Element: Figure-source

CONTENT

- **Empty**

ATTRIBUTES

- **Entity**= Singular CDATA (implied)
- **Impsize**= Singular CDATA (implied)
- **Ref-worldwide-unique-id**= Singular CDATA (implied)
- **Version-use**= Enumeration Current-version Bugfixes-allowed Small-updates-allowed Major-updates-allowed (implied Bugfixes-allowed)
- **Use-version**= Singular CDATA (implied 1.0.0)

The source of the figure, i.e. the 'container' of the data. It has attributes that, among others, allow it to be referenced from within the repository.

**Attribute: Ref-worldwide-unique-id**

References the IML specification containing the figure itself. IML is a specification of the location of resources that are bound or fit for a particular presentation medium. EML itself is medium-neutral and therefore does not reference a fixed resource.

**Attribute: Entity**

The name of an unparsed entity that holds the figure source data. The use of this forms an alternative to the direct reference to a set of IML defined resources through Ref-worldwide-unique-id=[237].

**Attribute: Impsize**

The imposition size of the figure.

**Element: Figure-text**

**CONTENT**

- Any of Zero or more
  - `<P>` [157]
  - `<Emphasis>` [80]
  - `<List>` [132]
  - `<Figure>` [88]
  - `<Formula>` [91]
  - `<Table>` [205]
  - `<Lemma>` [129]
  - `<Code-line>` [59]
  - `<Literature>` [133]
  - `<Audio>` [51]
  - `<Video>` [222]
  - `<Special>` [192]
  - `<View-property-value>`
  - `<View-property-group-values>`
  - `<Set-property-value>`
This element has no attributes

**OCCURS IN** `<Figure>` [88]

The caption for a figure.

**Element: File**

**CONTENT**

- **Empty**

**ATTRIBUTES**

- **Type**= Singular CDATA (implied)

**OCCURS IN** `<Property>` [168] `<Value>` [221]

The property is assigned the file name specified by the `<File>` [90] element. This value cannot be set in advance but must be supplied at runtime. It takes the form of a "URI" [241].

The property is set using the `<Change-property-value>` [57] element when the activity is completed.

**Attribute: Type**

This attribute specifies what kind of content this file holds. Example values are "report", "thesis" or "comments".

**Element: First-category**

**CONTENT**

- **Any of Zero or more**
  - `<P>` [157]
  - `<Emphasis>` [80]
  - `<List>` [132]
  - `<Figure>` [88]
  - `<Formula>` [91]
  - `<Table>` [205]
This element has no attributes

OCCURS IN <item-pair> [124]

This element contains the specification of an item in the first category. The element is part of a matching question, see <matching-question> [133].

Element: Formula

CONTENT

- Sequence of
  - <formula-source> [92]

Optional <formula-text>

ATTRIBUTES

- Id= Singular ID (implied)

A formula. This is represented by an "JML" [242] specification, which is referenced using the Ref-

Element: Formula-source

CONTENT

• Empty

ATTRIBUTES

• Entity= Singular CDATA (implied)
• Ref-worldwide-unique-id= Singular CDATA (implied)
• Version-use= Enumeration Current-version Bugfixes-allowed Small-updates-allowed
  Major-updates-allowed (implied Bugfixes-allowed)
• Use-version= Singular CDATA (implied 1.0.0)

[69] <Copyright-year> [70] <Creation-date> [72] <Creator> [72] <Date-last-change> [74]
<Keywords> [125] <Max-completion-time> [134] <Min-completion-time> <P> [157] <Special-
<Term> [207] <Title> [213] <Unstructured-source> [218]

The source of the formula. This is either wrapped in a <Formula> [91] element (when it occurs in
running text), or made available by itself in a <Formula> [91] element (when it occurs at the
paragraph-level).

See also <Figure-source> [88].

Element: Formula-text

CONTENT

• Any of Zero or more
  • <P> [157]
  • <Emphasis> [80]
  • <List> [132]
  • <Figure> [88]
  • <Formula> [91]
  • <Table> [205]
  • <Lemma> [129]
  • <Code-line> [59]
  • <Literature> [133]
  • <Audio> [51]
• <Video> [222]
• <Special> [192]
• <View-property-value>
• <View-property-group-values>
• <Set-property-value>
• <Set-property-group-values>
• <Interactions> [117]
• <Internet-source> [119]
• <Section> [182]
• <Section-ref> [183]
• <Comment> [60]

This element has no attributes

OCCURS IN <Formula> [91]

The caption of the formula. The formula is interpreted as a figure in this sense, compare <Figure-text> [89].

Element: Free-text-search

CONTENT

• Empty

This element has no attributes

OCCURS IN <Search> [181]

A "choice item" [242]. See the parent element for a description.

Element: General-feedback

CONTENT

• Any of Zero or more
  • <P> [157]
  • <Emphasis> [80]
  • <List> [132]
  • <Figure> [88]
  • <Formula> [91]
  • <Table> [205]
This element contains the feedback information for an activity, to be presented when the activity is completed.

**Attribute: Type**

The `Type` attribute specifies the type of feedback (a short descriptive string). Example values are "intermittent", "postponed", *et cetera*

**Element: General-properties**

This element is a wrapper for properties and groups that are defined for all actors in all roles.
Element: Greater-than

CONTENT

• Sequence of
  • Any of
    • <Property-ref> [170]
    • <Activity-ref> [40]
    • <Unit-of-study-ref> [217]
    • <Value> [221]
  • Any of
    • <Role-ref> [179]
    • <Is> [120]
    • <Is-not> [122]
    • <And> [44]
    • <Or> [153]
    • <Not> [143]
    • <Sum> [202]
    • <Subtract> [200]
    • <Multiply> [140]
    • <Divide> [76]
    • <Greater-than> [95]
    • <Less-than> [129]
    • <Users-in-role> [220]
    • <No-value> [145]
    • <Time-unit-of-study-started>
    • <Time-activity-started> [212]
    • <Current-time> [73]
    • <Complete> [64]
  • Any of
    • <Property-ref> [170]
    • <Activity-ref> [40]
    • <Unit-of-study-ref>
This element has no attributes


This element determines the relationship between two operands. It determines whether the first child element represents a value lower than the second child element.

The element is an operand in an expression, see Conceptual outline - Conditions [28]. Within expressions, this element produces a value of type boolean.

**Element: Hide**

**CONTENT**

- **Any of One or more**
  - <Content-type> [66]
  - <Activity-ref> [40]
This element has no attributes

OCCURS IN <Else> [79] <Then>

This element specifies that certain information should be hidden. See <Show> [187] element description.

Element: Hide-answer

CONTENT

• Empty

This element has no attributes

OCCURS IN <Answer-options> [49]

A "choice item" [242]. See the parent element for a description.

Element: Hint

CONTENT

• Any of Zero or more
  • <P> [157]
  • <Emphasis> [80]
  • <List> [132]
  • <Figure> [88]
  • <Formula> [91]
  • <Table> [205]
  • <Lemma> [129]
  • <Code-line> [59]
  • <Literature> [133]
  • <Audio> [51]
  • <Video> [222]
  • <Special> [192]
  • <View-property-value>
This element has no attributes


This element offers a hint or suggestion on the performance of an activity, or finding an answer to a question.

The element is a recurring part of the global design of questions within EML, see Conceptual outline - Self-tests and interaction modelling [33].

Element: History

CONTENT

• Any of Zero or more
  • Characters
    • <Bookmark> [55]
    • <EML-ref> [79]
    • <Internet-ref> [118]
    • <Emphasis> [80]
    • <Term> [207]
    • <View-property-value>
    • <Set-property-value>
    • <Comment-inline> [62]
    • <Special-inline> [193]
    • <Figure-source> [88]
    • <Formula-source> [92]

This element has no attributes

OCCURS IN <Extra-meta> [86]

A metadata element, showing how the object was created.
Element: How

CONTENT

- Any of Zero or more
  - <P> [157]
  - <Emphasis> [80]
  - <List> [132]
  - <Figure> [88]
  - <Formula> [91]
  - <Table> [205]
  - <Lemma> [129]
  - <Code-line> [59]
  - <Literature> [133]
  - <Audio> [51]
  - <Video> [222]
  - <Special> [192]
  - <View-property-value>
  - <View-property-group-values>
  - <Set-property-value>
  - <Set-property-group-values>
  - <Interactions> [117]
  - <Internet-source> [119]
  - <Section> [182]
  - <Section-ref> [183]
  - <Comment> [60]

This element has no attributes

OCCURS IN <Activity-description> [39]

This element contains specific information on how the activity should be implemented.

Element: If

CONTENT

- Sequence of
  - Sequence of Optional
• **Any of**
  - `<Role-ref>` [179]
  - `<Is>` [120]
  - `<Is-not>` [122]
  - `<And>` [44]
  - `<Or>` [153]
  - `<Not>` [143]
  - `<Sum>` [202]
  - `<Subtract>` [200]
  - `<Multiply>` [140]
  - `<Divide>` [76]
  - `<Greater-than>` [95]
  - `<Less-than>` [129]
  - `<Users-in-role>` [220]
  - `<No-value>` [145]
  - `<Time-unit-of-study-started>`
  - `<Time-activity-started>`
  - `<Current-time>` [73]
  - `<Complete>` [64]

• **Optional** `<Comment>`

*This element has no attributes*

**OCCURS IN** `<Conditions>` [65] `<Else>` [79]

This element represents a condition. When the condition, expressed in content, evaluates to "true" the sibling `<Then>` [212] element is evaluated, otherwise the sibling `<Else>` [79] element is evaluated (if available). The `<If>` [99] element's condition is an *expression* (see *Conceptual outline - Methods* [26]). Expressions either succeed or fail. When they succeed they must produce a value. The expected types for all possible values are:

• `<Role-ref>` [179] (True when role is played)
• `<Greater-than>` [95] `<Less-than>` [129] (Boolean)
• `<Users-in-role>` [220] (Boolean)
• `<No-value>` [145] (boolean)
• `<Time-unit-of-study-started> <Time-activity-started>` [212] `<Current-time>` (time)
• <Complete> [64] (boolean)

The evaluation result in the <If> [99] condition is lost; though expression results are used in calculations.

If no expressions are stated, <If> [99] succeeds, and the <Then> [212] part is evaluated.

Element: If-proportion-correct-greater-than

CONTENT

• Sequence of
  • Characters

This element has no attributes

OCCURS IN <Process-score-automatically> [166]

This element is used to process questionnaires (<Questionnaire-object> [174]). If the proportion of correct answers given within the questionnaire is greater than the value specified in content, a property value will be changed (as specified in the sibling <Change-property-value> [57]).

The element constitutes a lower boundary. An optional upper boundary is set by the sibling element <And-less-than> [45].

Element: Immediately

CONTENT

• Empty

This element has no attributes

OCCURS IN <Provide-feedback> [171]

A "choice item" [242]. See the parent element for a description.

Element: Incorrect-answer

CONTENT

• Any of Zero or more
  • <P> [157]
  • <Emphasis> [80]
  • <List> [132]
  • <Figure> [88]
  • <Formula> [91]
  • <Table> [205]
  • <Lemma> [129]
• <Code-line> [59]
• <Literature> [133]
• <Audio> [51]
• <Video> [222]
• <Special> [192]
• <View-property-value>
• <View-property-group-values>
• <Set-property-value>
• <Set-property-group-values> [185]
• <Interactions> [117]
• <Internet-source> [119]
• <Section> [182]
• <Section-ref> [183]
• <Comment> [60]

This element has no attributes

OCCURS IN <Multiple-choice-question> [139] <Multiple-response-question> [140]

The incorrect answer to a question. Used as an alternative to <Correct-answer> [71] within a choice-based question.

Element: Index

CONTENT

• Any of One or more
  • <Element-to-index-on>
  • <Object-to-index-on>
  • <Type-to-index-on>
  • <Content-type-reference>

This element has no attributes

OCCURS IN <Index-search-object> [112]

This element is a wrapper for indexing aspects, used to set up a search environment (see <Index-search-object> [112]). The element contains the following specifications:

• Which particular elements are to be indexed? The elements are identified by identifier and version. Indexing is carried out on a word-for-word basis.

• What kinds of object are to be indexed? The elements are identified by a "choice item" [242]. Indexing is carried out according to the nature of the object.
• The 'type' of each part of the specification. The element 'type' is formally specified in the
Type= [238] attribute of that element. The complete type name is indexed.

• The content type of any part of the specification. The 'content type' of an element is
formally specified in the Content-type= [232] attribute of that element. The complete
content type name is indexed.

Element: Index-on-activity

CONTENT

• Empty

This element has no attributes

OCCURS IN <Object-to-index-on> [149]

A "choice item" [242]. See the parent element for a description.

Element: Index-on-announcement-object

CONTENT

• Empty

This element has no attributes

OCCURS IN <Object-to-index-on> [149]

A "choice item" [242]. See the parent element for a description.

Element: Index-on-article

CONTENT

• Empty

This element has no attributes

OCCURS IN <Object-to-index-on> [149]

A "choice item" [242]. See the parent element for a description.

Element: Index-on-audio

CONTENT

• Empty

This element has no attributes

OCCURS IN <Object-to-index-on> [149]

A "choice item" [242]. See the parent element for a description.
Element: Index-on-book

CONTENT

- Empty

This element has no attributes

OCCURS IN <Object-to-index-on> [149]

A "choice item" [242]. See the parent element for a description.

Element: Index-on-bookmark

CONTENT

- Empty

This element has no attributes

OCCURS IN <Object-to-index-on> [149]

A "choice item" [242]. See the parent element for a description.

Element: Index-on-chapter

CONTENT

- Empty

This element has no attributes

OCCURS IN <Object-to-index-on> [149]

A "choice item" [242]. See the parent element for a description.

Element: Index-on-communication-object

CONTENT

- Empty

This element has no attributes

OCCURS IN <Object-to-index-on> [149]

A "choice item" [242]. See the parent element for a description.

Element: Index-on CONTRIBUTOR
This element has no attributes

OCCURS IN <Object-to-index-on> [149]

A "choice item" [242]. See the parent element for a description.

Element: Index-on-EML-ref

CONTENT

• Empty

This element has no attributes

OCCURS IN <Object-to-index-on> [149]

A "choice item" [242]. See the parent element for a description.

Element: Index-on-emphasis

CONTENT

• Empty

This element has no attributes

OCCURS IN <Object-to-index-on> [149]

A "choice item" [242]. See the parent element for a description.

Element: Index-on-environment

CONTENT

• Empty

This element has no attributes

OCCURS IN <Object-to-index-on> [149]

A "choice item" [242]. See the parent element for a description.

Element: Index-on-figure

CONTENT

• Empty

This element has no attributes

OCCURS IN <Object-to-index-on> [149]

A "choice item" [242]. See the parent element for a description.
Element: Index-on-formula

CONTENT

• Empty

This element has no attributes

OCCURS IN <Object-to-index-on> [149]

A "choice item" [242]. See the parent element for a description.

Element: Index-on-index-search-object

CONTENT

• Empty

This element has no attributes

OCCURS IN <Object-to-index-on> [149]

A "choice item" [242]. See the parent element for a description.

Element: Index-on-information

CONTENT

• Empty

This element has no attributes

OCCURS IN <Object-to-index-on> [149]

A "choice item" [242]. See the parent element for a description.

Element: Index-on-internet-ref

CONTENT

• Empty

This element has no attributes

OCCURS IN <Object-to-index-on> [149]

A "choice item" [242]. See the parent element for a description.

Element: Index-on-keywords

CONTENT

• Empty

This element has no attributes
A "choice item" [242]. See the parent element for a description.

Element: Index-on-knowledge-object

**CONTENT**

- **Empty**

This element has no attributes

A "choice item" [242]. See the parent element for a description.

Element: Index-on-learning-objectives

**CONTENT**

- **Empty**

This element has no attributes

A "choice item" [242]. See the parent element for a description.

Element: Index-on-lemma

**CONTENT**

- **Empty**

This element has no attributes

A "choice item" [242]. See the parent element for a description.

Element: Index-on-matching-question

**CONTENT**

- **Empty**

This element has no attributes

A "choice item" [242]. See the parent element for a description.
Element: Index-on-multiple-choice-question

CONTENT

• Empty

This element has no attributes

OCCURS IN <Object-to-index-on> [149]

A "choice item" [242]. See the parent element for a description.

Element: Index-on-multiple-response-question

CONTENT

• Empty

This element has no attributes

OCCURS IN <Object-to-index-on> [149]

A "choice item" [242]. See the parent element for a description.

Element: Index-on-performance-property

CONTENT

• Empty

This element has no attributes

OCCURS IN <Object-to-index-on> [149]

A "choice item" [242]. See the parent element for a description.

Element: Index-on-personal-object

CONTENT

• Empty

This element has no attributes

OCCURS IN <Object-to-index-on> [149]

A "choice item" [242]. See the parent element for a description.

Element: Index-on-prerequisites

CONTENT

• Empty

This element has no attributes
OCCURS IN <Object-to-index-on> [149]

A "choice item" [242]. See the parent element for a description.

Element: Index-on-prompt

CONTENT

• Empty

This element has no attributes

OCCURS IN <Object-to-index-on> [149]

A "choice item" [242]. See the parent element for a description.

Element: Index-on-question-answer

CONTENT

• Empty

This element has no attributes

OCCURS IN <Object-to-index-on> [149]

A "choice item" [242]. See the parent element for a description.

Element: Index-on-questionnaire-object

CONTENT

• Empty

This element has no attributes

OCCURS IN <Object-to-index-on> [149]

A "choice item" [242]. See the parent element for a description.

Element: Index-on-role-information-object

CONTENT

• Empty

This element has no attributes

OCCURS IN <Object-to-index-on> [149]

A "choice item" [242]. See the parent element for a description.
Element: Index-on-section

CONTENT

• Empty

This element has no attributes

OCCURS IN <Object-to-index-on> [149]

A "choice item" [242]. See the parent element for a description.

Element: Index-on-section-ref

CONTENT

• Empty

This element has no attributes

OCCURS IN <Object-to-index-on> [149]

A "choice item" [242]. See the parent element for a description.

Element: Index-on-sequence-question

CONTENT

• Empty

This element has no attributes

OCCURS IN <Object-to-index-on> [149]

A "choice item" [242]. See the parent element for a description.

Element: Index-on-short-answer-question

CONTENT

• Empty

This element has no attributes

OCCURS IN <Object-to-index-on> [149]

A "choice item" [242]. See the parent element for a description.

Element: Index-on-special

CONTENT

• Empty

This element has no attributes
A "choice item" [242]. See the parent element for a description.

Element: Index-on-special-inline

*Empty*

This element has no attributes

A "choice item" [242]. See the parent element for a description.

Element: Index-on-table

*Empty*

This element has no attributes

A "choice item" [242]. See the parent element for a description.

Element: Index-on-term

*Empty*

This element has no attributes

A "choice item" [242]. See the parent element for a description.

Element: Index-on-test-group

*Empty*

This element has no attributes

A "choice item" [242]. See the parent element for a description.
Element: Index-on-tool-object

(CONTENT)

• Empty

This element has no attributes

OCCURS IN <Object-to-index-on> [149]

A "choice item" [242]. See the parent element for a description.

Element: Index-on-true-false-question

(CONTENT)

• Empty

This element has no attributes

OCCURS IN <Object-to-index-on> [149]

A "choice item" [242]. See the parent element for a description.

Element: Index-on-video

(CONTENT)

• Empty

This element has no attributes

OCCURS IN <Object-to-index-on> [149]

A "choice item" [242]. See the parent element for a description.

Element: Index-search-object

(CONTENT)

• Sequence of
  • <Metadata> [136]
  • <Index> [102]
  • <Search> [181]

ATTRIBUTES

• EML-version= Singular CDATA (fixed 1.0)
• Link-name= Singular CDATA (required)
• Reusability= Enumeration Reusable Not-reusable (implied Not-reusable)
• Type= Singular CDATA (implied)
This object shows what kind of searches can be performed on the electronic materials that make up the unit of study. The object has two major parts (apart from metadata):

* `<Index>` [102]: Which parts of the unit of study to use in order to compile search indices. An index enhances search capabilities.

* `<Search>` [181]: How to search the materials and present the results. This is based on a free-text search, indexes that include references to the resources, and indexes without references to the resources.

**Attribute: Type**

Typical types are: "search function", "index".

**Element: Index-search-object-ref**

**CONTENT**

* **Empty**

**ATTRIBUTES**

* **Id-ref**= Singular IDREF (implied)

* **Version-use**= Enumeration Current-version Bugfixes-allowed Small-updates-allowed Major-updates-allowed (implied Bugfixes-allowed)

* **Ref-worldwide-unique-id**= Singular CDATA (implied)

* **Use-version**= Singular CDATA (implied 1.0.0)

**OCCURS IN** `<Environment>` [83]

An "inclusion reference" [243] to an `<Index-search-object>` [112].

**Element: Index-without-reference**

**CONTENT**

* **Empty**

*This element has no attributes*

**OCCURS IN** `<Search>` [181]

A "choice item" [242]. See the parent element for a description.
Element: Index-with-reference

**CONTENT**

- Empty

*This element has no attributes*

**OCCURS IN** `<Search>` [181]

A "choice item" [242]. See the parent element for a description.

Element: Information

**CONTENT**

- Any of Zero or more
  
  - `<P>` [157]
  
  - `<Emphasis>` [80]
  
  - `<List>` [132]
  
  - `<Figure>` [88]
  
  - `<Formula>` [91]
  
  - `<Table>` [205]
  
  - `<Lemma>` [129]
  
  - `<Code-line>` [59]
  
  - `<Literature>` [133]
  
  - `<Audio>` [51]
  
  - `<Video>` [222]
  
  - `<Special>` [192]
  
  - `<View-property-value>` [224]
  
  - `<View-property-group-values>`
  
  - `<Set-property-value>`
  
  - `<Set-property-group-values>`
  
  - `<Interactions>` [117]
  
  - `<Internet-source>` [119]
  
  - `<Section>` [182]
  
  - `<Section-ref>` [183]
  
  - `<Comment>` [60]

**ATTRIBUTES**
• **Type**= Singular CDATA (implied)

**OCCURS IN** `<Activity-selection>` [40] `<Activity-sequence>`

This element allows one to add general doming information to an activity or a set of activities. This information is intended for the student.

Apart from regular text the element may also contain other objects such as audio, video and images. Questions *(Conceptual outline - Self-tests and interaction modelling [33])* are also possible.

**Attribute: Type**

Examples are: 'introduction', 'information', 'background'.

**Element: Information-about-person**

**CONTENT**

• **Sequence of**
  - *Optional* `<Show-name>`
  - *Optional* `<Show-street>`
  - *Optional* `<Show-zip>`
  - *Optional* `<Show-city>`
  - *Optional* `<Show-country>`
  - *Optional* `<Show-email>`
  - *Optional* `<Show-telephone>`
  - *Optional* `<Show-roles>`
  - *Optional* `<Show-miscellaneous>`

*This element has no attributes*

**OCCURS IN** `<Role-information-object>` [178]

This element includes a number of choices, representing aspects of personal information. Any "choice item" [242] selected will display the information about the actor to the user of the system.

This information includes:

- `<Show-name>` [189]: Name
- `<Show-street>` [189]: Street
- `<Show-zip>` [190]: Zip-code
- `<Show-city>` [188]: City
- `<Show-country>` [188]: Country
- `<Show-email>` [188]: E-mail address
- `<Show-telephone>` [190]: Telephone number
• `<Show-roles>` [189]: The roles played by this person in this unit of study. Roles are named in accordance with `Type=` [238] attribute of the `<Role>` [177] element.

• `<Show-miscellaneous>`: Miscellaneous other kinds of information, recorded for the role. This may include educational background, length of the role, website et cetera. This is expressed in the `Type=` [238] attribute on the `<Show-miscellaneous>` [189] subelement..

Element: Information-for-role

CONTENT

• Any of Zero or more
  • `<P>` [157]
  • `<Emphasis>` [80]
  • `<List>` [132]
  • `<Figure>` [88]
  • `<Formula>` [91]
  • `<Table>` [205]
  • `<Lemma>` [129]
  • `<Code-line>` [59]
  • `<Literature>` [133]
  • `<Audio>` [51]
  • `<Video>` [222]
  • `<Special>` [192]
  • `<View-property-value`
  • `<View-property-group-values`
  • `<Set-property-value`
  • `<Set-property-group-values`
  • `<Interactions>` [117]
  • `<Internet-source>` [119]
  • `<Section>` [182]
  • `<Section-ref>` [183]
  • `<Comment>` [60]

This element has no attributes

OCCURS IN `<Learner>` [127] `<Role>` [177] `<Staff>` [194]

This element includes information that is relevant for the person who is to play a particular role. For example, the element provides a description of the role.
Element: Initials-prefix

**CONTENT**

- *Sequence of*
  
  - *Characters*

*This element has no attributes*

**OCCURS IN** `<Article-author> [50] <Book-author> [54] <Chapter-author> [58] <Editor-author> [78]`

The initials and/or prefixes of a person.

This element is part of the APA bibliographic reference model, see `<Literature> [133]`.

Element: Insight

**CONTENT**

- *Empty*

*This element has no attributes*

**OCCURS IN** `<Objective-type> [148] <Prerequisite-type> [165]`

A "choice item" [242]. See the parent element for a description.

Element: Integer

**CONTENT**

- *Any of Zero or more*
  
  - *Characters*
    
    - `<Value-list> [221]`

*This element has no attributes*

**OCCURS IN** `<New-property> [142] <Property> [168] <Value> [221]`

An integer value. The value is specified in content, which may include several `<Value-list> [221]`

Element: Interactions

**CONTENT**

- *Any of Zero or more*
  
    - `<Multiple-choice-question>`
    
    - `<True-false-question>`
This is a "wrapper" [241] for all possible interaction-elements. It is introduced in order to hide the different question forms in regular editing situations. In practice the <Interactions> [117] element is used to insert a complete list of questions, to be dealt with as a whole (for example, series of self-test questions).

Element: Internet-ref

CONTENT

- Any of Zero or more
  - Characters
    - <Bookmark> [55]
    - <EML-ref> [79]
    - <Internet-ref> [118]
    - <Emphasis> [80]
    - <Term> [207]
    - <View-property-value>
    - <Set-property-value>
    - <Comment-inline> [62]
    - <Special-inline> [193]
    - <Figure-source> [88]
    - <Formula-source> [92]
A reference to an Internet page. The text covered is treated the same as `<EML-ref>` [79] for different media. The referenced object's address is a URL, recorded in the `Url=` attribute.

Element: Internet-source

CONTENT

- Empty

ATTRIBUTES

- `Url=` Singular CDATA (required)
- `Link-name=` Singular CDATA (required)

The source of an object (knowledge-object, tool, audio fragment et cetera) that is available on the Internet rather than specified in the particular object.

Attribute: `Url`

The URL of the Internet source for the object.

Element: Introduction

CONTENT

- Any of Zero or more
  - `<P>` [157]
  - `<Emphasis>` [80]
  - `<List>` [132]
  - `<Figure>` [88]
  - `<Formula>` [91]
This element has no attributes

**OCCURS IN** `<Activity-description> [39]`

This is the introductory text for a single activity.

**Element: Is**

**CONTENT**

- **Sequence of**
  - **Any of**
    - `<Property-ref> [170]`
    - `<Activity-ref> [40]`
    - `<Unit-of-study-ref>`
    - `<Value> [221]`
  - **Any of**
    - `<Role-ref> [179]`
    - `<Is> [120]`
    - `<Is-not> [122]`
• `<And>` [44]
• `<Or>` [153]
• `<Not>` [143]
• `<Sum>` [202]
• `<Subtract>` [200]
• `<Multiply>` [140]
• `<Divide>` [76]
• `<Greater-than>` [95]
• `<Less-than>` [129]
• `<Users-in-role>` [220]
• `<No-value>` [145]
• `<Time-unit-of-study-started>` [213]
• `<Time-activity-started>`
• `<Current-time>` [73]
• `<Complete>` [64]

• Any of
  • `<Property-ref>` [170]
  • `<Activity-ref>` [40]
  • `<Unit-of-study-ref>`
  • `<Value>` [221]

• Any of
  • `<Role-ref>` [179]
  • `<Is>` [120]
  • `<Is-not>` [122]
  • `<And>` [44]
  • `<Or>` [153]
  • `<Not>` [143]
  • `<Sum>` [202]
  • `<Subtract>` [200]
  • `<Multiply>` [140]
  • `<Divide>` [76]
  • `<Greater-than>` [95]
This element has no attributes


This element determines whether two operands are equal. For example, it tests whether a property has a particular value.

The element is an operand in an expression, see Conceptual outline - Conditions [28]. Within expressions, this element produces a value of type boolean.

Element: Is-not

CONTENT

• Sequence of
  • Any of
    • <Property-ref> [170]
    • <Activity-ref> [40]
    • <Unit-of-study-ref>
    • <Value> [221]
  • Any of
    • <Role-ref> [179]
    • <Is> [120]
    • <Is-not> [122]
    • <And> [44]
    • <Or> [153]
    • <Not> [143]
    • <Sum> [202]
    • <Subtract> [200]
    • <Multiply> [140]
• <Divide> [76]
• <Greater-than> [95]
• <Less-than> [129]
• <Users-in-role> [220]
• <No-value> [145]
• <Time-unit-of-study-started>
• <Time-activity-started>
• <Current-time> [73]
• <Complete> [64]

• Any of
  • <Property-ref> [170]
  • <Activity-ref> [40]
  • <Unit-of-study-ref> [217]
  • <Value> [221]

• Any of
  • <Role-ref> [179]
  • <Is> [120]
  • <Is-not> [122]
  • <And> [44]
  • <Or> [153]
  • <Not> [143]
  • <Sum> [202]
  • <Subtract> [200]
  • <Multiply> [140]
  • <Divide> [76]
  • <Greater-than> [95]
  • <Less-than> [129]
  • <Users-in-role> [220]
  • <No-value> [145]
  • <Time-unit-of-study-started>
  • <Time-activity-started>
  • <Current-time> [73]
This element has no attributes

**OCCURS IN** <And> [44] <Divide> <Greater-than> [95] <If> [99] <Is> [120] <Is-not> [122] 
.Users-in-role> [220]

This element determines whether two operands are not equal. For example, it tests whether a property does not have a particular value.

The element is an operand in an expression, see Conceptual outline - Conditions [28]. Within expressions, this element produces a value of type boolean.

**Element: Issue**

**CONTENT**

• Sequence of

  • **Characters**

This element has no attributes

**OCCURS IN** <Article> [49]

The issue number in a series.

This element is part of the APA bibliographic reference model, see <Literature> [133].

**Element: Item-pair**

**CONTENT**

• Sequence of

  • <First-category> [90]

  • <Second-category> [181]

This element has no attributes

**OCCURS IN** <Matching-question> [133]

This element represents a pair of items, taken from the first and second category. The element is part of a matching question, see <Matching-question> [133].

**Element: Journal**

**CONTENT**

• Sequence of

  • **Characters**

This element has no attributes

**OCCURS IN** <Article> [49]
The name of a journal.
This element is part of the APA bibliographic reference model, see <Literature> [133].

Element: Keywords

CONTENT

• Any of Zero or more
  • Characters
    • <Bookmark> [55]
    • <EML-ref> [79]
    • <Internet-ref> [118]
    • <Emphasis> [80]
    • <Term> [207]
    • <View-property-value> [224]
    • <Set-property-value>
    • <Comment-inline> [62]
    • <Special-inline> [193]
    • <Figure-source> [88]
    • <Formula-source> [92]

This element has no attributes

OCCURS IN <Metadata> [136]

A collection of keywords for this element. Keywords are entered in content, and are separated by a semicolon. For example: "keyword 1; keyword 2; key; word" has four keywords.

Any formatting occurring in the content of this element is disregarded in indexing. Keyword indexes are available only when <Index-on-keywords> [106] is set.

Element: Knowledge

CONTENT

• Empty

This element has no attributes

OCCURS IN <Objective-type> [148] <Prerequisite-type> [165]

A "choice item" [242]. See the parent element for a description.
Element: Knowledge-object

**CONTENT**

- *Sequence of*
  - `<Metadata>` [136]
  - *Any of*
    - `<Source>` [190]
    - `<Internet-source>` [119]

**ATTRIBUTES**

- **EML-version** = Singular CDATA (fixed 1.0)
- **Link-name** = Singular CDATA (required)
- **Reusability** = Enumeration Reusable Not-reusable (implied Not-reusable)
- **Type** = Singular CDATA (implied)
- **Version** = Singular CDATA (implied 1.0.0)
- **Id** = Singular ID (implied)
- **Worldwide-unique-id** = Singular CDATA (implied)

**OCCURS IN** `<Environment>` [83]

An object that contains information to be used in performing activities. It is completely independent of any particular `<Unit-of-study>` [216], `<Activity>` [39] or `<Play>` [161]. The physical equivalent of a knowledge-object would be a book, article, report, manual et cetera. It may contain the information structure itself (`<Source>` [190]), or a reference to an Internet source (`<Internet-source>` [119]).

**Attribute: Type**

Typical types are: 'case study', 'report', 'manual', 'article' et cetera

Element: Knowledge-object-ref

**CONTENT**

- *Empty*

**ATTRIBUTES**

- **Id-ref** = Singular IDREF (implied)
- **Version-use** = Enumeration Current-version Bugfixes-allowed Small-updates-allowed Major-updates-allowed (implied Bugfixes-allowed)
- **Ref-worldwide-unique-id** = Singular CDATA (implied)
- **Use-version** = Singular CDATA (implied 1.0.0)

**OCCURS IN** `<Environment>` [83]
An "inclusion reference" [243] to a <Knowledge-object> [125].

Element: Learner

CONTENT

- Sequence of
  - Optional <Information-for-role>
  - Any of Zero or more
    - <Property> [168]
    - <Property-group> [169]
  - Zero or more <Role>
  - Optional <Comment>

ATTRIBUTES

- Link-name= Singular CDATA (implied)
- Min-persons= Singular CDATA (implied)
- Max-persons= Singular CDATA (implied)
- Match-persons= Enumeration Exclusively-in-roles Not-exclusively (implied)
- Type= Singular CDATA (implied)
- Id= Singular ID (implied)

OCCURS IN <Roles> [180]

The <Learner> [127] element is the standard role within a <Unit-of-study> [216]. This element specifies all sub-roles that learners may play within that learning unit.

Furthermore, general dossier properties and groups of properties may be declared; these are valid for all learners.

Attribute: Type

This describes the type of learner. Example values are: 'student', 'scholar', 'trainee' et cetera

Element: Learning-objective

CONTENT

- Sequence of
  - Optional <Metadata>
  - <Objective-description>
  - <Objective-type> [148]
This element describes the learning objectives that the student is expected to have reached by finishing the unit of study. Each objective can be handled as a separate unit to be referenced later (<Learning-objective-ref>).

Element: Learning-objective-ref

CONTENT

- **Empty**

ATTRIBUTES

- **Id-ref**= Singular IDREF (implied)
- **Version-use**= Enumeration Current-version Bugfixes-allowed Small-updates-allowed Major-updates-allowed (implied Bugfixes-allowed)
- **Ref-worldwide-unique-id**= Singular CDATA (implied)
- **Use-version**= Singular CDATA (implied 1.0.0)

OCCURS IN <Learning-objectives> [128]

A reference to a learning objective defined separately within the same unit of study. Note that objectives and prerequisites are not managed as components in the repository.

Element: Learning-objectives

CONTENT

- Any of One or more
  - <Learning-objective>
  - <Learning-objective-ref>
  - <Comment> [60]

This element has no attributes

OCCURS IN <Objectives> [147] <Unit-of-study> [216]

This element is a "wrapper" [241] for learning goals, expressed in <Learning-objective> [127] elements.
Element: Lemma

CONTENT

- Sequence of
  - Optional <Metadata>
  - <Normalised-term>[143]
  - <Description>[75]

ATTRIBUTES

- Class= Singular CDATA (implied)
- Id= Singular ID (implied)


A <Lemma>[129] defines terms marked in the text by <Term>[207].

The subelement <Term>[207] contains the term itself, and the subelement <Description>[75] contains the definition of the term. It is possible to build up a glossary using a complete series of <Lemma>[129] specifications. Glossary parts may be identified using a superimposed class system, see class= [231].

These <Term Normalised-term="King med">kings</> were monitored constantly.

The corresponding Lemma is:

```
<Lemma Class="Royalty">
  <Term Normalised-term="King med">Kings (medieval)</Term>
  <Description><P>The male head of a royal family.</P></Description>
</Lemma>
```

Attribute: Class

The class of the <Term>[207] as specified in a <Lemma>[129]. This may be any descriptive string. The EDUBOX system provides for automatic indexing of terms taken from a restricted set of classes.

Element: Less-than

CONTENT

- Sequence of
• *Any of*
  
  • `<Property-ref>` [170]
  • `<Activity-ref>` [40]
  • `<Unit-of-study-ref>`
  • `<Value>` [221]
  
  • *Any of*
    
    • `<Role-ref>` [179]
    • `<Is>` [120]
    • `<Is-not>` [122]
    • `<And>` [44]
    • `<Or>` [153]
    • `<Not>` [143]
    • `<Sum>` [202]
    • `<Subtract>` [200]
    • `<Multiply>` [140]
    • `<Divide>` [76]
    • `<Greater-than>` [95]
    • `<Less-than>` [129]
    • `<Users-in-role>` [220]
    • `<No-value>` [145]
    • `<Time-unit-of-study-started>`
    • `<Time-activity-started>`
    • `<Current-time>` [73]
    • `<Complete>` [64]

  • *Any of*
    
    • `<Property-ref>` [170]
    • `<Activity-ref>` [40]
    • `<Unit-of-study-ref>`
    • `<Value>` [221]
    
    • *Any of*
      
      • `<Role-ref>` [179]
      • `<Is>` [120]
This element has no attributes


This element determines the relationship between two operands. It determines if the first child element represents a value lower than the second child element.

This element is an operand in an expression, see Conceptual outline - Conditions [28]. Within expressions, this element produces a value of type boolean.

**Element: Li**

**CONTENT**

- Any of Zero or more
  - <P> [157]
  - <Emphasis> [80]
  - <List> [132]
  - <Figure> [88]
  - <Formula> [91]
  - <Table> [205]
This element has no attributes

OCCURS IN <List> [132]

A list item within a <List> [132]. A list item may contain several paragraph-level elements.

Element: Link-name

CONTENT

- Sequence of
  - Characters

This element has no attributes

OCCURS IN <With-collapse-and-expand-control> [229]

This element records the link-name for which collapse and expand control is defined, see description of <With-collapse-and-expand-control> [229] and the Link-name= [234] attribute.

Element: List

CONTENT

- Sequence of
  - One or more <Li>

ATTRIBUTES
A regular list of 'list items'. Lists can be ordered, i.e. the sequence of the items must be preserved in all cases.

Attribute: Ordered

Is the list ordered? If ordered, typically show in order with numbering. If not ordered, typically show with bullets.

Element: Literature

CONTENT

- Any of Zero or more
  - <Article> [49]
  - <Article-ref> [50]
  - <Chapter> [57]
  - <Chapter-ref> [58]
  - <Book> [54]
  - <Book-ref> [55]

This element has no attributes

Element: Matching-question

CONTENT

- Sequence of
This question type requires the user to match items taken from two categories to be placed in the right order, every n-th item in the first category (<First-category> [90]) being associated with every n-th item in the second category (<Second-category> [181]). In the EML specification, all items are placed correctly (in pairs); in publications the items will be shuffled.

Element: Max-completion-time

This element has no attributes
The expected maximum amount of time in which the object may be completed. 'Completion' is to be interpreted for each object in a different way: it may concern the reading of a knowledge object, finishing a unit of study or activity, et cetera.

This element is informative only and should be used only where applicable.

**Element: Medium**

**CONTENT**

- Any of
  - <Text-conference>
  - <Video-conference>
  - <Audio-conference>
  - <Animated-conference>
  - <Face-to-face-conference>

This element has no attributes.

**OCCURS IN** <Synchronous-conference>

The medium in which a synchronous conference is set up. This can be any of the following:

- Text (chat)
- Video, normal video-type conference
- Audio, normal audio-type conference
- Animated, i.e. an animated figure such as Microsoft's Cartoon Chat or Avatars.
- Face-to-face (direct contact)

The subelements represent these choices.

**Element: Meta**

**CONTENT**

- Any of One or more
  - <Meta>
  - <Structured-source>
  - <Unstructured-source>

**ATTRIBUTES**

- **Base** = Singular CDATA (implied)
- **Description** = Singular CDATA (implied)
OCCURS IN `<Extra-meta>` [86] `<Meta>` [135]

An element that allows the author to add new metadata, possibly in accordance with a particular metadata scheme (or "base" scheme).

The element is set up such that a hierarchical information structure can be created.

**Attribute: Base**

The base of this metadata item. Examples are: "Dublin Core" and "IMS4". A base value is inherited from ancestor `<Meta>` [135] elements.

**Attribute: Description**

Formal description of this metadata item. Example: "Feasibility", "Author", "Rate".

**Element: Metadata**

**CONTENT**

- Sequence of
  - `<Title>` [213]
- Any of Zero or more
  - `<Subtitle>` [200]
  - `<Creator>` [72]
  - `<Description>` [75]
  - `<Keywords>` [125]
  - `<Copyright>` [68]
  - `<Study-load>` [199]
  - `<Extra-meta>` [86]
  - `<Comment>` [60]

This element has no attributes


Metadata is information about data. The `<Metadata>` [136] element contains this ‘descriptive’ information. All data that is specified within `<Metadata>` [136] may be used to formulate and resolve search requests. The element is therefore part of many reusable elements in the specification (Conceptual outline - Reuse and retrieval [35]). In all cases, the `<Metadata>` [136] concerns the parent element.
Element: Method

**CONTENT**

- **Sequence of**
  - Zero or more `<Activity-structure>`
  - One or more `<Play>`
  - Zero or more `<Conditions>`
  - Optional `<Comment>`

*This element has no attributes*

**OCCURS IN** `<Unit-of-study>` [216]

This element is a "wrapper" [241] for elements that implement the structure, didactics and processes in a `<Unit-of-study>` [216]. Within the method section a more elaborate or new structuring of activities may take place, creating new `<Activity-structure>` [42]s. Conditions may also be set, under which specific learning components are linked to specific roles.

Element: Min-completion-time

**CONTENT**

- Any of Zero or more
  - **Characters**
    - `<Bookmark>` [55]
    - `<EML-ref>` [79]
    - `<Internet-ref>` [118]
    - `<Emphasis>` [80]
    - `<Term>` [207]
    - `<View-property-value>`
    - `<Set-property-value>`
    - `<Comment-inline>` [62]
    - `<Special-inline>` [193]
    - `<Figure-source>` [88]
    - `<Formula-source>` [92]

*This element has no attributes*

**OCCURS IN** `<Extra-meta>` [86]

The expected minimum amount of time in which the object can be completed. 'Completion' is interpreted differently for each object: it may concern the reading of a knowledge object, finishing a unit of study or activity, et cetera.
This element is simply informative and should be used only where applicable.

**Element: Moderator**

**CONTENT**

- Sequence of
  - One or more `<Role-ref>`

*This element has no attributes*

**OCCURS IN** `<Asynchronous-conference>` [51] `<Synchronous-conference>` [205]

A moderator in a computer conference is the chairman of an on-line discussion about a specific topic, course, or subject area. This function can be compared to that of a chairman in a regular discussion group. A moderator invites people to participate in the discussion, summarises, draws conclusions.

The moderator is included in the conference.

The actor is identified by a reference to his/her role.

**Element: Modify-announcements**

**CONTENT**

- Sequence of
  - One or more `<Role-ref>`

*This element has no attributes*

**OCCURS IN** `<Announcement-object>` [46]

An element is used as a "choice item" [242]. See the parent element for a description.

Announcements can be modified by persons playing roles that are referenced by the embedded `<Role-ref>` [179].

**Element: Monitor-access-time**

**CONTENT**

- Sequence of
  - Optional `<Access-date-first-access>`
  - Optional `<Access-date-last-access>`
  - Optional `<Access-count>`
  - Optional `<Comment>`

*This element has no attributes*

**OCCURS IN** `<Role-information-object>` [178]
This element is a wrapper for "choice item" [242] elements that express when an actor played a role, or 'participated in' the run of the current unit of study. There are three such indications:

- `<Access-date-first-access>`: The date of first access to the current unit of study.
- `<Access-date-last-access>`: The date of last access to the current unit of study.
- `<Access-count>` [38]: The number of times the actor accessed the current unit of study.

**Element: Monitor-activity-progression**

**CONTENT**

- Sequence of One or more
  - Optional `<Activity-ref>`
  - Optional `<Unit-of-study-ref>`
  - Optional `<Comment>`

*This element has no attributes*

**OCCURS IN** `<Role-information-object>` [178]

This element specifies which activities should be monitored with respect to the progression made by the actor:

- `<Unit-of-study-ref>`: Monitor progression in unit of study.
- `<Activity-ref>` [40]: Monitor progression in activity.

No prior assumptions are made on how this information is to be represented in a run.

**Element: Multiple-choice-question**

**CONTENT**

- Sequence of
  - Optional `<Metadata>`
  - `<Question>` [172]
  - `<Correct-answer>` [71]
  - One or more `<Incorrect-answer>`
  - Optional `<Hint>`
  - Optional `<Feedback>`
  - Optional `<Score>`

**ATTRIBUTES**

- `Version`= Singular CDATA (implied 1.0.0)
- `Worldwide-unique-id`= Singular CDATA (implied)
• **Id**= Singular ID (implied)

• **EML-version**= Singular CDATA (fixed 1.0)

**OCCURS IN** `<Interactions>` [117] `<Questionnaire-items>` [174] `<Test-group>`

A multiple-choice question. There is only one correct answer and a range of 1..n incorrect answers. All these answers are 'shuffled' in rendition, i.e. the order in which the choices are presented on screen or paper may be changed each time the question is generated.

**Element: Multiple-response-question**

**CONTENT**

• **Sequence of**
  
  • *Optional* `<Metadata>`
  
  • `<Question>` [172]
  
  • *One or more* `<Correct-answer>`
  
  • *Zero or more* `<Incorrect-answer>`
  
  • *Optional* `<Hint>`
  
  • *Optional* `<Feedback>` [86]
  
  • *Optional* `<Score>`

**ATTRIBUTES**

• **Give-number**= Enumeration Yes No (implied No)

• **Version**= Singular CDATA (implied 1.0.0)

• **Id**= Singular ID (implied)

• **Worldwide-unique-id**= Singular CDATA (implied)

• **EML-version**= Singular CDATA (fixed 1.0)

**OCCURS IN** `<Interactions>` [117] `<Questionnaire-items>` [174] `<Test-group>`

This is almost the same as the well-known multiple-choice question (<Multiple-choice-question> [139]) but this question type allows for more than one (rather than only one) correct answer to be specified.

**Attribute: Give-number**

This attribute specifies whether the number of correct answers should be shown in advance. For example:

• Yes: "In the following, 2 out of 4 statements are correct. Which ones are correct?"

• No: "In the following, 1 or more out of 4 statements are correct. Which ones are correct?"
Element: Multiply

CONTENT

• Sequence of
  • Any of
    • <Property-ref> [170]
    • <Activity-ref> [40]
    • <Unit-of-study-ref>
    • <Value> [221]
  • Any of
    • <Role-ref> [179]
    • <Is> [120]
    • <Is-not> [122]
    • <And> [44]
    • <Or> [153]
    • <Not> [143]
    • <Sum> [202]
    • <Subtract> [200]
    • <Multiply> [140]
    • <Divide> [76]
    • <Greater-than> [95]
    • <Less-than> [129]
    • <Users-in-role> [220]
    • <No-value> [145]
    • <Time-unit-of-study-started>
    • <Time-activity-started>
    • <Current-time> [73]
    • <Complete> [64]

• Any of
  • <Property-ref> [170]
  • <Activity-ref> [40]
  • <Unit-of-study-ref>
  • <Value> [221]
This element has no attributes

**OCCURS IN** &lt;And&gt; [44] &lt;Divide&gt; &lt;Greater-than&gt; [95] &lt;If&gt; [99] &lt;Is&gt; [120] &lt;Is-not&gt; [122] &lt;Less-than&gt; [129] &lt;Multiply&gt; [140] &lt;Not&gt; [143] &lt;Or&gt; [153] &lt;Subtract&gt; [200] &lt;Sum&gt; [202] &lt;Users-in-role&gt; [220]

This element calculates the multiplication of two numerical operands, e.g. it multiplies the values of two properties.

The element is an operand in an expression, see *Conceptual outline - Conditions* [28]. Within expressions, this element produces a value of type *number*.

**Element: New-property**

**CONTENT**

- Any of
  - &lt;Integer&gt; [117]
  - &lt;Real&gt; [176]
  - &lt;Boolean&gt; [56]
**ATTRIBUTES**

- **Id=** Singular ID (implied)
- **Worldwide-unique-id=** Singular CDATA (implied)
- **Lifetime=** Enumeration Archive Delete (implied Archive)
- **Type=** Singular CDATA (implied)

**OCCURS IN** `<Performance-property> [158] <Prerequisite-property>`

This element identifies the creation of a property in the dossier. The property is initialised to any of the values specified in content.

**Attribute: Lifetime**

See the general description of this attribute. Default value is 'Archive'.

**Element: Normalised-term**

**CONTENT**

- **Sequence of**
  - **Characters**

*This element has no attributes*

**OCCURS IN** `<Lemma> [129]`

The normalised term of a lemma. This is the term that this lemma clarifies, in the form that is assumed to be common to all possible variant forms. For example, "Academy" is the normalised term for "Academy", "Academic", "University", *et cetera*

**Element: Not**

**CONTENT**

- **Any of**
  - `<Role-ref> [179]`
  - `<Is> [120]`
  - `<Is-not> [122]`
  - `<And> [44]`
  - `<Or> [153]`
  - `<Not> [143]`
  - `<Sum> [202]`
  - `<Subtract> [200]`
  - `<Multiply> [140]`
This element has no attributes


This element negates the boolean value of an expression. For example, if a property has a particular value, the sub-expression succeeds; this element causes the complete expression to fail.

The element is an operand in an expression, see *Conceptual outline - Conditions* [28]. Within expressions, this element produces a value of type *boolean*.

**Element: Notification**

**CONTENT**

- Sequence of
  - One or more <Role-ref>
  - Optional <Activity-ref>
  - <Subject> [199]

This element has no attributes

**OCCURS IN** <Change-property-value> [57] <Set-property-group-values> <Set-property-value> [186]

This element denotes that a notification be sent to all actors in roles identified in content. The notification consists of:

- <Role-ref> [179], identifying the actors to whom the notification should be sent.

- <Activity-ref> [40], identifying the activity to be performed by those actors in response. Note: when the receiver has to implement a support activity, the context of the notifier will be passed automatically to this support activity. In other words, the receiver does not have to choose for whom he/she performs the activity.

- <Subject> [199], the reason why the notification was sent.

<Activity-ref> [40] is optional because sometimes only a message has to be sent, without an activity needing to be performed by the receiver. The message text is set as a property in the containing <Change-property-value> [57], <Set-property-group-values> [185] or <Set-
Element: No-value

*CONTENT*

- *Sequence of*
  - *<Property-ref>* [170]

*This element has no attributes*


This element determines whether a particular property has a value. It succeeds if no value is specified.

Note that all properties defined in an EML specification may have an initial value (*<Property>* [168], *<New-property>* [142]).

The element is an operand in an expression, see *Conceptual outline - Conditions* [28]. Within expressions, this element produces a value of type *boolean*.

Element: Number-answered

*CONTENT*

- *Sequence of*
  - *<Property-ref>* [170]

*This element has no attributes*

*OCCURS IN* *<Properties>* [167]

This element specifies the number of questions that were answered in the questionnaire (*<Questionnaire-object>* [174]).

The information is stored in the property referenced in content.

Element: Number-correct

*CONTENT*

- *Sequence of*
  - *<Property-ref>* [170]

*This element has no attributes*

*OCCURS IN* *<Properties>* [167]

This element specifies the number of questions that were answered correctly in the questionnaire (*<Questionnaire-object>* [174]).
The information is stored in the property referenced in content.

Element: Number-of-test-items-provided

CONTENT

- Sequence of
  - <Property-ref>[170]

This element has no attributes

OCCURS IN <Properties>[167]

This element specifies the number of test items that were provided in the run, i.e. when delivering the questionnaire to the student (<Questionnaire-object>[174]).

The information is stored in the property referenced in content.

Element: Number-of-test-trials

CONTENT

- Any of Zero or more
  - Characters
    - <Unlimited-number-of-test-trials>

This element has no attributes

OCCURS IN <Options>[152]

This element expresses the number of test trials allowed for the questionnaire, or whether this is an unlimited number.

Element: Number-wrong

CONTENT

- Sequence of
  - <Property-ref>[170]

This element has no attributes

OCCURS IN <Properties>[167]

This element specifies the number of questions that were answered wrongly in the questionnaire (<Questionnaire-object>[174]).

The information is stored in the property referenced in content.
**Element: Objective-description**

**CONTENT**

- *Any of Zero or more*
  - `<P>` [157]
  - `<Emphasis>` [80]
  - `<List>` [132]
  - `<Figure>` [88]
  - `<Formula>` [91]
  - `<Table>` [205]
  - `<Lemma>` [129]
  - `<Code-line>` [59]
  - `<Literature>` [133]
  - `<Audio>` [51]
  - `<Video>` [222]
  - `<Special>` [192]
  - `<View-property-value>`
  - `<View-property-group-values>`
  - `<Set-property-value>`
  - `<Set-property-group-values>`
  - `<Interactions>` [117]
  - `<Internet-source>` [119]
  - `<Section>` [182]
  - `<Section-ref>` [183]
  - `<Comment>` [60]

*This element has no attributes*

**OCCURS IN** *<Learning-objective>* [127]

This specifies the objective of the unit of study or activity. The learning objectives must be a sub-objective of any element. The objectives of subelements are tallied and add up to, at best, the objectives of the various elements.

**Element: Objectives**

**CONTENT**

- *Any of*
This element has no attributes

OCCURS IN <Activity> [39]

This is a wrapper for the objectives of an activity. This presents a choice between:

- <Learning-objectives>: the learning objectives that belong to an activity or a unit of study; i.e. for the role(s) played by learners (<Learner> [127]). In EML design students' activities form the basis for a unit of study. These activities are characterized by having specific learning objectives.

- <Support-role> [204]: identifies that an activity is meant to support other roles. Note that there is no formal way to express the nature of the objective of a support role. In other words, the objective of a support role is 'to support learners' (as identified by the embedded <Role-ref> [179]).

Element: Objective-type

CONTENT

- Any of
  
  - <Skill> [190]
  
  - <Knowledge> [125]
  
  - <Insight> [117]
  
  - <Attitude> [51]
  
  - <Competence> [64]
  
  - <Other> [155]

This element has no attributes

OCCURS IN <Learning-objective> [127]

The type of objective. There can be only one objective type.

The element's content is taken as a more precise, formal description of the objective (if specified).

Possible values are expressed in content through choice items:

- skill
- insight
- knowledge
- attitude
- competence
- some other classification
Element: Object-to-index-on

CONTENT

• Any of
  • <Index-on-bookmark>
  • <Index-on-EML-ref>
  • <Index-on-internet-ref>
  • <Index-on-emphasis>
  • <Index-on-term>[111]
  • <Index-on-special-inline>
  • <Index-on-formula>
  • <Index-on-figure>[105]
  • <Index-on-table>[111]
  • <Index-on-lemma>[107]
  • <Index-on-article>
  • <Index-on-chapter>
  • <Index-on-book>[104]
  • <Index-on-audio>[103]
  • <Index-on-video>[112]
  • <Index-on-special>
  • <Index-on-section>
  • <Index-on-multiple-choice-question>
  • <Index-on-true-false-question>
  • <Index-on-multiple-response-question>
  • <Index-on-sequence-question>
  • <Index-on-matching-question>
  • <Index-on-short-answer-question>
  • <Index-on-question-answer>
  • <Index-on-prompt>[109]
  • <Index-on-learning-objectives>
  • <Index-on-prerequisites>
  • <Index-on-keywords>
This element has no attributes

OCCURS IN <Index> [102]

This element is a wrapper for a number of "choice item" [242]s, each representing a type of object to index on. The choice is made between:

- <Index-on-bookmark> [104], on content of <Bookmark> [55]s.
- <Index-on-EML-ref> [105], on content of <EML-ref> [79]
- <Index-on-internet-ref>, on content of <Internet-ref> [118]
- <Index-on-emphasis>, on content of <Emphasis> [80]
- <Index-on-term> [111], on content of <Term> [207]
- <Index-on-special-inline>, on content of <Special-inline> [193]
- <Index-on-formula> [105], on of <Formula>
- <Index-on-figure> [105], on of <Figure>
- <Index-on-table> [111], on content of all cells in <Table> [205]
- <Index-on-lemma> [107], on term and description of <Lemma> [129]
- <Index-on-article> [103], on content of <Article> bibliographical description
- <Index-on-chapter> [104], on content of <Chapter> [57] bibliographical description
- <Index-on-book> [104], on content of <Book> [54] bibliographical description
- <Index-on-audio> [103], on <Audio> [51] metadata
• `<Index-on-video> [112], on <Video> [222] metadata`
• `<Index-on-special> [110], on content of <Special> [192]`
• `<Index-on-section> [109], on content of <Section> [182]`
• `<Index-on-multiple-choice-question>, on content of <Multiple-choice-question> [139]`
• `<Index-on-true-false-question>, on content of <True-false-question> [215]`
• `<Index-on-multiple-response-question>, on content of <Multiple-response-question> [140]`
• `<Index-on-sequence-question>, on content of <Sequence-question> [185]`
• `<Index-on-matching-question>, on content of <Matching-question> [133]`
• `<Index-on-short-answer-question>, on content of <Short-answer-question> [187]`
• `<Index-on-question-answer>, on content of <Question-answer> [173]`
• `<Index-on-learning-objectives>, on content of <Learning-objectives> [128]`
• `<Index-on-prerequisites>, on content of <Prerequisites> [164]`
• `<Index-on-keywords>, on metadata <Keywords> [125]`
• `<Index-on-contributor>, on metadata <Contributor> [68]`
• `<Index-on-activity>, on description of <Activity> [39]`
• `<Index-on-information>, on content of <Information> [114]`
• `<Index-on-environment>, on description of <Environment> [83]`
• `<Index-on-announcement-object>, on description of <Announcement-object> [46]`
• `<Index-on-communication-object> [104], on description of <Communication-object> [62]`
• `<Index-on-index-search-object>, on description of <Index-search-object> [112]`
• `<Index-on-knowledge-object>, on content of <Knowledge-object> [125]`
• `<Index-on-personal-object>, on description of <Personal-object> [159]`
• `<Index-on-questionnaire-object>, on description of <Questionnaire-object> [174]`
• `<Index-on-role-information-object>, on description of <Role-information-object> [178]`
• `<Index-on-test-group>, on questions in <Test-group> [208]`
• `<Index-on-tool-object>, on description of <Tool-object> [214]`
• `<Index-on-section-ref>, on content of <Section-ref> [183]`
• `<Index-on-performance-property>, on value of <Performance-property> [158]`
Element: Object-type

**CONTENT**
- **Empty**

**ATTRIBUTES**
- **Type** = Enumeration Electronic Non-electronic Mix (implied)

**OCCURS IN** <Extra-meta> [86]

A metadata element, indicating that this object is available as an electronic, non-electronic (physical or lucid), or mixed entity.

**Attribute: Type**
Sets the type of the object.

Element: Observer

**CONTENT**
- **Sequence of**
  - One or more <Role-ref>

*This element has no attributes*

**OCCURS IN** <Asynchronous-conference> [51] <Synchronous-conference> [205]

An observer in a conference. He/she cannot send out messages but can access the information freely. The actor is identified by a reference to his/her role.

Element: Only-for-learner

**CONTENT**
- **Sequence of**
  - One or more <Role-ref>

*This element has no attributes*

**OCCURS IN** <Learning-objective> [127] <Prerequisite> [162]

This element signals that an objective is only specified for a learner. The actors to whom this applies are identified by their role, using <Role-ref> [179] elements in content. By definition, this can only be for roles defined as part of the <Learner> [127] element.

Element: Options

**CONTENT**
- **Sequence of**
This element has no attributes

OCCURS IN <Questionnaire-object> [174]

This element shows how to process a <Questionnaire-object> [174], and is expressed through the following (optional) subelements:

- <Properties> [167], defines the properties used to store the results of answering the items in the questionnaire.
- <Provide-feedback> [171], a choice element stating that feedback should be provided either immediately (<Immediately> [101]) or when the complete questionnaire is processed (<When-processing>).
- <Provide-hints> [172], specifies that hints (<Hint>) may be provided.
- <Number-of-test-trials>, for specifying how many test trials are accepted.
- <Random-presentation>, specifies that the questionnaire items can be presented in random order.

Element: Options-are-presented-as

CONTENT

- Empty

ATTRIBUTES

- Options= Enumeration True-false Correct-incorrect Right-wrong (implied True-false)

OCCURS IN <True-false-question> [215]

This element is part of the <True-false-question> [215] element, specifying how to express truth and falsity. This is specified by the Options= [236] attribute.

Attribute: Options

This attribute specifies how truth/falsity should be presented. In English, this translates to:

- 'True' versus 'False'
- 'Correct' versus 'Incorrect'
- 'Right' versus 'Wrong'
Element: Or

**CONTENT**

- **Sequence of**
  - **Any of**
    - `<Role-ref>` [179]
    - `<Is>` [120]
    - `<Is-not>` [122]
    - `<And>` [44]
    - `<Or>` [153]
    - `<Not>` [143]
    - `<Sum>` [202]
    - `<Subtract>` [200]
    - `<Multiply>` [140]
    - `<Divide>` [76]
    - `<Greater-than>` [95]
    - `<Less-than>` [129]
    - `<Users-in-role>` [220]
    - `<No-value>` [145]
    - `<Time-unit-of-study-started>`
    - `<Time-activity-started>`
    - `<Current-time>` [73]
    - `<Complete>` [64]

- **Any of One or more**
  - **Any of**
    - `<Role-ref>` [179]
    - `<Is>` [120]
    - `<Is-not>` [122]
    - `<And>` [44]
    - `<Or>` [153]
    - `<Not>` [143]
    - `<Sum>` [202]
    - `<Subtract>` [200]
This element has no attributes


This element determines whether one out of two expressions succeeds. For example, it tests if property A or property B has a particular value.

The element is an operand in an expression, see Conceptual outline - Conditions [28]. Within expressions, this element produces a value of type boolean.

Element: Other

CONTENT

- Empty

ATTRIBUTES

- Type= Singular CDATA (implied)

OCCURS IN <Objective-type> [148] <Prerequisite-type> [165]

A "choice item" [242]. See the parent element for a description.

Attribute: Type

This attribute defines the alternative type of objective or prerequisite for a task. A short descriptive string.

Element: Other-objective

CONTENT

- Any of Zero or more
  - <P> [157]
This element has no attributes

**OCCURS IN** `<Objectives>` [147]

Describes an objective that is not a learning objective or an objective for a supporting actor.

**Element: Other-score-property**

**CONTENT**

- **Sequence of**
  - **One or more** `<Role-ref>`
  - `<Property-ref>` [170]

This element has no attributes

**OCCURS IN** `<Properties>` [167]

This element is added to EML for future extensions.
Element: P

CONTENT

- Any of Zero or more
  - Characters
    - <Bookmark> [55]
    - <EML-ref> [79]
    - <Internet-ref> [118]
    - <Emphasis> [80]
    - <Term> [207]
    - <View-property-value>
    - <Set-property-value>
    - <Comment-inline> [62]
    - <Special-inline> [193]
    - <Figure-source> [88]
    - <Formula-source> [92]

This element has no attributes


This is the standard paragraph element, representing a single paragraph in a textual object. It is similar to the HTML <P> element.

Element: Pages

CONTENT

- Sequence of
  - <Start-page> [196]
  - <End-page> [81]

This element has no attributes

OCCURS IN <Article> [49] <Chapter> [57]
The pages that a chapter or article occupies in a book or series.
This element is part of the APA bibliographic reference model, see <Literature> [133].

Element: Participant

CONTENT

- Sequence of
  - One or more <Role-ref>

This element has no attributes

OCCURS IN <Asynchronous-conference> [51] <Synchronous-conference> [205]

A participant in a conference. He/she has 'read and write' access (other than an <Observer> [152] who has read-access only). The actor is identified by a reference to his/her role.

Element: Performance-property

CONTENT

- Sequence of
  - Optional <Comment>
  - Any of
    - <New-property> [142]
    - <Property-ref> [170]
    - <Target-value> [206]
  - Optional <Entry-value>

ATTRIBUTES

- Type= Enumeration Skill Knowledge Insight Attitude Competence Situational (implied)

OCCURS IN <Learning-objective> [127]

Element: Personal-homepage

CONTENT

- Empty

ATTRIBUTES

- Type= Singular CDATA (implied)

OCCURS IN <Personal-object> [159]

A "choice item" [242]. See the parent element for a description.
Attribute: Type
The type of home page. A short descriptive string.

Element: Personal-hyperlinks

CONTENT

• Empty

This element has no attributes

OCCURS IN <Personal-object> [159]

A "choice item" [242]. See the parent element for a description.

Element: Personal-notebook

CONTENT

• Empty

ATTRIBUTES

• Type= Singular CDATA (implied)

OCCURS IN <Personal-object> [159]

A "choice item" [242]. See the parent element for a description.

Attribute: Type
The type of notebook. A short descriptive string.

Element: Personal-object

CONTENT

• Sequence of
  • <Metadata> [136]
  • Any of
    • <Personal-notebook>
    • <Personal-hyperlinks>
    • <Personal-homepage>

ATTRIBUTES

• EML-version= Singular CDATA (fixed 1.0)
• Link-name= Singular CDATA (required)
- **Reusability** = Enumeration Reusable Not-reusable (implied Not-reusable)
- **Type** = Singular CDATA (implied)
- **Version** = Singular CDATA (implied 1.0.0)
- **Id** = Singular ID (implied)
- **Worldwide-unique-id** = Singular CDATA (implied)

**OCCURS IN** <Environment> [83]

An object representing the assets that are available to the actor. These assets are created on request and include:

- `<Personal-notebook>`: A notebook
- `<Personal-hyperlinks>`: A set of hyperlinks
- `<Personal-homepage>`: An Internet home page

**Attribute: Type**

Typical types are: 'home page', 'notebook' et cetera

**Element: Personal-object-ref**

**CONTENT**

- **Empty**

**ATTRIBUTES**

- **Id-ref** = Singular IDREF (implied)
- **Version-use** = Enumeration Current-version Bugfixes-allowed Small-updates-allowed Major-updates-allowed (implied Bugfixes-allowed)
- **Ref-worldwide-unique-id** = Singular CDATA (implied)
- **Use-version** = Singular CDATA (implied 1.0.0)

**OCCURS IN** <Environment> [83]

An "inclusion reference" [243] to a `<Personal-object>` [159].

**Element: Place**

**CONTENT**

- **Sequence of**
  - **Characters**

This element has no attributes

**OCCURS IN** <Book> [54] <Chapter>

The place of publication.
This element is part of the APA bibliographic reference model, see <Literature> [133].

Element: Play

CONTENT

- **Sequence of**
  - Optional `<Metadata>`
  - **Sequence of One or more**
    - Optional `<Comment>`
    - `<Role-ref>` [179]
  - **Any of**
    - `<Activity-ref>` [40]
    - `<Activity-structure-ref>`
    - `<Unit-of-study-ref>`
  - Optional `<Continue>`

ATTRIBUTES

- **Id**= Singular ID (implied)
- **Default-visibility**= Enumeration Show Hide (implied Show)
- **Link-name**= Singular CDATA (required)

OCCURS IN `<Method>` [137]

This element is the essence of the EML specification. The `<Play>` [161] element allows for specific forms of interaction between different roles to be modelled. The basic pattern within `<Play>` [161] is:

*Activity X for role A is followed by activity Y for role B*

The element `<Play>` [161] especially serves those didactical models in which the regulation or content of specific activities is determined by the output of one or more other activities. Examples of this are games and role-plays.

Mutual dependencies between activities within play, as in:

*Activity Y for role B may start when activity X for role A is completed*

can be made explicit using the `<Continue>` [67] element. In the example this means that for activity A the `<Continue>` [67] element must be filled with the element `<When-completed>` [227].

If no `<Continue>` [67]-elements are used, all `<Play>` [161]-elements are accessible.

**Attribute: Default-visibility**

If for a `<Play>` [161] the attribute **Default-visibility**= [232] is set to "Hide" (this attribute has a default value of "Show") this means that the play is hidden to users until the play is made visible using a conditions. When the attribute is set to "Show", the play is always visible (however this
does not mean that all parts of the play are visible!). In this case, it cannot be hidden.

Element: Play-ref

**CONTENT**
- **Empty**

**ATTRIBUTES**
- **Id-ref**= Singular IDREF (implied)

**OCCURS IN** <Hide> [96] <Show> [187]

A reference to a `<Play>` [161]. Plays can be predefined and referenced later within conditions (`<Conditions>` [65]), thus reconfiguring the global unit of study in response to changing conditions.

Element: Possible-value

**CONTENT**
- **Sequence of**
  - **Characters**

*This element has no attributes*

**OCCURS IN** `<Value-list>` [221]

A possible value within a `<Value-list>` [221]. At least two possible values must be provided for a single value list. The values must be of the type specified in the ancestor element, i.e. either `<String>` [198], `<Integer>` [117], `<Real>` [176] or `<Date>` [74].

Element: Prerequisite

**CONTENT**
- **Sequence of**
  - **Optional** `<Metadata>`
  - `<Prerequisite-description>`
  - `<Prerequisite-type>`
  - **Optional** `<Only-for-learner>`
  - **Optional** `<Prerequisite-property>`

**ATTRIBUTES**
- **Version**= Singular CDATA (implied 1.0.0)
- **Worldwide-unique-id**= Singular CDATA (implied)
- **Id**= Singular ID (implied)
- **EML-version** = Singular CDATA (fixed 1.0)

**OCCURS IN** `<Prerequisites>` [164]

This element contains the specification of one of the demands for being able to start the unit of study.

**Element: Prerequisite-description**

**CONTENT**

- **Any of Zero or more**
  - `<P>` [157]
  - `<Emphasis>` [80]
  - `<List>` [132]
  - `<Figure>` [88]
  - `<Formula>` [91]
  - `<Table>` [205]
  - `<Lemma>` [129]
  - `<Code-line>` [59]
  - `<Literature>` [133]
  - `<Audio>` [51]
  - `<Video>` [222]
  - `<Special>` [192]
  - `<View-property-value>`
  - `<View-property-group-values>`
  - `<Set-property-value>`
  - `<Set-property-group-values>`
  - `<Interactions>` [117]
  - `<Internet-source>` [119]
  - `<Section>` [182]
  - `<Section-ref>` [183]
  - `<Comment>` [60]

This element has no attributes

**OCCURS IN** `<Prerequisite>` [162]

A free form description of the prerequisite.
Element: Prerequisite-property

CONTENT

• Sequence of
  • Optional <Comment>
  • Any of
    • <New-property> [142]
    • <Property-ref> [170]
  • Optional <Target-value>
  • <Entry-value> [83]

ATTRIBUTES

• Type= Enumeration Skill Knowledge Insight Attitude Competence Situational (implied)

OCCURS IN <Prerequisite> [162]

Element: Prerequisite-ref

CONTENT

• Empty

ATTRIBUTES

• Id-ref= Singular IDREF (implied)
• Version-use= Enumeration Current-version Bugfixes-allowed Small-updates-allowed Major-updates-allowed (implied Bugfixes-allowed)
• Ref-worldwide-unique-id= Singular CDATA (implied)
• Use-version= Singular CDATA (implied 1.0.0)

OCCURS IN <Prerequisites> [164]

A reference to a prerequisite defined separately within the same unit of study. Note that objectives and prerequisites are not managed as components in the repository.

Element: Prerequisites

CONTENT

• Any of One or more
  • <Prerequisite> [162]
  • <Prerequisite-ref>
  • <Comment> [60]

This element has no attributes
The element <Prerequisites> [164] is a "wrapper" [241] for the complete set of requirements needed to carry out the <Unit-of-study> [216], or support of these activities.

**Element: Prerequisite-type**

**CONTENT**

- Any of
  
  - <Skill> [190]
  - <Knowledge> [125]
  - <Insight> [117]
  - <Attitude> [51]
  - <Competence> [64]
  - <Situational-factor>
  - <Other> [155]

*This element has no attributes*

**OCCURS IN** <Prerequisite> [162]

The type of prerequisite. There can be only one prerequisite type.

The element's content is taken as a more precise, formal description of the prerequisite (if specified).

**Attribute: Type**

Possible values are:

- skill
- insight
- knowledge
- attitude
- competence
- Situational
- some other classification

**Element: Process**

**CONTENT**

- Any of
This element has no attributes

OCCURS IN <Questionnaire-object> [174]

This is a "wrapper" [241] element for the specification of how to process a questionnaire. The score can be processed automatically (<Process-score-automatically> [166]) or manually. For the latter, a comment (<Comment> [60]) describes how to do this.

Element: Process-score-automatically

CONTENT

• Sequence of One or more
  • <If-proportion-correct-greater-than>
  • Optional <And-less-than>
  • <Change-property-value>

This element has no attributes

OCCURS IN <Process> [165]

This element states that the scores of a questionnaire (<Questionnaire-object> [174]) can be processed automatically. It defines how this can be accomplished using a condition, which is expressed in three steps:

• Test the proportion of correct answers: check whether the proportion is greater than a specified value (<If-proportion-correct-greater-than> [101]).

• Optionally test to see if the proportion is less than another percentage (<And-less-than> [45]).

• If the previous expressions succeed, change a previously defined property value (<Change-property-value> [57]).

The value for a proportion must be a percentage expressed as an integer between 0 and 100 inclusive.

Element: Prompt

CONTENT

• Sequence of
  • Optional <Metadata>
  • <Question> [172]
  • One or more <Choice>
  • Optional <Hint>
  • Zero or more <When-choice>
**Attributes**

- **Version** = Singular CDATA (implied 1.0.0)
- **Worldwide-unique-id** = Singular CDATA (implied)
- **Id** = Singular ID (implied)
- **EML-version** = Singular CDATA (fixed 1.0)

**OCCURS IN** `<Interactions>` [117]

This element represents a request for information rather than a true question (a 'pick-list' as it were). It has a set of possible answers (`<Choice>` [58]), each of which may have an identifier (`Id` = [233]). For each possible choice made (`<When-choice>` [226]) a property may be specified which value should be changed (`<Change-property-value>` [57]). This question type therefore allows one to associate an action with any particular answer.

**Element: Properties**

**content**

- Sequence of
  - Optional `<Proportion-correct>`
  - Optional `<Number-correct>`
  - Optional `<Number-wrong>`
  - Optional `<Number-answered>`
  - Optional `<Number-of-test-items-provided>`
  - Zero or more `<Other-score-property>` [156]

**Attributes**

- **Id** = Singular ID (implied)

**OCCURS IN** `<Options>` [152]

This element records the results of answering questions in a `<Questionnaire-object>` [174]. Subelements include:

- `<Proportion-correct>`, sets the property used to store the percentage of correctly answered questions.
- `<Number-correct>` [145], sets the property used to store the exact number of correctly answered questions.
- `<Number-wrong>` [146], sets the property used to store the exact number of wrongly answered questions.
- `<Number-answered>` [145], sets the property used to store the exact number of answered questions.
- `<Number-of-test-items-provided>`, identifies the property used to store the exact number of questions presented in the run. This number is fixed in the run.

These subelements all record the property by name using the `<Property-ref>` [170] subelement.
One may also specify any number of `<Other-score-property>` subelements.

**Attribute: Id**

The element has an identifier such that it can be referenced within the dossier.

**Element: Property**

**CONTENT**

- Any of
  - `<Boolean>` [56]
  - `<Integer>` [117]
  - `<Real>` [176]
  - `<String>` [198]
  - `<Date>` [74]
  - `<Url>` [219]
  - `<Text>` [209]
  - `<File>` [90]

**ATTRIBUTES**

- **Lifetime**= Enumeration Archive Delete (implied Delete)
- **Owner**= Enumeration Person Role Person-in-role (implied Person-in-role)
- **Id**= Singular ID (implied)
- **Worldwide-unique-id**= Singular CDATA (implied)
- **Label**= Singular CDATA (implied)
- **Type**= Singular CDATA (implied)

**OCCURS IN** `<General-properties>` [94] `<Learner>` [127] `<Property-group>` [169] `<Role>` [177] `<Staff>` [194]

Properties, together with `<Property-group>` [169]s, form the building blocks of the dossier (Conceptual outline - Dossiers and properties [31]) for a person in a role. A `<Property>` is a named value, that is (similar to the `<Property-group>` [169]) either declared within a particular role, or as a general property. The possible types of properties are recorded in the child elements of `<Property>` [168].

A property is always referenced using the `<Property>` [168]'s identifier (Id [233], Worldwide-unique-id=).

More on this issue can be found in Conceptual outline - Dossiers and properties [31].
Attribute: Label

The property label is the name of the property as shown in interactive systems that deliver EML specifications (e.g. the EDUBOX system).

Attribute: Type

Typical values are:

Element: Property-group

CONTENT

- Any of
  - One or more <Property>
  - One or more <Property-group>

ATTRIBUTES

- Lifetime= Enumeration Archive Delete (implied Delete)
- Owner= Enumeration Person Role Person-in-role (implied Person-in-role)
- Id= Singular ID (implied)
- Worldwide-unique-id= Singular CDATA (implied)
- Label= Singular CDATA (implied)
- Type= Singular CDATA (implied)

OCCURS IN <General-properties> [94] <Learner> [127] <Property-group> [169] <Role> [177] <Staff> [194]

The element <Property-group> [169] is a "wrapper" [241] for defining groups or subgroups of properties. This grouping mechanism has two functions:

- It is a means of structuring the features of a role (as expressed by individual properties).
- It allows users to view and manipulate complete sets of properties.

Element: Property-group-ref

CONTENT

- Empty

ATTRIBUTES

- Id-ref= Singular IDREF (implied)
- Ref-worldwide-unique-id= Singular CDATA (implied)

OCCURS IN <Property-information> [170] <Set-property-group-values> <View-property-group-values> [223]
This element references an existing property group in the dossier. See `<Property-ref>` [170] for an explanation.

Element: Property-information

**CONTENT**
- Any of One or more
  - `<Property-ref>` [170]
  - `<Property-group-ref>`

This element has no attributes

**OCCURS IN** `<Role-information-object>` [178]

This element indicates which property values or property group values should be shown as part of the role information. The properties are identified by normal property reference.

Element: Property-ref

**CONTENT**
- Empty

**ATTRIBUTES**
- `Id-ref=` Singular IDREF (implied)
- `Ref-worldwide-unique-id=` Singular CDATA (implied)

**OCCURS IN** `<Change-property-value>` [57] `<Divide>` `<Greater-than>` `<Is>` `<Is-not>` `<Less-than>` `<Multiply>` `<No-value>` `<Number-answered>` `<Number-correct>` `<Number-of-test-items-provided>` `<Number-wrong>` `<Number-score-property>` `<Performance-property>` `<Prerequisite-property>` `<Property-information>` `<Proportion-correct>` `<Score>` `<Set-property-value>` `<Subtract>` `<Sum>` `<View-property-value>` `<When-property-value-is-set>`

This element points to an existing property in the dossier. The `<Property-ref>` [170] element is used anywhere that a previously declared property has been identified. The interpretation of the element depends on its context:

- Set and view the value of a property (`<Set-property-value>` [186] and `<View-property-value>` [224])
- Reference the property that identifies a learning objective or prerequisite level (`<Performance-property>` [158] and `<Prerequisite-property>`).
- Deal with correct answers in a question (`<Properties>` [167] within `<Questionnaire-object>` [174]), or place the score in a property (`<Score>` [180])
- Compare the property value with other values in an expression or calculation (for example, `<If>` [99])
- *et cetera*
Element: Property-value

CONTENT

• Any of Zero or more
  • Characters
  • <Text-line> [211]

This element has no attributes

OCCURS IN <Change-property-value> [57] <When-property-value-is-set>

The value of a property. This value is built up using a combination of characters or text lines.

Element: Proportion

CONTENT

• Sequence of
  • Characters

This element has no attributes

OCCURS IN <Users-in-role> [220]

This element sets the proportion (as a percentage) of the number of users in a particular role for which a condition is true. This proportion is used in the sense of: "If 80% of the students that all play the role X have finished the activity Y, then continue". This is expressed in <Users-in-role> [220]:
  • <Role-ref> [179] (role X)
  • <Proportion> [171] (80)
  • <Complete> [64]/ <Activity-ref> [40] (activity Y completed)

Within expressions, this element produces a value of type boolean.

Element: Proportion-correct

CONTENT

• Sequence of
  • <Property-ref> [170]

This element has no attributes

OCCURS IN <Properties> [167]

This part of the <Questionnaire-object> [174] specifies the property storing the proportion of correct answers (out of all answers given).
Element: Provide-feedback

CONTENT

- Any of
  - <Immediately> [101]
  - <When-processing> [227]

This element has no attributes

OCCURS IN <Options> [152]

This element specifies whether feedback on questions in a <Questionnaire-object> [174] should be provided immediately (<Immediately> [101]) or when the complete questionnaire is processed (<When-processing> [227]).

See also the parent element for a description.

Element: Provide-hints

CONTENT

- Empty

This element has no attributes

OCCURS IN <Options> [152]

A "choice item" [242]. See the parent element for a description.

Element: Publisher

CONTENT

- Sequence of
  - Characters

This element has no attributes

OCCURS IN <Book> [54] <Chapter>

The publisher of a book.

This element is part of the APA bibliographic reference model, see <Literature> [133].

Element: Question

CONTENT

- Any of Zero or more
  - <P> [157]
  - <Emphasis> [80]
This element has no attributes


The question posed.

This element is a recurring part of the global design of questions within EML, see *Conceptual outline - Self-tests and interaction modelling* [33].

**Element: Question-answer**

**CONTENT**

- **Sequence of**
  - **Optional** <Metadata>
  - <Answer-options> [49]
  - **Sequence of One or more**
    - <Question> [172]
• <Answer> [47]

**ATTRIBUTES**

- **Version** = Singular CDATA (implied 1.0.0)
- **Worldwide-unique-id** = Singular CDATA (implied)
- **Id** = Singular ID (implied)
- **EML-version** = Singular CDATA (fixed 1.0)

**OCCURS IN** <Interactions> [117]

A set of question-and-answer pairs. The answer must be the correct answer. This element is typically used in the construction of FAQs (frequently asked questions). The answer may be hidden, shown or visibility may be determined by the user, in accordance with the <Answer-options> [49] element.

**Element: Questionnaire-items**

**CONTENT**

- Any of Zero or more
  - <Multiple-choice-question>
  - <True-false-question>
  - <Multiple-response-question>
  - <Sequence-question>
  - <Matching-question>
  - <Short-answer-question>
  - <Test-group> [208]
  - <Test-group-ref> [209]
  - <Test-item-ref> [209]

*This element has no attributes*

**OCCURS IN** <Questionnaire-object> [174]

A "wrapper" [241] for all questions that make up a <Questionnaire-object> [174].

**Element: Questionnaire-object**

**CONTENT**

- **Sequence of**
  - <Metadata> [136]
  - Any of
    - **Sequence of**
- `<Questionnaire-items>`
- Optional `<Options>`
- Optional `<Process>`
- `<External-questionnaire>`

**ATTRIBUTES**

- **EML-version** = Singular CDATA (fixed 1.0)
- **Link-name** = Singular CDATA (required)
- **Reusability** = Enumeration Reusable Not-reusable (implied Not-reusable)
- **Type** = Singular CDATA (implied)
- **Version** = Singular CDATA (implied 1.0.0)
- **Id** = Singular ID (implied)
- **Worldwide-unique-id** = Singular CDATA (implied)

**OCCURS IN** `<Environment>` [83]

This is a complete list of *Conceptual outline - Self-tests and interaction modelling* [33] that are dealt with as a whole, and processed in a particular way. It includes the following embedded elements:

- `<Metadata>` [136]
- `<Questionnaire-items>`, i.e. the questions that make up the questionnaire.
- `<Options>` [152], a formal specification of how to handle the questionnaire.
- `<Process>` [165], a specification showing how to process the scores of the items.
- `<External-questionnaire>`, a reference to a questionnaire that is accessible on the Internet. This is an alternative to supplying the list of items here.

**Attribute: Type**

Typical types are: 'self-assessment', 'enquiry'.

**Element: Questionnaire-object-ref**

**CONTENT**

- *Empty*

**ATTRIBUTES**

- **Id-ref** = Singular IDREF (implied)
- **Version-use** = Enumeration Current-version Bugfixes-allowed Small-updates-allowed Major-updates-allowed (implied Bugfixes-allowed)
- **Ref-worldwide-unique-id** = Singular CDATA (implied)
- **Use-version** = Singular CDATA (implied 1.0.0)
An "inclusion reference" to a `<Questionnaire-object>`.

Element: Random-presentation

CONTENT

- Empty

This element has no attributes.

OCCURS IN `<Options>`

A "choice item". See the parent element for a description.

Element: Real

CONTENT

- Any of Zero or more
  - Characters
  - `<Value-list>`

This element has no attributes.

OCCURS IN `<New-property>` `<Property>` `<Value>`

A real. The value is specified in content, which may include several `<Value-list>`s. Examples are '6.5', '1.', '0.00003'.

Element: Receive-announcements

CONTENT

- Sequence of
  - One or more `<Announcement-object-ref>`

This element has no attributes.

OCCURS IN `<Announcement-object>`

A "choice item". See the parent element for a description.

Announcements can be received from the announcement objects referenced by the embedded `<Announcement-object-ref>`.

Element: Receive-mail

CONTENT

- Sequence of
• One or more <Communication-object-ref>

This element has no attributes

OCCURS IN <Communication-object> [62]

This element models the possibility to receive mail sent out by particular communication-objects, identified in content.

Element: Right-answer-pattern

CONTENT
  • Sequence of
    • Characters

This element has no attributes

OCCURS IN <Short-answer-question> [187]

This is a pattern matching a right answer in a short answer question (<Short-answer-question> [187]). Several such elements in content indicate alternative right answers.

Element: Role

CONTENT
  • Sequence of
    • Optional <Information-for-role>
    • Any of Zero or more
      • <Property> [168]
      • <Property-group> [169]
    • Zero or more <Role>
    • Optional <Comment>

ATTRIBUTES
  • Link-name= Singular CDATA (implied)
  • Min-persons= Singular CDATA (implied)
  • Max-persons= Singular CDATA (implied)
  • Match-persons= Enumeration Exclusively-in-roles Not-exclusively (implied)
  • Type= Singular CDATA (implied)
  • Id= Singular ID (implied)

OCCURS IN <Learner> [127] <Role> [177] <Staff> [194]

This element allows for specific (sub)roles of learners (<Learner> [127]) or staff (<Staff> [194]) to be defined.
The sub-elements <Property> [168] and <Property-group> [169] serve to declare all relevant features or variables for all actors in the specified role.

Roles may contain subroles, which means they are defined as covering all aspects of the subroles (properties, privileges). An example is a mentor who is also a teacher.

Element: Role-choice

CONTENT

- Sequence of
  - One or more <Role-ref>

This element has no attributes

OCCURS IN <Continue> [67]

This element specifies that the actors playing any of the roles referenced in content (<Role-ref> [179]) may cause the play (<Play> [161]) to continue (<Continue> [67]).

Element: Role-information-object

CONTENT

- Sequence of
  - <Metadata> [136]
  - Any of
    - <Role-ref> [179]
    - <Self> [184]
    - Optional <Information-about-person>
    - Optional <Property-information>
    - Optional <Monitor-access-time> [138]
    - Optional <Monitor-activity-progression>

ATTRIBUTES

- EML-version= Singular CDATA (fixed 1.0)
- Link-name= Singular CDATA (required)
- Reusability= Enumeration Reusable Not-reusable (implied Not-reusable)
- Type= Singular CDATA (implied)
- Version= Singular CDATA (implied 1.0.0)
- Id= Singular ID (implied)
- Worldwide-unique-id= Singular CDATA (implied)

OCCURS IN <Environment> [83]
This object specifies what kind of information should be shown about a person playing a role in the
unit of study. It specifies:

- The actor concerned, about whom information should be shown. This may be
  - `<Self>`: the person who logged into the session (electronic delivery) or who
    was specified as the receiver of the specifications (other delivery).
  - `<Role-ref>`: some other actor.
- What actor information should be shown (name, address, telephone number et cetera)
  (`<Information-about-person>`).
- Which property values should be shown (`<Property-information>`).
- Which activities carried out by the actor should be monitored: access (`<Monitor-access-
  time>`) and/or the progression of the actor's activities (`<Monitor-activity-
  progression>`).

**Attribute: Type**

Typical types are: 'monitor', 'study advancement', 'student-related information'

**Element: Role-information-object-ref**

**CONTENT**

- Empty

**ATTRIBUTES**

- `Id-ref=` Singular IDREF (implied)
- `Version-use=` Enumeration Current-version Bugfixes-allowed Small-updates-allowed
  Major-updates-allowed (implied Bugfixes-allowed)
- `Ref-worldwide-unique-id=` Singular CDATA (implied)
- `Use-version=` Singular CDATA (implied 1.0.0)

**OCCURS IN** `<Environment>` [83]

An "Inclusion reference" [243] to a `<Role-information-object>` [178].

**Element: Role-ref**

**CONTENT**

- Empty

**ATTRIBUTES**

- `Id-ref=` Singular IDREF (implied)

A reference to a `<Role>`.

This element is primarily used in the regular sense, pointing to a previously defined `<Role>`. The element is also an operand in an expression, see `Conceptual outline - Conditions`. Within expressions, this element produces a value of type `boolean` (True when the role is played).

**Element: Roles**

**CONTENT**

- Sequence of
  - `<Learner>`
  - *Optional* `<Staff>`
  - *Optional* `<General-properties>`
  - *Optional* `<Comment>`

*This element has no attributes*

**OCCURS IN** `<Unit-of-study>`

This element specifies the roles within a single unit of study. There is always at least one learner (`<Learner>`). Additional supporting roles (`<Staff>`) may also be defined.

**Element: Row**

**CONTENT**

- Sequence of
  - One or more `<Entry>`

**ATTRIBUTES**

- **Rowsep** = Singular NMTOKEN (implied)
- **Valign** = Enumeration Top Middle Bottom (implied Bottom)

**OCCURS IN** `<Tbody>` `<Tfoot>` `<Thead>`

This element is part of the CALS table model. Its application is controlled by the authoring tools used.

**Element: Score**

**CONTENT**

- Sequence of
This element has no attributes


Specifies that the success or failure of an answer in a run should be recorded in a property, as specified in the subelement <Property-ref> [170].

This element is a recurring part of the global design of questions within EML, see *Conceptual outline - Self-tests and interaction modelling* [33].

### Element: Search

**CONTENT**

- Any of
  - <Free-text-search>
  - <Index-with-reference>
  - <Index-without-reference>

This element has no attributes

**OCCURS IN** <Index-search-object> [112]

This element specifies how the information available to the actor can be searched. This is expressed as "choice item" [242]s in content, i.e.:

- <Free-text-search> [93]: search over the full text.
- <Index-with-reference>: Search objects included and present an index with a reference to the resource.
- <Index-without-reference>: Search objects included but do not reference the original resources.

### Element: Second-category

**CONTENT**

- Any of Zero or more
  - <P> [157]
  - <Emphasis> [80]
  - <List> [132]
  - <Figure> [88]
  - <Formula> [91]
  - <Table> [205]
This element has no attributes

OCCURS IN <Item-pair> [124]

This element contains the specification of an item in the second category. The element is part of a matching question, see <Matching-question> [133].

Element: Section

CONTENT

• Sequence of
  • Optional <Metadata>
  • <Source> [190]

ATTRIBUTES

• Content-type= Singular NMTOKENS (implied)
• Version= Singular CDATA (implied 1.0.0)
• Id= Singular ID (implied)
• Worldwide-unique-id= Singular CDATA (implied)
• EML-version= Singular CDATA (fixed 1.0)

Sections are considered untyped portions of a text and are used to "section" the information by hierarchical relations. Sections may contain extensive metadata, and may consist of a mix of paragraph-level elements and subsections. Sections may be rather short (for example, containing a single example) or long (for example, span a complete 'chapter' or 'section' in a book).

The subelement `<Source>` holds the contents of the section.

**Element: Section-ref**

**CONTENT**

- `Empty`

**ATTRIBUTES**

- `Content-type` = Singular NM_TOKENS (implied)
- `Id-ref` = Singular IDREF (implied)
- `Ref-worldwide-unique-id` = Singular CDATA (implied)
- `Type` = Singular CDATA (implied)
- `Version-use` = Enumeration Current-version Bugfixes-allowed Small-updates-allowed Major-updates-allowed (implied Bugfixes-allowed)
- `Use-version` = Singular CDATA (implied 1.0.0)

**OCCURS IN** `<Additional-information>` `<Answer>` `<Answer-item>` `<Choice>` `<Comment>` `<Copyright-statement>` `<Correct-answer>` `<Description>` `<Entry>` `<Feedback>` `<Figure-text>` `<First-category>` `<Formula-text>` `<General-feedback>` `<Hint>` `<How>` `<Incorrect-answer>` `<Information>` `<Information-for-role>` `<Introduction>` `<Li>` `<Objective-description>` `<Other-objective>` `<Prerequisite-description>` `<Question>` `<Second-category>` `<Source>` `<Special>` `<Standard-message>` `<Statement>` `<Structured-source>` `<Text>` `<What>` `<When>` `<Why>` `<With-whom>`

A reference to a section defined elsewhere. When a `<Section-ref>` is found, the complete section is inserted at the reference point and all parts are evaluated in the context of that reference point.

**Element: Select-persons-in-role**

**CONTENT**

- `Sequence of`
  - `One or more `<Role-ref`

This element has no attributes
**Element: Self**

CONTENT

- **Empty**

_This element has no attributes_

**OCCURS IN** `<Role-information-object>` [178]

This element identifies the actor who is logged into the system, i.e. for whom the unit of study is now made available. For example, when student S accesses the role information object ( `<Role-information-object>` [178]), this is the student himself.

The only alternative to Self is an explicit reference to a role using `<Role-ref>` [179]. The `<Role-information-object>` [178] will then display information on all actors playing that role. Again, this concerns the current run.

**Element: Send-mail**

CONTENT

- **Sequence of**
  - **Optional** `<Standard-message>`
  - `<Send-to>` [184]
  - **Optional** `<Cc>`
  - **Optional** `<Bc>`
  - **Optional** `<Subject>`

_This element has no attributes_

**OCCURS IN** `<Communication-object>` [62]

This element shows that mail can be sent by the actor and defines the parameters for this process. This includes:

- a standard message ( `<Standard-message>` ), which may be elaborate, and is sent as specified to the receiver
- actors to send the message to (referencing the role of these actors)
- actors to send copies to (referencing the role of these actors)
- a subject line.
Element: Send-to

CONTENT

- **Sequence of**
  - *Optional* `<Select-persons-in-role>`
  - *Optional* `<All-persons-in-role>`

*This element has no attributes*

OCCURS IN `<Send-mail>` [184]

This element follows a standard model for specifying how the mail is sent, in this case who is immediately addressed by this mail. This model is as follows:

- Either: Specify that the sender must specify which actors, taken from a list, should receive the e-mail `<Select-persons-in-role>` [183].
- Or: Specify that all actors taken from a list should receive the e-mail `<All-persons-in-role>` [43].

Element: Sequence-question

CONTENT

- **Sequence of**
  - *Optional* `<Metadata>`
  - `<Question>` [172]
  - `<Answer-item>` [48]
  - **One or more** `<Answer-item>`
  - *Optional* `<Hint>`
  - *Optional* `<Feedback>`
  - *Optional* `<Score>`

ATTRIBUTES

- **Version**= Singular CDATA (implied 1.0.0)
- **Worldwide-unique-id**= Singular CDATA (implied)
- **Id**= Singular ID (implied)
- **EML-version**= Singular CDATA (fixed 1.0)

OCCURS IN `<Interactions>` [117] `<Questionnaire-items>` [174] `<Test-group>`

This question type requires the student to place a number of items in the correct sequence. This sequence is entered in the EML specification as a list of `<Answer-item>` [48] elements; the system shuffles these before offering the question to the student.
Element: Set-property-group-values

**CONTENT**

- Sequence of
  - <Property-group-ref>
- Zero or more <Notification>

**ATTRIBUTES**

- **Property-of** = Enumeration Self Supported-persons (implied Self)


This element allows the user to set a group of properties Conceptual outline - Dossiers and properties [31]. Setting properties can be done anywhere in textual content. See <View-property-value> [224] and <Set-property-value> [186] for explanations.

Element: Set-property-value

**CONTENT**

- Sequence of
  - <Property-ref> [170]
- Zero or more <Notification>

**ATTRIBUTES**

- **Property-of** = Enumeration Self Supported-persons (implied Self)


This element allows the user to set the value of a property Conceptual outline - Dossiers and properties [31]. Setting a property can be done anywhere in textual content. Optionally, once the
property is set this may be signalled by some <Notification> [144] elements. For example, when the user sets the accept-agreement property (accepting some agreement) this may be important for a staff member, who should be notified of this.

Element: Short-answer-question

CONTENT

- Sequence of
  - Optional <Metadata>
  - <Question>[172]
  - One or more <Right-answer-pattern>
  - Optional <Hint>
  - Optional <Feedback>
  - Optional <Score>

ATTRIBUTES

Version= Singular CDATA (implied 1.0.0)
- Worldwide-unique-id= Singular CDATA (implied)
- Id= Singular ID (implied)
- EML-version= Singular CDATA (fixed 1.0)

OCCURS IN <Interactions>[117] <Questionnaire-items>[174] <Test-group>

A question which requires a short answer to be specified (for example, typed in). The answer is matched against one or more answer patterns.

Element: Show

CONTENT

- Any of One or more
  - <Content-type>[66]
  - <Activity-ref>[40]
  - <Activity-structure-ref>
  - <Play-ref>[162]
  - <Unit-of-study-ref>

This element has no attributes

OCCURS IN <Else>[79] <Then>

This element specifies that the following information should be shown:

- All elements with a specified content type (as recorded in the Content-type= [232]
attribute on the element). This is expressed by the `<Content-type>` [66] child element.

- Activity (through `<Activity-ref>` child element).
- Unit of study (through `<Unit-of-study-ref>` [217] child element).
- Play (through `<Play-ref>`)
- Activity-structure (Through `<Activity-structure-ref>` [42])

The counterpart of this element is `<Hide>` [96], i.e.: hide these elements.

**Attribute: Type**

The parts of the specification that have to be shown. Each element that has a Type= [238] attribute can this be shown (<Show> [187]) / hidden (<Hide> [96]).

**Element: Show-answer**

**CONTENT**

- Empty

This element has no attributes

OCCURS IN `<Answer-options>` [49]

A "choice item" [242]. See the parent element for a description.

**Element: Show-city**

**CONTENT**

- Empty

This element has no attributes

OCCURS IN `<Information-about-person>` [115]

A "choice item" [242]. See the parent element for a description.

**Element: Show-country**

**CONTENT**

- Empty

This element has no attributes

OCCURS IN `<Information-about-person>` [115]

A "choice item" [242]. See the parent element for a description.
Element: Show-email

CONTENT

• Empty

This element has no attributes

OCCURS IN <Information-about-person> [115]

A "choice item" [242]. See the parent element for a description.

Element: Show-miscellaneous

CONTENT

• Empty

ATTRIBUTES

• Type= Singular CDATA (implied)

OCCURS IN <Information-about-person> [115]

A "choice item" [242]. See the parent element for a description.

Element: Show-name

CONTENT

• Empty

This element has no attributes

OCCURS IN <Information-about-person> [115]

A "choice item" [242]. See the parent element for a description.

Element: Show-roles

CONTENT

• Empty

This element has no attributes

OCCURS IN <Information-about-person> [115]

A "choice item" [242]. See the parent element for a description.

Element: Show-street

CONTENT

• Empty
Element: Show-telephone

CONTENT
  • Empty

Element: Show-zip

CONTENT
  • Empty

Element: Situational-factor

CONTENT
  • Empty

Element: Skill

CONTENT
  • Empty
Element: Source

CONTENT

- Any of Zero or more
  - <p> [157]
  - <Emphasis> [80]
  - <List> [132]
  - <Figure> [88]
  - <Formula> [91]
  - <Table> [205]
  - <Lemma> [129]
  - <Code-line> [59]
  - <Literature> [133]
  - <Audio> [51]
  - <Video> [222]
  - <Special> [192]
  - <View-property-value>
  - <View-property-group-values> [223]
  - <Set-property-value>
  - <Set-property-group-values>
  - <Interactions> [117]
  - <Internet-source> [119]
  - <Section> [182]
  - <Section-ref> [183]
  - <Comment> [60]

This element has no attributes

OCCURS IN <Knowledge-object> [125] <Section> [182]

The source of a <Knowledge-object> [125], i.e. the "wrapper" [241] for textual elements comprising the knowledge source.

Element: Spanspec

CONTENT

- Empty
**ATTRIBUTES**

- **Align**= Enumeration Left Right Center Justify Char (implied Left)
- **Char**= Singular CDATA (implied)
- **Charoff**= Singular NMTOKEN (implied)
- **Colsep**= Singular NMTOKEN (implied)
- **Nameend**= Singular NMTOKEN (required)
- **Namest**= Singular NMTOKEN (required)
- **Rowsep**= Singular NMTOKEN (required)
- **Spanname**= Singular NMTOKEN (required)

**OCCURS IN** `<Tgroup>` [211]

This element is part of the CALS table model. Its application is controlled by the authoring tools used.

**Element: Special**

**CONTENT**

- **Any of Zero or more**
  - `<P>` [157]
  - `<Emphasis>` [80]
  - `<List>` [132]
  - `<Figure>` [88]
  - `<Formula>` [91]
  - `<Table>` [205]
  - `<Lemma>` [129]
  - `<Code-line>` [59]
  - `<Literature>` [133]
  - `<Audio>` [51]
  - `<Video>` [222]
  - `<Special>` [192]
  - `<View-property-value>`
  - `<View-property-group-values>`
  - `<Set-property-value>`
  - `<Set-property-group-values>` [185]
  - `<Interactions>` [117]
This element is used to characterise pieces of text that should be marked as 'special' as they should be dealt with in a special way. The nature of <Special> treatment is indicated by the Content-type attribute.

Attribute: Content-type

Suggested values are 'Case' 'Example' 'Elaboration'

Element: Special-inline

CONTENT

• Any of Zero or more
  • Characters
    • <Bookmark> [55]
    • <EML-ref> [79]
    • <Internet-ref> [118]
    • <Emphasis> [80]
    • <Term> [207]
    • <View-property-value>
    • <Set-property-value>
    • <Comment-inline> [62]
    • <Special-inline> [193]
This element is used to characterise a number of words or phrases that should be marked as 'special' as they need to be dealt with in a special way. The nature of treatment of <Special-inline> [193] is indicated by the Content-type= attribute.

Attribute: Content-type

Suggested values are 'note', 'assumption', 'person' 'company'

Element: Staff

CONTENT

• Sequence of
  • Optional <Information-for-role>
  • Any of Zero or more
    • <Property> [168]
    • <Property-group> [169]
  • Zero or more <Role>
  • Optional <Comment>

ATTRIBUTES

• Link-name= Singular CDATA (implied)
• Min-persons= Singular CDATA (implied)
• Max-persons= Singular CDATA (implied)
• Match-persons= Enumeration Exclusively-in-roles Not-exclusively (implied)
• Type= Singular CDATA (implied)
• Id= Singular ID (implied)
**OCCURS IN** `<Roles>` [180]

This element is used to specify all kinds of roles of 'staff members' rather than learners. These actors *support* the learning process of the learners. Examples of such roles include 'teacher', 'expert', 'tutor' or 'project leader'.

The elements `<Property>` [168] and `<Property-group>` [169] are used to declare all relevant features or properties for all actors in the role.

**Attribute: Type**

The type of the role. Examples: 'coach', 'expert'.

**Element: Standard-message**

**CONTENT**

- *Any of Zero or more*
  - `<P>` [157]
  - `<Emphasis>` [80]
  - `<List>` [132]
  - `<Figure>` [88]
  - `<Formula>` [91]
  - `<Table>` [205]
  - `<Lemma>` [129]
  - `<Code-line>` [59]
  - `<Literature>` [133]
  - `<Audio>` [51]
  - `<Video>` [222]
  - `<Special>` [192]
  - `<View-property-value>`
  - `<View-property-group-values>`
  - `<Set-property-value>`
  - `<Set-property-group-values>`
  - `<Interactions>` [117]
  - `<Internet-source>` [119]
  - `<Section>` [182]
  - `<Section-ref>` [183]
  - `<Comment>` [60]
This element has no attributes

OCCURS IN <Send-mail> [184]

The standard message, or 'template' for the mail (<Send-mail> [184]) to be composed using a communication object (<Communication-object> [62]). In an interactive environment this message may be altered by the user before it is sent.

Element: Start-page

CONTENT

- Sequence of
  - Characters

This element has no attributes

OCCURS IN <Pages> [157]

The start-page of an article or chapter.

This element is part of the APA bibliographic reference model, see <Literature> [133].

Element: Statement

CONTENT

- Any of Zero or more
  - <P> [157]
  - <Emphasis> [80]
  - <List> [132]
  - <Figure> [88]
  - <Formula> [91]
  - <Table> [205]
  - <Lemma> [129]
  - <Code-line> [59]
  - <Literature> [133]
  - <Audio> [51]
  - <Video> [222]
  - <Special> [192]
  - <View-property-value>
  - <View-property-group-values>
  - <Set-property-value>
• `<Set-property-group-values>`
• `<Interactions>` [117]
• `<Internet-source>` [119]
• `<Section>` [182]
• `<Section-ref>` [183]
• `<Comment>` [60]

**ATTRIBUTES**
- **Statement-is**= Enumeration True False (required)

**OCCURS IN** `<True-false-question>` [215]

A statement that is either true or false, as specified in the `Statement-is` attribute. This element is part of a `<True-false-question>`.

**Element: Status**

**CONTENT**
- Any of Zero or more
  - **Characters**
    - `<Bookmark>` [55]
    - `<EML-ref>` [79]
    - `<Internet-ref>` [118]
    - `<Emphasis>` [80]
    - `<Term>` [207]
    - `<View-property-value>`
    - `<Set-property-value>`
    - `<Comment-inline>` [62]
    - `<Special-inline>` [193]
    - `<Figure-source>` [88]
    - `<Formula-source>` [92]

**ATTRIBUTES**
- **Type**= Singular CDATA (implied)

**OCCURS IN** `<Extra-meta>` [86]

Defines the status of the object. For example, if the object is translated this may be indicated in content.
**Attribute: Type**

Specifies the status definition type. For example, the type may be set to 'Translation', and the element's content may be: "English translation completed in November 2000".

**Element: String**

*CONTENT*

- Any of Zero or more
  - **Characters**
  - <Value-list> [221]

*This element has no attributes*

*OCCURS IN* <Property> [168] <Value> [221]

A string of characters. The value is specified in content, which may include several <Value-list> [221]s.

**Element: Structured-source**

*CONTENT*

- Any of Zero or more
  - <P> [157]
  - <Emphasis> [80]
  - <List> [132]
  - <Figure> [88]
  - <Formula> [91]
  - <Table> [205]
  - <Lemma> [129]
  - <Code-line> [59]
  - <Literature> [133]
  - <Audio> [51]
  - <Video> [222]
  - <Special> [192]
  - <View-property-value>
  - <View-property-group-values>
  - <Set-property-value>
  - <Set-property-group-values>
This element has no attributes

OCCURS IN <Meta> [135]

This element represents a structured piece of text, allowing lists, figures, and even complete sections to be specified as part of the text. Alternatively, unstructured-source represents relatively simple, 'running' text.

See also Conceptual outline - Recording textual information [34].

Element: Study-load

CONTENT

- Any of Zero or more
  - Characters
    - <Bookmark> [55]
    - <EML-ref> [79]
    - <Internet-ref> [118]
    - <Emphasis> [80]
    - <Term> [207]
    - <View-property-value>
    - <Set-property-value>
    - <Comment-inline> [62]
    - <Special-inline> [193]
    - <Figure-source> [88]
    - <Formula-source> [92]

This element has no attributes

OCCURS IN <Metadata> [136]

The registration of the study-load. This is not inherently related to the <Learning-objectives> [128] of an activity.

Element: Subject

CONTENT
• Sequence of
  • Characters

This element has no attributes

OCCURS IN <Notification> [144] <Send-mail> [184]

This element has two similar uses, i.e.:

* it specifies the subject of a mail message within a communication object (<Communication-object> [62], <Send-mail>).
* it specifies the subject of a notification, to be presented to the notified actor when the notification is activated.

Element: Subtitle

CONTENT

• Any of Zero or more
  • Characters
    • <Bookmark> [55]
    • <EML-ref> [79]
    • <Internet-ref> [118]
    • <Emphasis> [80]
    • <Term> [207]
    • <View-property-value>
    • <Set-property-value>
    • <Comment-inline> [62]
    • <Special-inline> [193]
    • <Figure-source> [88]
    • <Formula-source> [92]

This element has no attributes

OCCURS IN <Metadata> [136]

The element <Subtitle> [200] contains a subtitle.

See also <Title> [213].

Element: Subtract

CONTENT

• Sequence of
• *Any of*
  - `<Property-ref>` [170]
  - `<Activity-ref>` [40]
  - `<Unit-of-study-ref>`
  - `<Value>` [221]

• *Any of*
  - `<Role-ref>` [179]
  - `<Is>` [120]
  - `<Is-not>` [122]
  - `<And>` [44]
  - `<Or>` [153]
  - `<Not>` [143]
  - `<Sum>` [202]
  - `<Subtract>` [200]
  - `<Multiply>` [140]
  - `<Divide>` [76]
  - `<Greater-than>` [95]
  - `<Less-than>` [129]
  - `<Users-in-role>` [220]
  - `<No-value>` [145]
  - `<Time-unit-of-study-started>`
  - `<Time-activity-started>`
  - `<Current-time>` [73]
  - `<Complete>` [64]

• *Any of*
  - `<Property-ref>` [170]
  - `<Activity-ref>` [40]
  - `<Unit-of-study-ref>`
  - `<Value>` [221]

• *Any of*
  - `<Role-ref>` [179]
  - `<Is>` [120]
This element has no attributes


This element calculates the subtraction of two numerical operands. For example, it subtracts the values of two properties.

The element is an operand in an expression, see Conceptual outline - Conditions [28]. Within expressions, this element produces a value of type number.

Element: Sum

CONTENT

• Sequence of
  • Any of
    • <Property-ref> [170]
    • <Activity-ref> [40]
    • <Unit-of-study-ref>
    • <Value> [221]
    • Any of
- `<Role-ref>` [179]
- `<Is>` [120]
- `<Is-not>` [122]
- `<And>` [44]
- `<Or>` [153]
- `<Not>` [143]
- `<Sum>` [202]
- `<Subtract>` [200]
- `<Multiply>` [140]
- `<Divide>` [76]
- `<Greater-than>` [95]
- `<Less-than>` [129]
- `<Users-in-role>` [220]
- `<No-value>` [145]
- `<Time-unit-of-study-started>`
- `<Time-activity-started>`
- `<Current-time>` [73]
- `<Complete>` [64]

*Any of*

- `<Property-ref>` [170]
- `<Activity-ref>` [40]
- `<Unit-of-study-ref>`
- `<Value>` [221]

*Any of*

- `<Role-ref>` [179]
- `<Is>` [120]
- `<Is-not>` [122]
- `<And>` [44]
- `<Or>` [153]
- `<Not>` [143]
- `<Sum>` [202]
- `<Subtract>` [200]
This element has no attributes


This element calculates the sum of two numerical operands. For example, it adds the values of two properties.

The element is an operand in an expression, see Conceptual outline - Conditions [28]. Within expressions, this element produces a value of type number.

Element: Supplied

CONTENT

• Empty

ATTRIBUTES

• Type= Enumeration Supplied Not-supplied (implied)

OCCURS IN <Extra-meta> [86]

A metadata element.

Specifies whether the object is supplied in the working environment, or assumed to be available or accesible outside the environment.

Attribute: Type

Specifies whether the object is supplied.

Element: Support-role

CONTENT

• Sequence of
• One or more <Role-ref>

This element has no attributes

**OCCURS IN** <Objectives> [147]

This element specifies the objectives of the activity for the actor in a support role.

**Element: Synchronous-conference**

**CONTENT**

• Sequence of
  • <Medium> [135]
  • Optional <Duration>
  • Optional <Access-code>
  • <Participant> [158]
  • Optional <Observer>
  • <Conference-manager>
  • Optional <Moderator>

This element has no attributes

**OCCURS IN** <Communication-object> [62]

This element models a synchronous conference as a communication strategy. Typical examples are video conferences and chatboxes. Subelements define aspects of the conference such that the communication channel can be set up within a run.

**Element: Table**

**CONTENT**

• Sequence of
  • <Table-title> [206]
  • One or more <Tgroup>

**ATTRIBUTES**

• **Frame**= Enumeration Top Bottom Topbot All Sides None (implied)
• **Orient**= Enumeration Port Land (implied)
• **Pgwide**= Singular NMTOKEN (implied)
• **Rowsep**= Singular NMTOKEN (implied)
• **Tabstyle**= Singular NMTOKEN (implied)
• **Colsep**= Singular NMTOKEN (implied)
Tables are primarily related to a particular processing model. The CALS table model is used in EML. Tables are managed entirely by the authoring software, and are not part of EML in that sense. Subsequently, CALS table attributes and subelements are not described further in the EML reference manual.

This element is part of the CALS table model.

**Element: Table-title**

**CONTENT**

- Any of Zero or more
  - **Characters**
    - <Bookmark> [55]
    - <EML-ref> [79]
    - <Internet-ref> [118]
    - <Emphasis> [80]
    - <Term> [207]
    - <View-property-value>
    - <Set-property-value>
    - <Comment-inline> [62]
    - <Special-inline> [193]
    - <Figure-source> [88]
    - <Formula-source> [92]

*This element has no attributes*

**OCCURS IN** <Table> [205]

The title of a table.

This element is part of the CALS table model. Its application is controlled by the authoring tool used.
Element: Target-value

CONTENT
  • Sequence of
    • Characters

This element has no attributes

OCCURS IN <Performance-property> [158] <Prerequisite-property> [163]

This identifies the target value of property that records a prerequisite or objective level.

Element: Tbody

CONTENT
  • Sequence of
    • One or more <Row>

ATTRIBUTES
  • Valign= Enumeration Top Middle Bottom (implied Bottom)

OCCURS IN <Tgroup> [211]

This element is part of the CALS table model. Its application is controlled by the authoring tool used.

Element: Term

CONTENT
  • Any of Zero or more
    • Characters
    • <Bookmark> [55]
    • <EML-ref> [79]
    • <Internet-ref> [118]
    • <Emphasis> [80]
    • <Term> [207]
    • <View-property-value>
    • <Set-property-value>
    • <Comment-inline> [62]
    • <Special-inline> [193]
    • <Figure-source> [88]
    • <Formula-source> [92]
**ATTRIBUTES**

- **Normalised-term**= Singular CDATA (required)


This element marks an abbreviation, word or phrase in the text and indicates that the definition of that term is available elsewhere. Typically, a corresponding <Lemma> [129] element exists, which expands, defines and/or clarifies the term.

**Attribute: Normalised-term**

The normalised form of the term. This is the form that is copied in the corresponding <Lemma> [129]. When this attribute is not set, the textual content of <Term> is assumed to be in normalised form already. For example, the terms 'injure', 'blemish', 'damage' et cetera may be associated with the same normalised term 'injure'.

**Element: Test-group**

**CONTENT**

- **Sequence of**
  - **Optional** <Metadata>
  - **Any of Zero or more**
    - <Multiple-choice-question>
    - <True-false-question>
    - <Multiple-response-question>
    - <Sequence-question>
    - <Matching-question>
    - <Short-answer-question>

**ATTRIBUTES**

- **EML-version**= Singular CDATA (fixed 1.0)
- **Link-name**= Singular CDATA (required)
- **Reusability**= Enumeration Reusable Not-reusable (implied Not-reusable)
- **Type**= Singular CDATA (implied)
- **Version**= Singular CDATA (implied 1.0.0)
- **Id**= Singular ID (implied)
- **Worldwide-unique-id**= Singular CDATA (implied)
**OCCURS IN** `<Questionnaire-items>` [174]

This is a group of questions that can be reused as a whole.

The difference with a questionnaire (`<Questionnaire-object>` [174]) is that the latter may be processed in a particular way, and to this end it holds the options and declaration of processing strategy. The `<Test-group>` [208] is typically a set of questions that cover a particular field, and that must be handled in accordance with the processing defined on the containing questionnaire.

**Attribute: Type**

Typical types are: "Questions on knowledge", "traffic situations" et cetera

**Element: Test-group-ref**

**CONTENT**

- Empty

**ATTRIBUTES**

- `Id-ref` = Singular IDREF (implied)
- `Version-use` = Enumeration Current-version Bugfixes-allowed Small-updates-allowed Major-updates-allowed (implied Bugfixes-allowed)
- `Ref-worldwide-unique-id` = Singular CDATA (implied)
- `Use-version` = Singular CDATA (implied 1.0.0)

**OCCURS IN** `<Questionnaire-items>` [174]

An inclusion reference to a `<Test-group>` [208] element.

**Element: Test-item-ref**

**CONTENT**

- Empty

**ATTRIBUTES**

- `Id-ref` = Singular IDREF (implied)
- `Version-use` = Enumeration Current-version Bugfixes-allowed Small-updates-allowed Major-updates-allowed (implied Bugfixes-allowed)
- `Ref-worldwide-unique-id` = Singular CDATA (implied)
- `Use-version` = Singular CDATA (implied 1.0.0)

**OCCURS IN** `<Questionnaire-items>` [174]

An inclusion reference to a test item, i.e. a question. See `<Questionnaire-items>` [174] for a list of all possible items.
Element: Text

CONTENT

- Any of Zero or more
  - `<P>` [157]
  - `<Emphasis>` [80]
  - `<List>` [132]
  - `<Figure>` [88]
  - `<Formula>` [91]
  - `<Table>` [205]
  - `<Lemma>` [129]
  - `<Code-line>` [59]
  - `<Literature>` [133]
  - `<Audio>` [51]
  - `<Video>` [222]
  - `<Special>` [192]
  - `<View-property-value>`
  - `<View-property-group-values>` [223]
  - `<Set-property-value>`
  - `<Set-property-group-values>`
  - `<Interactions>` [117]
  - `<Internet-source>` [119]
  - `<Section>` [182]
  - `<Section-ref>` [183]
  - `<Comment>` [60]

This element has no attributes

OCCURS IN `<Property>` [168] `<Value>` [221]

A textual value for a `<Property>` [168]. The value may hold running text and text-level subelements.

Element: Text-conference

CONTENT

- Empty
This element has no attributes

OCCURS IN <Medium> [135]

A "choice item" [242]. See the parent element for a description.

Element: Text-line

CONTENT

• Sequence of

  • Characters

This element has no attributes

OCCURS IN <Property-value> [170]

Element: Tfoot

CONTENT

• Sequence of

  • Zero or more <Colspec>
  • One or more <Row>

ATTRIBUTES

• Valign= Enumeration Top Middle Bottom (implied Bottom)

OCCURS IN <Tgroup> [211]

This element is part of the CALS table model. Its application is controlled by the authoring tools used.

Element: Tgroup

CONTENT

• Sequence of

  • Zero or more <Colspec>
  • Zero or more <Spanspec>
  • Optional <Thead>
  • Optional <Tfoot>
  • <Tbody> [207]

ATTRIBUTES

• Align= Enumeration Left Right Center Justify Char (implied Left)
• Char= Singular CDATA (implied)
- **Charoff**= Singular NMToken (implied)
- **Cols**= Singular NMToken (required)
- **Colsep**= Singular NMToken (implied)
- **Rowsep**= Singular NMToken (implied)
- **Tgroupstyle**= Singular NMTokens (implied)

OCCURS IN `<Table>` [205]

This element is part of the CALS table model. Its application is controlled by the authoring tools used.

**Element: Thead**

**CONTENT**

- Sequence of
  - Zero or more `<Colspec>`
  - One or more `<Row>`

**ATTRIBUTES**

- **Valign**= Enumeration Top Middle Bottom (implied Bottom)

OCCURS IN `<Tgroup>` [211]

This element is part of the CALS table model. Its application is controlled by the authoring tools used.

**Element: Then**

**CONTENT**

- Any of
  - `<Show>` [187]
  - `<Hide>` [96]

This element has no attributes

OCCURS IN `<Conditions>` [65] `<Else>` [79]

This element contains a set of actions that need to be taken when this `<Then>` [212] element is selected as part of a condition. The condition is part of the `<Conditions>` [65] element, and is expressed as a sequence of `<If>` [99], `<Then>` [212] and `<Else>` [79] elements.

The child elements of the `<Then>` [212] and `<Else>` [79] elements determine whether a particular subset of elements should be shown or hidden (`<Show>` [187], `<Hide>` [96]).
Element: Time-activity-started

CONTENT

- Sequence of
  - <Activity-ref> [40]

This element has no attributes


This element represents the time that an activity started. The <Activity> [39] is referenced in content.

The element is an operand in an expression, see Conceptual outline - Conditions [28]. Within expressions, this element produces a value of type time.

Element: Time-unit-of-study-started

CONTENT

- Sequence of
  - <Unit-of-study-ref>

This element has no attributes


This element represents the time that a unit of study started. The <Unit-of-study> [216] is referenced in content.

The element is an operand in an expression, see Conceptual outline - Conditions [28]. Within expressions, this element produces a value of type time.

Element: Title

CONTENT

- Any of Zero or more
  - Characters
    - <Bookmark> [55]
    - <EML-ref> [79]
    - <Internet-ref> [118]
    - <Emphasis> [80]
    - <Term> [207]
    - <View-property-value> [224]
Element: Tool-object

CONTENT

- Sequence of
  - <Metadata> [136]
  - Optional <Internet-source>

ATTRIBUTES

- **EML-version** = Singular CDATA (fixed 1.0)
- **Link-name** = Singular CDATA (required)
- **Reusability** = Enumeration Reusable Not-reusable (implied Not-reusable)
- **Type** = Singular CDATA (implied)
- **Version** = Singular CDATA (implied 1.0.0)
- **Id** = Singular ID (implied)
- **Worldwide-unique-id** = Singular CDATA (implied)

OCCURS IN <Environment> [83]

An undefined tool that is accessible on the Internet, or is expected to be available in some other way, for example, in the possession of the user.

Attribute: Type

Possible types are: ‘calculator’, ‘thermometer’, ‘word processor’, *et cetera*

Element: Tool-object-ref

CONTENT
• **Empty**

**ATTRIBUTES**

• **Id-ref** = Singular IDREF (implied)
• **Version-use** = Enumeration Current-version Bugfixes-allowed Small-updates-allowed Major-updates-allowed (implied Bugfixes-allowed)
• **Ref-worldwide-unique-id** = Singular CDATA (implied)
• **Use-version** = Singular CDATA (implied 1.0.0)

**OCCURS IN** `<Environment>` [83]

An "inclusion reference" [243] to a `<Tool-object>` [214].

**Element: True-false-question**

**CONTENT**

• **Sequence of**
  • Optional `<Metadata>`
  • `<Statement>` [196]
  • Optional `<Statement>`
  • Optional `<Options-are-presented-as>`
  • Optional `<Hint>`
  • Optional `<Feedback>`
  • Optional `<Score>`

**ATTRIBUTES**

• **Version** = Singular CDATA (implied 1.0.0)
• **Worldwide-unique-id** = Singular CDATA (implied)
• **Id** = Singular ID (implied)
• **EML-version** = Singular CDATA (fixed 1.0)

**OCCURS IN** `<Interactions>` [117] `<Questionnaire-items>` [174] `<Test-group>`

A question that represents one or two statements. These `<Statement>` [196]s are true or false. The user must determine truth or falsity. The way the truth is represented is expressed by the `<Options-are-presented-as>` [153] element.

The reason why there only two alternatives is that the number of combinations in a three-part question (9 combinations) is considered too large for normal processing.

**Element: Type**

**CONTENT**
**Empty**

**ATTRIBUTES**
- **Emphasis-level** = Enumeration Emph-1 Emph-2 Emph-3 Emph-4 Emph-5 (implied)
- **Content-type** = Singular NM TOKENS (implied)

**OCCURS IN** `<Content-type> [66]`

This element records the type-related features of a particular content type.

**Attribute: Content-type**

This attribute records the name of the content type, modelled as a `<Content-type> [66]` element. Any element containing the `Content-type=` attribute is processed in line with this specification, i.e.:

- the emphasis level is expressed in `Emphasis-level=` [232]
- collapse and expand control is expressed in the sibling `<With-collapse-and-expand-control> [229]` element.

**Element: Type-to-index-on**

**CONTENT**
- **Empty**

**ATTRIBUTES**
- **Type** = Singular CDATA (implied)

**OCCURS IN** `<Index> [102]`

This element records an element type as recorded in the `Type=` [238] attribute. Elements with the type specified are indexed. Note that several such elements may be specified, thus covering several element 'types'.

**Attribute: Type**

The type name of the element, as it occurs in the elements that have the `Type=` attribute. This Type-to-index-on element itself is not considered part of this list.

**Element: Unit-of-study**

**CONTENT**
- **Sequence of**
  - `<Metadata> [136]`
  - `<Roles> [180]`
  - **Optional** `<Learning-objectives>`
Optional <Prerequisites>

Optional <Content>

<Method> [137]

**ATTRIBUTES**

- **EML-version**= Singular CDATA (fixed 1.0)
- **Link-name**= Singular CDATA (required)
- **Reusability**= Enumeration Reusable Not-reusable (implied Not-reusable)
- **Type**= Singular CDATA (implied)
- **Version**= Singular CDATA (implied 1.0.0)
- **Id**= Singular ID (implied)
- **Worldwide-unique-id**= Singular CDATA (implied)

This is a root element

This element is a "wrapper" [241] and contains:

- the general description of the unit of study (<Metadata> [136])
- the roles that are distinguished within the unit of study (<Roles> [180])
- the learning objectives and prerequisites of the unit of study (<Learning-objects> [128] and <Prerequisites>)
- the content (for example, information, exercises, instruments) of the unit of study (<Content> [66])
- implementation of the didactical strategy (<Method> [137]).

The element may be defined at different levels. It can be compiled as a complete curriculum, but also as its ingredients, such as a course, module or block. The curriculum then describes how the parts relate to each other.

**Attribute: Type**

The 'nature' of the Unit of study. Examples: 'Unit of study', 'Module', 'Course', 'Colloquium', 'Block', 'Class', 'Lectio', 'Lesson', 'Reading', 'Conference', 'Lecture', 'Discussion of progress', 'Study-group'.

**Element: Unit-of-study-ref**

**CONTENT**

- **Empty**

**ATTRIBUTES**

- **Ref-worldwide-unique-id**= Singular CDATA (implied)
- **Version-use**= Enumeration Current-version Bugfixes-allowed Small-updates-allowed Major-updates-allowed (implied Bugfixes-allowed)
- **Planning**= Enumeration Planned-with-this-uos Planned-when-selected (implied)
• **Use-version** = Singular CDATA (implied 1.0.0)

• **Link-name** = Singular CDATA (required)

**OCCURS IN**  

A reference to a unit of study (<Unit-of-study> [216]).

**Attribute: Planning**

This element determines how to plan the unit of study. This can be:

- Planned with the unit of study. The unit of study, when created, is immediately linked to the user.
- Planned when selected. The user must select the unit of study before it can be linked to that user.

For example, when a complete unit of study is selected (the complete study programme for example) the student is linked to all lower-level units of study. As this may not be a natural approach, the alternative path may be followed, where the unit of study is planned only when selected.

Of course, this is not an aspect of a unit of study in itself, but only of the composition of these units into a whole. Therefore the attribute is only part of the reference element.

**Element: Unlimited-number-of-test-trials**

**CONTENT**

- **Empty**

*This element has no attributes*

**OCCURS IN**  
<Number-of-test-trials> [146]

A "choice item" [242]. See the parent element for a description.

**Element: Unrestricted**

**CONTENT**

- **Empty**

*This element has no attributes*

**OCCURS IN**  
<Completed> [64]

A "choice item" [242]. See the parent element for a description.

**Element: Unstructured-source**

**CONTENT**
• Any of Zero or more
  • **Characters**
    • <Bookmark> [55]
    • <EML-ref> [79]
    • <Internet-ref> [118]
    • <Emphasis> [80]
    • <Term> [207]
    • <View-property-value> [224]
    • <Set-property-value>
    • <Comment-inline> [62]
    • <Special-inline> [193]
    • <Figure-source> [88]
    • <Formula-source> [92]

*This element has no attributes*

**OCCURS IN** <Meta> [135]

A wrapper for running text, i.e. text without internal structure at the paragraph level.

**Element: Url**

**CONTENT**

• **Sequence of**
  • **Characters**

*This element has no attributes*

**OCCURS IN** <Property> [168] <Value> [221]

A Uniform Resource Locator, or 'URL'.

A URL is a set of "URI" [241] schemes that have explicit instructions on how to access a resource on the Internet. The URL is therefore a URI scheme 'that is in use'. For URL syntax and use see RFC1738.

**Element: User-choice**

**CONTENT**

• **Empty**

*This element has no attributes*

**OCCURS IN** <Completed> [64]
A "choice item" [242]. See the parent element for a description.

Element: User-control

**CONTENT**

- **Empty**

*This element has no attributes*

**OCCURS IN** <Answer-options> [49]

A "choice item" [242]. See the parent element for a description.

Element: Users-in-role

**CONTENT**

- **Sequence of**
  - <Role-ref> [179]
  - *Optional* <Proportion>
  - **Any of**
    - <Role-ref> [179]
    - <Is> [120]
    - <Is-not> [122]
    - <And> [44]
    - <Or> [153]
    - <Not> [143]
    - <Sum> [202]
    - <Subtract> [200]
    - <Multiply> [140]
    - <Divide> [76]
    - <Greater-than> [95]
    - <Less-than> [129]
    - <Users-in-role> [220]
    - <No-value> [145]
    - <Time-unit-of-study-started>
    - <Time-activity-started>
    - <Current-time> [73]
• <Complete> [64]

This element has no attributes


This element determines the number of users that play a role referenced in content. Roles can be played by several actors, as expressed in the <Role> [177] attributes Min-persons= [235] and Max-persons= [235].

It is possible to define a proportion P (element <Proportion> [171] in content). This is evaluated in the context of the expression E that follows in content. This states that if for P percent of the users in the role the expression E succeeds, then the complete expression succeeds. Example: if 80% of all students have finished, the next activity may be started.

This element is an operand in an expression, see Conceptual outline - Conditions [28].

Element: Value

CONTENT

• Any of
  • <Boolean> [56]
  • <Integer> [117]
  • <Real> [176]
  • <Strings> [198]
  • <Date> [74]
  • <Url> [219]
  • <Text> [209]
  • <File> [90]

This element has no attributes


This element represents a literal value in an expression. The elements in the content model represent all possible value types. See also Conceptual outline - Dossiers and properties [31].

Element: Value-list

CONTENT

• Sequence of
  • <Possible-value> [162]

  One or more <Possible-value>
Optional <Default-value>

This element has no attributes

OCCURS IN <Date> [74] <Integer> <Real> [176] <String> [198]

A list of values for a <Property> [168]. When the property is typed as <Integer> [117], <Real> [176], <String> [198] or <Date> [74] a list of possible values may be supplied rather than a fixed value. In this case the value-list provides for two or more possible values, and a default. Any assigned value must be taken from this list.

Element: Video

CONTENT

• Sequence of
  • Optional <Metadata>
  • <Video-type> [222]
  • <Internet-source> [119]

ATTRIBUTES

• Content-type= Singular NMTOKENS (implied)
• Ref-worldwide-unique-id= Singular CDATA (implied)
• Version-use= Enumeration Current-version Bugfixes-allowed Small-updates-allowed Major-updates-allowed (implied Bugfixes-allowed)
• Use-version= Singular CDATA (implied 1.0.0)


A representation of a moving image.

Element: Video-conference

CONTENT

• Empty

This element has no attributes

OCCURS IN <Medium> [135]

A "choice item" [242]. See the parent element for a description.
Element: Video-type

**CONTENT**
- **Empty**

**ATTRIBUTES**
- **Nature** = Enumeration Life Streaming-file File (implied)
- **Type** = Enumeration Image Animation Running-video Story-board (implied)

**OCCURS IN** `<Video>` [222]

An element that identifies the type of video. There are two attributes for this: Type and Nature.

**Attribute: Type**

The type attribute is one of the following:
- Image
- Animation
- Running-video
- Story-board

**Attribute: nature**

The 'nature' of the object holding the video image. This may be any of the following:
- Life
- Streaming-file
- File

Element: View-property-group-values

**CONTENT**
- **Sequence of**
  - `<Property-group-ref>` [169]

**ATTRIBUTES**
- **Property-of** = Enumeration Self Supported-persons (implied Self)

This element inserts property group values Conceptual outline - Dossiers and properties [31] where they are referenced anywhere in textual content.

See <View-property-value> [224] for explanation.

Element: View-property-value

**CONTENT**

- Sequence of
  - <Property-ref> [170]

**ATTRIBUTES**

- Property-of= Enumeration Self Supported-persons (implied Self)


This element inserts a property value Conceptual outline - Dossiers and properties [31] where this is referenced anywhere in textual content. The property itself is referenced in content by the <property-ref> [170] element.

The property must be accessible to the actor, i.e. the property must be defined in the actor's dossier.

Element: Volume

**CONTENT**

- Sequence of
  - Characters

This element has no attributes

**OCCURS IN**<Article> [49]

A volume of a book or series.

This element is part of the APA bibliographic reference model, see <Literature> [133].
Element: What

**CONTENT**

- Any of Zero or more
  - `<P>` [157]
  - `<Emphasis>` [80]
  - `<List>` [132]
  - `<Figure>` [88]
  - `<Formula>` [91]
  - `<Table>` [205]
  - `<Lemma>` [129]
  - `<Code-line>` [59]
  - `<Literature>` [133]
  - `<Audio>` [51]
  - `<Video>` [222]
  - `<Special>` [192]
  - `<View-property-value>`
  - `<View-property-group-values>`
  - `<Set-property-value>`
  - `<Set-property-group-values>` [185]
  - `<Interactions>` [117]
  - `<Internet-source>` [119]
  - `<Section>` [182]
  - `<Section-ref>` [183]
  - `<Comment>` [60]

*This element has no attributes*

**OCCURS IN** `<Activity-description>` [39]

This element contains the specific instruction for the activity to be performed.

Element: When

**CONTENT**

- Any of Zero or more
  - `<P>` [157]
This element has no attributes

OCCURS IN <Activity-description> [39]

This element describes the specific circumstances under which the activity can be carried out.

Element: When-choice

CONTENT

• Sequence of
  • Optional <Feedback>
  • <Change-property-value>

ATTRIBUTES

• Id-ref= Singular IDREF (required)

OCCURS IN <Prompt> [166]
This element records the situation where a choice has been made out of a set of <Choice> [58]s within a <Prompt> [166] question.

**Attribute: Id-ref**

This value identifies a <Choice> [58] item within the same <Prompt> [166] element. When the identifier of the <When-choice> [226] matches the identifier of a <Choice> [58] selected in the run, a property is set (as specified by the <Change-property-value> element) and optionally some feedback is provided (<Feedback> [86]).

**Element: When-completed**

**CONTENT**

- **Empty**

This element has no attributes

**OCCURS IN** <Continue> [67]

A "choice item" [242]. See the parent element for a description.

**Element: When-condition-true**

**CONTENT**

- **Sequence of**
  - <Users-in-role> [220]
  - **Optional** <Comment>

This element has no attributes

**OCCURS IN** <Continue> [67]

This element signals the fact that an actor may continue the activities in a <Play> [161] only when the embedded condition succeeds.

**Element: When-processing**

**CONTENT**

- **Empty**

This element has no attributes

**OCCURS IN** <Provide-feedback> [171]

A "choice item" [242]. See the parent element for a description.
Element: When-property-value-is-set

CONTENT

• Sequence of
  • <Property-ref> [170]
  • Optional <Property-value>

This element has no attributes

OCCURS IN <Completed> [64]

A "choice item" [242]. See also the parent element for a description.

This element states that the task is completed when a particular property

• is set (no <Property-value> specified in content).
• is set to a particular value (<Property-value> [170] is specified in content).

The property is indicated by a property reference element.

Element: Why

CONTENT

• Any of Zero or more
  • <P> [157]
  • <Emphasis> [80]
  • <List> [132]
  • <Figure> [88]
  • <Formula> [91]
  • <Table> [205]
  • <Lemma> [129]
  • <Code-line> [59]
  • <Literature> [133]
  • <Audio> [51]
  • <Video> [222]
  • <Special> [192]
  • <View-property-value>
  • <View-property-group-values>
  • <Set-property-value>
  • <Set-property-group-values>
Element: With-collapse-and-expand-control

CONTENT

- Sequence of
  - Optional <Link-name>

This element has no attributes

OCCURS IN <Content-type> [66]

This element marks the fact that the user has control over collapse and expansion of the information structure in an interactive environment (such as the Edubox browser). In this browser context, the elements with the specified content type will be shown as trees in which nodes have been collapsed (hidden) or expanded (shown); users may click on that node (control the expansion) to change this situation.

Note that in this situation the link name (<Link-name> [132] subelement) is used to represent the collapsed subtree (as in a partial table of contents). There is only one exception to this rule, namely that the section title (<Section> [182]/<Title> [213]) is preferred rather than the link name.

Element: With-whom

CONTENT

- Any of Zero or more
  - <P> [157]
  - <Emphasis> [80]
  - <List> [132]
  - <Figure> [88]
  - <Formula> [91]
  - <Table> [205]
  - <Lemma> [129]
  - <Code-line> [59]
  - <Literature> [133]
• <Audio> [51]
• <Video> [222]
• <Special> [192]
• <View-property-value>
• <View-property-group-values>
• <Set-property-value>
• <Set-property-group-values>
• <Interactions> [117]
• <Internet-source> [119]
• <Section> [182]
• <Section-ref> [183]
• <Comment> [60]

This element has no attributes

OCCURS IN <Activity-description> [39]

This element allows one to describe actors with whom the <Activity> [39] must be carried out, e.g. fellow-students, groups, et cetera

Element: Year

CONTENT

• Sequence of

• Characters

This element has no attributes

OCCURS IN <Article> [49] <Book> [54] <Chapter> [57]

Year of publication.

This element is part of the APA bibliographic reference model, see <Literature> [133].

Attribute: Align


This attribute is part of the CALS table model.

Attribute: Base

ATTRIBUTE OF <Meta> [135]
The name of the standard metadata set that forms the basis of a `<Meta>` [135] element.

**Attribute: Char**


This attribute is part of the CALS table model.

**Attribute: Charoff**


This attribute is part of the CALS table model.

**Attribute: Class**

*ATTRIBUTE OF* `<Lemma>` [129]

The class of the `<Term>` [207] as specified in a `<Lemma>` [129].

**Attribute: Colname**

*ATTRIBUTE OF* `<Colspec>` [60] `<Entry>` [82]

This attribute is part of the CALS table model.

**Attribute: Colnum**

*ATTRIBUTE OF* `<Colspec>` [60]

This attribute is part of the CALS table model.

**Attribute: Cols**

*ATTRIBUTE OF* `<Tgroup>` [211]

This attribute is part of the CALS table model.

**Attribute: Colsep**


This attribute is part of the CALS table model.
Attribute: Colwidth

*ATTRIBUTE OF* `<Colspec>` [60]

This attribute is part of the CALS table model.

Attribute: Content-type


This attribute has three uses.

- The attribute assigns the element to a presentation category, the aspects of which are specified by a corresponding `<Content-type>` [66] element. This applies to `<Special>` [192], `<Special-inline>` [193], `<Audio>` [51], `<Video>` [222], `<Section>` [182], `<Type>` [215].

- The `<Content-type>` element includes the Content-type= attribute, which sets the presentation mode for all elements that have been assigned to this content type.

- The `<Content-type-reference>` element references a particular content type using this attribute.

Attribute: Default-visibility


Records the default visibility status of the element. This is either "show" or "hide". This status can be altered in the conditions section; see `<Conditions>` [65], and the `<Show>` [187] and `<Hide>` [96] elements.

Attribute: Description

*ATTRIBUTE OF* `<Meta>` [135]

The descriptive name of the metadata item modelled in a `<Meta>` [135] element. Example: "creator ".

Attribute: EML-version


Version number of the EML used to mark up the document.
Attribute: Emphasis-level

ATTRIBUTE OF <Emphasis> [80] <Type> [215]

The level of emphasis intended: low (1) or high (5).

Attribute: Entity

ATTRIBUTE OF <Figure-source> [88] <Formula-source> [92]

This is the declared XML entity (an unparsed external entity) that names the actual resource for the figure or formula.

Attribute: Frame

ATTRIBUTE OF <Table> [205]

This attribute is part of the CALS table model.

Attribute: Id


Unique identifier. Must be a unique and valid XML name, i.e. a name consisting of a combination of letters, digits, '!', '.', '?' and '_'. The identifier value is constrained to the current document. This means that one cannot reference an element by its identifier value from outside the document. For referencing components and parts thereof the Worldwide-unique-id= [240] is used (when available).

Attribute: Id-ref


A reference to an element by its identifier attribute value. Such references can only be made to elements within the same document.

See also the attribute Id= [233].
Attribute: Impsize

**ATTRIBUTE OF** `<Figure-source>` [88]

This attribute is part of the strategy by which figures are handled in the Edubox authoring environment. See `<Figure>` [88].

Attribute: Label

**ATTRIBUTE OF** `<Property>` [168] `<Property-group>` [169]

A property in a property group has a label containing the name of the property as shown in the interface. When no label is specified, any valid representation may be chosen (for example, the identifier value).

Attribute: Lifetime

**ATTRIBUTE OF** `<New-property>` [142] `<Property>` [168] `<Property-group>` [169]

The intended ‘lifetime’ of the `<Property>` [168] or `<Property-group>` [169].

The value ‘delete’ implies that after the run of the `<Unit-of-study>` [216] the value of the property should not be saved. The value ‘archive’ means that it should be saved. Properties will typically be saved to build a portfolio.

The element `<New-property>` [142] also has this property, which means that the lifetime can be specified when the property is introduced.

Attribute: Link-name


This is the name that can be used by the application to ‘classify’ the reference made by the element. This value, a short descriptive string, determines the way the reference is represented. For example, the link name of a reference to an Internet site ( `<Internet-source>` [119] ) could be the name of the company. The link name of a knowledge-object could be the title of the book that it represents.

In the EDUBOX online delivery the link-name appears in the tree headings in the environment, in the activity tree, and as tooltips in the running texts.

Attribute: Match-persons

**ATTRIBUTE OF** `<Learner>` [127] `<Role>` [177] `<Staff>` [194]

The `Match-persons` [234] attribute contains the rules by which a role may be played by persons.
Specific roles can only be accepted by one person, because that is a characteristic of the role. An example of this is the 'chairman' role. Because normally only one person can be chairman at a particular moment in the run, this role has the value "exclusively-in-roles".

Attribute: Max-persons

\textit{ATTRIBUTE OF} <Learner> [127] <Role> [177] <Staff> [194]

This attribute specifies the maximum number of persons that can play the role.

Attribute: Min-persons

\textit{ATTRIBUTE OF} <Learner> [127] <Role> [177] <Staff> [194]

This attribute specifies the minimum number of persons that must play the role.

Attribute: Morerows

\textit{ATTRIBUTE OF} <Entry> [82]

This attribute is part of the CALS table model.

Attribute: Nameend

\textit{ATTRIBUTE OF} <Entry> [82] <Spanspec> [191]

This attribute is part of the CALS table model.

Attribute: Namest

\textit{ATTRIBUTE OF} <Entry> [82] <Spanspec> [191]

This attribute is part of the CALS table model.

Attribute: Nature

\textit{ATTRIBUTE OF} <Audio-type> [52] <Video-type> [222]

This attribute defines the nature of the audio (<Audio-type> [52]) or video (<Video-type> [222]) object. See these elements for a complete description.

Attribute: Number-to-select

\textit{ATTRIBUTE OF} <Activity-selection> [40]

The number of activities in the select question.
Attribute: Orient

ATTRIBUTE OF <Table> [205]

This attribute is part of the CALS table model.

Attribute: Options

ATTRIBUTE OF <Options-are-presented-as> [153]

Specifies how to represent the options in a <True-false-question> [215].

Attribute: Owner

ATTRIBUTE OF <Property> [168] <Property-group> [169]

This attribute describes the owner of a property or property-group.

Values are:

- Role: the property is shared by all persons in the same role.
- Person-in-role (default): the property is part of the dossier of all individual persons in the role, but the property is associated with the current "run" [243].
- Person: the property is part of the personal dossier of the actor and therefore all persons in the role receive a copy of this property. This property is available outside the "run" [243]. This also means that if the property is altered, this effects all runs in which this particular property of this person is referenced!

Attribute: Pgwide

ATTRIBUTE OF <Table> [205]

This attribute is part of the CALS table model.

Attribute: Position

ATTRIBUTE OF <Special> [192] <Special-inline> [193]

Specifies how the <Special> [192] or <Special-inline> [193] can be treated when the information is processed or rendered. Position values are:

- In-flow. Text will be shown in flow, possibly after clicking on the link, without special features. It will then become an integrated part of the visual text flow. When a link is available the block is placed directly below the link.
- Block-in-flow. Text is placed (possibly after clicking on the link) in the position in text flow, but is visually marked, for example, as a 'box' (white background) or with coloured characters.
- Typed-block-in-flow. Same as above, but a type is added. This is the way the [Element] Special-with-p element is marked (the same type of texts will have the same symbols and type name above the text block).
• After-flow. This functions as a note behind the current flow in a separate display environment. As an example, these elements can be collected after the current flow in sequence, below which an enumeration is placed showing all existing texts marked 'after-flow'. The design is: the link is effectuated by link name, or marked by * when none specified; bookmark text is placed at the bottom and connects with the footnote marker or link.

• New-flow. This means that the text will be placed in a new flow. In the browser this means: a pop-up window. In print this means: in an appendix.

• Next-to-flow. This means that the contents should be displayed alongside the main flow.

Attribute: Property-of

ATTRIBUTE OF <Set-property-group-values> [185] <Set-property-value> [186] <View-property-group-values> [223] <View-property-value> [224]

Before setting or viewing property values, one must first specify whose property is intended. This may be either 'Self' or 'Supported-persons'.

• Self: The property is taken from the dossier of the actor for whom the current activity is intended.

• Supported-persons: the actors that the actor in the support role supports.

Attribute: Ref-worldwide-unique-id


An element that may reference any EML object outside the current document by specifying this attribute.

See also the attribute Worldwide-unique-id [240].

Attribute: Reusability


This attribute determines whether the element can be reused within other contexts. The arrangements of the element, including its discourse structure, determines the level of reuse allowed by the element.
Attribute: Rotate

ATTRIBUTES OF <Entry> [82]

This attribute is part of the CALS table model.

Attribute: Rowsep


This attribute is part of the CALS table model.

Attribute: Spanname

ATTRIBUTES OF <Entry> [82] <Spanspec> [191]

This attribute is part of the CALS table model.

Attribute: Statement-is

ATTRIBUTES OF <Statement> [196]

This attribute sets the truth or falsity of a <Statement> [196].

Attribute: Tabstyle

ATTRIBUTES OF <Table> [205]

This attribute is part of the CALS table model.

Attribute: Tgroupstyle

ATTRIBUTES OF <Tgroup> [211]

This attribute is part of the CALS table model.

Attribute: Type

This attribute ‘types’ the element. Many elements have this attribute. A set of possible values is given for each element.

In general, Type= serves two purposes:

- it classifies similar objects such that common operations can be defined for them.
- it offers the opportunity to use a different semantic model. For example, a unit of study is typed as "lecture".

**Attribute: Url**

```
ATTRIBUTE OF <External-program> [85] <External-questionnaire> <Internet-ref> [118]
<Internet-source> [119]
```

The specification of an Internet address, for example, http://www.ou.nl. This specification is used in different ways, depending on the nature of the element.

**Attribute: Use-version**

```
<Communication-object-ref> <EML-ref> [79] <Element-to-index-on> [79] <Environment-ref>
[85] <Figure-source> [88] <Formula-source> [92] <Index-search-object-ref> [113]
<Knowledge-object-ref> [126] <Learning-objective-ref> [128] <Personal-object-ref> [160]
<Prerequisite-ref> [164] <Questionnaire-object-ref> [175] <Role-information-object-ref>
[214] <Unit-of-study-ref> [217] <Video>
```

Determines which version to use when more than one version is available. The author of the EML specification determines which version to use in the delivery (selection from all available versions at runtime).

**Attribute: Valign**

```
```

This attribute is part of the CALS table model.

**Attribute: Version**

```
[62] <Environment> [83] <Index-search-object> <Knowledge-object> [125]
<Multiple-response-question> [140] <Personal-object> [159] <Prerequisite> [162]
[178] <Section> [182] <Sequence-question> [185] <Short-answer-question> <Test-group>
```

This is the version number of the object on which the Versions= attribute is defined.

The version number has a fixed syntax, i.e. a three-number "major-release.minor-release.bugfix".
Note: the EML-version= [232] attribute is not related to this attribute.

The Version-use= [240] attribute is set when a particular version of a referenced EML component is intended. The system converts this to a valid version number.

### Attribute: Version-use


Determines the version of the object referenced to be used. The following rules may apply:

- Only the current version
- Allow bugfixes on the version
- Small updates are allowed.
- Major updates allowed.

When a choice is made it is assumed that the reference does not point to an invalid version in the current context.

### Attribute: Worldwide-unique-id


This identifies an object that is certified to be unique throughout the world. All identifier type attributes must be translated to worldwide unique identifiers in order to certify that referencing is valid in all possible reuse situations.

Note that the majority of elements in EML with an Id= [233] attribute also have a Worldwide-unique-id= [240] attribute. This is because in XML there is no way to ascertain that no name collisions occur when elements are placed in a different context (i.e. when reused, see Conceptual outline - Reuse and retrieval). Exceptions to this rule are:

- `<Article>` [49], `<Book>` [54] and `<Chapter>` [57]; bibliographic references cannot be referenced from outside the current component
- `<Choice>` [58]. The element has an ID only in order to be able to provide feedback on a particular choice made (as defined using `<When-choice>` [226], within `<Prompt>` [166]). Note that this is defined as a CDATA attribute.
- `<Figure>` [88], `<Formula>` [91] and `<Table>` [205].
- `<Learner>` [127], `<Staff>` [194], `<Role>` [177], `<Activity-structure>` [42],
<Conditions> and <Play> [161]. These element may not be referenced from outside the unit of study they are part of. Note that <Role> [177] elements are referenced by <Role-ref> [179].

- <Lemma> [129].
- <Properties> [167].

Choice item

Some elements are modelled as so-called "choice-items". These elements are introduced to allow the creator of the component to make a choice. The elements thus functions as options in an 'option list'. The element is empty in most cases; exceptions occur when a more specific type of choice is to be specified (expressed in text content, of sub-element structure).

Several sets of choice items may well be expanded in later versions. An example of such an element is <With-collapse-and-expand-control> [229].

Wrapper

This element exists solely in order to group elements that together implement a specific functional part of EML. Examples are the top-level elements <Metadata> [136], <Learning-objectives> [128], <Method> et cetera

URI

Universal Resource Identifier, as defined in RFC2396.

A URI is a name for any resource. The URI specification determines how to construct such a name. The URI lexical form is identical to URL and URN forms, and consists of a scheme and a path specification:

```
scheme:path
```

The path is interpreted by the protocol parser for the scheme. For example:

```
xpath:/chapter//p
```

is an xpath scheme specification, that locates any descendant <p> element in the <chapter> root element. Reserved characters are:

- `\` for escape character
- `/` for path separator
- `.` and `..` substrings are used to denote relative paths
- `#` for separating the storage system's object path from a fragment specification within that object. Example: a bookmark.
- `?` separates the object specification in the path from a query, which uses the object as the starting point of retrieval.
- `*` and `!` are reserved for unspecified reasons.

The following examples illustrate URI that are in common use.
• ftp scheme for File Transfer Protocol services, for example, ftp://ftp.is.co.za/rfc/rfc1808.txt

• gopher scheme for Gopher and Gopher+ Protocol services, for example, Gopher://spinaltap.micro.umn.edu/00/Weather/California/Los%20Angeles

• http scheme for Hypertext Transfer Protocol services, for example, http://www.math.uio.no/faq/compression-faq/part1.html

• mailto scheme for electronic mail addresses, for example, mailto:mduerst@ifi.unizh.ch

• news scheme for USENET news groups and articles, for example, news:comp.infosystems.www.servers.unix

• telnet scheme for interactive services via the TELNET Protocol, for example, telnet://melvyl.ucop.edu/

Actor

An actor is a person that plays a role in a "run" [243]. In EML we do not model persons but rather roles that persons can play. Note that an 'actor' may also be a group of persons that all play the same role. A role in itself may be played by several persons at the same time (e.g. "student" role); this may only be restricted by the definition of that particular role.

Choice item

An element that exists solely or primarily to specify a choice made out of a set of such items.

Element

An element is a typed part of the XML document. It represents a piece of information or a structural unit. Information parts may be nested (information and sub-information, structure and substructure). Therefore the XML document may be viewed upon as a hierarchy, or tree, of elements. Typical elements are "address", "paragraph" and "section".

There is only one 'root element'. The type of root element determines the document type. Typical root elements are <report>, <book> and <letter>.

For the EML the root elements may be <Unit-of-study> or <Knowledge-object>.

Each element is associated with a particular presentation, both in the authoring environment and in the ultimate delivery environment. These presentation forms are very different; the information structure of the document is not inherently associated with any single presentation form.

IML

IML (Import Meta Language) is an Edubox specific XML application which defines how to import EML document into the Edubox database. It focusses on the mapping of medium-independent specifications to corresponding constructs for a particular output medium. This particularly concerns figures, formulae, video and audio. IML may change through time as the Edubox system evolves.

In order to create medium-neutral content in EML, some IML specification must accompany the main specification. A typical author only specifies the resources needed to compile a complete unit of study, knowledge object, and such; the implementation team defines the IML accordingly and
adds resources where appropriate.

Inclusion reference

A reference to an object that is to be inserted in the EML specification at the point of reference. This reference takes effect during a run.

Person

In EML perspective a person is an individual "actor" [242]. The main status of an individual person in the EML design is that it is assumed that he/she has a personal dossier containing properties defined in all study tasks in which the person has played a role.

Property

A property is a named value, stored in a dossier. The dossier is "owned" by an actor or actor group. Properties are defined, set and queried in a unit of study. Properties are typically defined for holding actor-specific information, results of assignments, upload material, et cetera.

Role

A role is a formal description of a person or group of persons that all take part in the activities of a unit of study. The role is very much the same as that in a play: the script does not identify persons but roles. When a person, or group of persons, play(s) the role that (group of) person(s) becomes an "actor" [242].

Run

An instantiation of a Unit of study. When the EML specification is 'run' all resources are instantiated and collected such that the activities can actually be performed by persons. The 'performance of a play'.