IMS Question & Test Interoperability Information Model Specification

Final Specification
Version 1.0

About This Document

Title	IMS Question & Test Interoperability Information Model Specification
Authors	Colin Smythe and Eric Shepherd
Version	1.0
Version Date	5th June, 2000
Status	**Final Specification.**
Summary	This document describes the IMS Question & Test Interoperability Information Model which is used to support question and test interoperability between different authors, publishers and other corresponding content developers.
Revision Information	Last revised 5th June, 2000
Purpose	Defines the Question & Test Interoperability Information Model.
Document Location	http://www.imsproject.org/question/qtinfo01.html

List of Contributors

The following individuals contributed to the development of this document:

Russell Almond	ETS	Eric Shepherd	Question Mark Corporation
Richard Johnson	Goal Design Inc	Colin Smythe	Dunelm Services Ltd
John Kleeman	Question Mark Computing Ltd	Linda Steinberg	ETS
Wayne Martin	Miami-Dade Community College		
Mike Pettit	Blackboard Inc		
Paul Roberts	Question Mark Computing Ltd		

Revision History

Version No.	Release Date	Comments
Base 1.0	23rd December, 1999	The first formally released version of the full IMS Question & Test Interoperability Information Model Base Document.
Public Draft 1.0	18th February, 2000	The first public released version of the full IMS Question & Test Interoperability Information Model Specification.
Final 1.0	5th June, 2000	The version 1.0 of the IMS Question & Test Interoperability Information Model Final Specification. The amendments from the Public Draft release are: • The meta-data elements have been added to each of the *assessmentmetada*, *sectionmetadata* and *itemmetadata* elements; • The *showdraw* attribute has been added to the render_hotspot elemet; • The objectives element has been added to relce the *assessobjectives*, *sectionobjectives* and *itemobjectives* elements; • The *varcontains* element has been renamed *varsubset*; The *setmatch* attribute has been added to the *varsubset* element to control set testing.

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1. Introduction

1.1 Overview

The IMS Question & Test Interoperability Information Model describes the data structures that are used to provide interoperability between question and test systems, particularly those that are Internet-based. The key data structures are those of:

- Assessment – the basic test unit;
- Section – a container for groups of sections and items which support a common objective;
- Item – the fundamental self-contained question/response block within which the individual questions are contained.

It is also possible to exchange multiple Assessments and any combination of Assessments, Sections and Items within a single data structure. The principal aim of the specification is to allow users to import and export their question (termed Items and grouped in Sections) and test (termed Assessments and containing Sections) materials. This requires a clear, concise and unambiguous specification that caters for a wide range of types of questions and test. This specification is constructed such that it is capable of supporting both complex and simple question and test materials, and allows for proprietary extensions that do not compromise the rest of the specification.

The information model representation is based upon object oriented Unified Modelling Language (UML). In the XML binding specifications this UML representation will be mapped to an Extensible Mark-up Language (XML) implementation.

Conformance to the Information Model is declared and defined within the Question & Test Interoperability Best Practice & Implementation Guide. Due to the complexity of the Information Model there are many ways in which a vendor can claim conformance to the specification and so it must not be assumed that conformance equates to the support of the full range of functions and capabilities defined within the Information Model.

1.2 Scope & Context

This document is the IMS Question & Test Interoperability (Q&TI) Information Model Base Document. As such it will be used as the basis for the production of the following documents:

- IMS Question & Test Interoperability XML Binding Specification v1.0;
- IMS Question & Test Specification Best Practice & Implementation Guide v1.0 document.

This requirement has been derived from the agreed IMS Q&TI Requirement Specification [QTI, 99a].

At some point in the future a Version 2.0 of the Information Model will be developed. That version will extend the functions and capabilities of version 1.0 but will be backwards compatible except for those areas identified as extensions and/or for further study.

1.3 Structure of this Document

The structure of the rest of this document is:

2.	SPECIFICATION USE CASES:	The underlying usage, processing control and data structures comprising the question and test interoperability system;
3.	QUESTIONS, ITEMS AND RESPONSES:	The taxonomy of responses and their relationship to question/items;
4.	BASIC INFORMATION MODEL:	The underlying question and test interoperability information model;
5.	CONCEPTUAL DESCRIPTION OF THE DATA OBJECTS:	The detailed description of the Assessment, Section and Item objects in terms of their elements, sub-

	elements and attributes;
6. META-DATA DESCRIPTIONS:	The item, section and assessment meta-data descriptions;
7. CONFORMANCE STATEMENT	The definition of Conformance to be used by vendors;
APPENDIX A – DETAILED OBJECT MODEL	The detailed class and object model for the Assessment, Section and Item objects.

1.4 List of Abbreviations

ASI	Assessment, Section and Item
FIB	Fill In Blank
IHS	Image Hot Spot
LDS	Logical Data Structure
LMS	Learning Management System
Q&TI	Question & Test Interoperability
UML	Unified Modelling Language
XML	Extensible Markup Language

1.5 References

[ETS, 99] *A Sample Assessment Using the Four Process Framework*, R.Almond, L.Steinberg and R.Mislevy, ETS Working Paper, October 1998.

[QTI, 99a] *IMS Question & Test Interoperability Requirement Specification*, C.Smythe, Version 1.0, Draft 0.3, IMS, November 1999.

[QTI, 00a] *IMS Question & Test Interoperability XML Binding Specification*, C.Smythe and Eric Shepherd, Version 1.0, IMS, May 2000.

[QTI, 00b] *IMS Question & Test Interoperability Best Practice & Implementation Guide Document*, C.Smythe and Eric Shepherd, Version 1.0, IMS, May 2000.

[RFC1521] *MIME (Multipurpose Internet Mail Extensions) Part One: Mechanisms for Specifying and Describing the Format of Internet Message Bodies*, N.Borenstein and N.Freed, IETF, IETF Request for Comment, September 1993.

[RFC1630] *Universal Resource Identifiers in WWW: A Unifying Syntax for the Expression of Names and Addresses of Objects on the Network as used in the World-Wide Web*, T. Berners-Lee, IETF, IETF Request for Comment, June 1994.

2. Specification Use Cases

The Requirement Specification [QTI, 99a] introduced the base Q&TI system architecture. The underlying process components (circles) and data structures (thin rectangles) and the actors (stick-people) are shown in Figure 2.1.

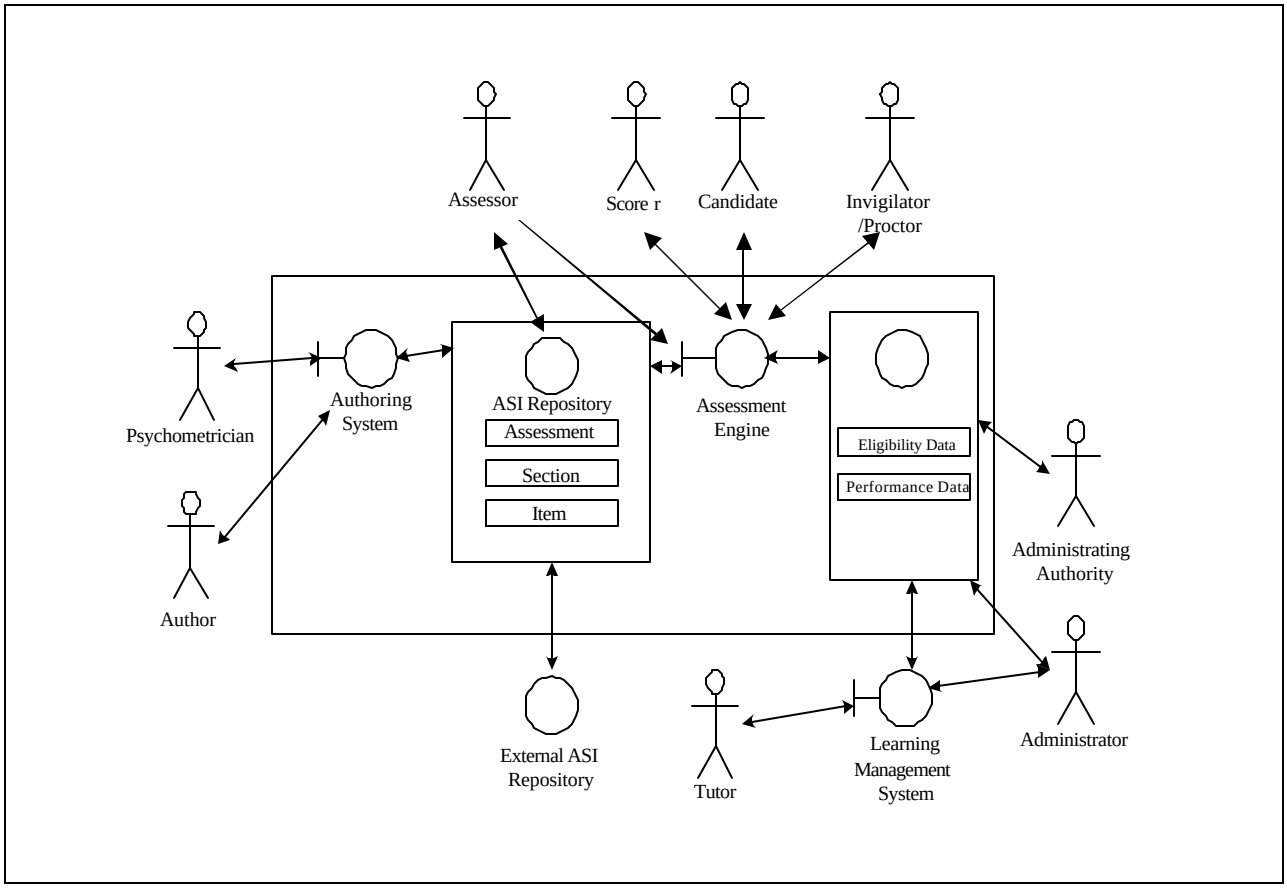


Figure 2.1 Assessment system component representation.

The key components of the assessment system are:

- Authoring system – the process that supports the creation and editing of the Assessments, Sections and Items (ASIs);
- Assessment engine – the process that supports the evaluation of the responses in terms of producing ASI related scores, evaluation and feedback;
- Learning management system – the process/system which is responsible for the management of the entire learning architecture;
- Candidate data repository – the database of the candidate specific information. The eligibility content is outside of the scope of the Q&TI specifications whereas the Examinee record information will be addressed by later versions of this specification;
- ASI repository – the database of the local ASIs;
- External ASI repository – the databases of the external ASI that will be imported through the use of the Q&TI specifications.

The Version 1.0 IMS Q&TI Information Model is concerned with the specification of the *ASI* data structures. Throughout the detailed information model description the term 'view' will be used to describe the perspective of

the system as perceived by a particular actor. As such different actors will have access to similar functions but the content will reflect the nature of the actor.

A range of Use-cases are possible but only three are presented as examples of this current version of the specification:

- Authoring – creation and editing of the ASIs;
- High-stakes Assessment – candidate examination;
- Low-stakes Assessment – tutor support using the ASIs.

2.1 Authoring Use-case

The sequence of processing, with respect to the ASI data structures is:

- The Author launches the Authoring System;
- The *Author* then creates, or modifies, *Items*, *Sections* and/or *Assessments*. These are then exported using this Q&TI specification and stored in some external database. The ASI data structures can consist of complex groups based upon multiple *Assessments* and/or multiple recursive *Sections* and/or multiple *Items*;
- The Author may import ASIs that will be used to create the new ASIs. These imported ASIs will also conform to the Q&TI specifications;
- One of the key responsibilities of the author is to determine the response-type and to map this to the appropriate rendering type. This mapping will depend upon the educational objective of the Item. Similarly, the Section and/or Item groupings, selection and sequencing will be dependent upon the educational objectives of the ASI unit. The author is also responsible for supplying the actor view specific information – this is important as it will help the users appreciate how the material is to be used;
- The Psychometrican sets Item weights and parameters in the Assessment and may reference Assessment records (pre-test data);

2.2 Assessment Use-cases

2.2.1 High-stakes Assessment Use-case

The *Assessment Engine* process is responsible for realising this activity (the basic processing scheme is derived from the ETS framework [ETS, 99]). It is important to note that the internal operation of the *Assessment Engine* is beyond the scope of this specification. This use-case is included because it justifies some of the structural components that must be defined within the ASIs. The Assessment Engine's assessment processing sequence is:

- The *Assessor* constructs/selects the ASIs to be used throughout the assessment procedure. These ASIs will be stored in some internal database and as such the dynamic sequencing information must be self contained;
- The assessment is activated by the *Candidate* and this activity is monitored by the *Invigilator/Proctor.* The *Candidate* responds to the ASIs and produces a set of *Responses*, again stored internally. The *Responses* are the set of Item identifiers plus associated information that accurately characterise the response;
- Either synchronously or asynchronously each *Response* will be evaluated by the *Response Processing* to construct the initial score (the scoring information is a part of the *Item* data structure). This scoring requires the usage of a set of *Evidence Rules* that are used to define the key parameters through which the responses are to be evaluated. The resulting Item evaluation is stored in the *Outcomes* data structure. If an Item is to be reused in two different assessments (e.g. high-stakes selection or low-stakes tutoring), then the same content with different response processing and accumulation can be used. In this case, Authoring Systems would be responsible for changing the associated outcome description and response processing, as well as accumulation data and parameters;
- *Accumulation Processing* now takes place in which the *Outcomes* are analysed and collated in terms of the weighting, etc. defined as part of the *Section* data structures. This information is stored as part of the *Assessment Record* (this data structure will be formally defined in Version 2.0 of this specification);

- The final stage of assessment processing is the *Assessment Accumulated Process* in which the *Assessment Record* is further processed with respect to the *Assessment* data structure level instructions;
- The final stage of processing is feedback of the *Assessment Record* to the *Activity Selection* that may in turn result in a modification of the ASIs presented to the *Candidate*.

2.2.2 Low-stakes Assessment Use-case

The Tutor use-case is similar to the Assessment use-case. The differences are that the Candidate will receive a range of feedback information including hints and one or more possible solutions. The Assessment Engine's tutor processing sequence is:

- The *Tutor* constructs/selects the ASIs to be used throughout the tutoring procedure. These ASIs will be stored in some internal database and as such the dynamic sequencing information must be self contained. Candidates may be able to act as their own tutor with some control over their activity selection;
- The tutor session is activated by the *Candidate*. The *Candidate* responds to the ASIs and produces a set of *Responses*, again stored internally. The *Responses* are the set of item identifiers including response-type identifiers plus associated information that accurately characterise the response;
- Each *Response* is evaluated by the *Response Processing* to construct the *Item* store. This scoring requires the usage of a set of *Evidence Rules* that are used to define the key parameters through which the responses are to be evaluated. The resulting Item evaluation is stored in the *Outcomes* data structure. This information is then used to generate Feedback e.g. *Hints* or to reveal a partial or complete *Solution*.

The rest of the processing is as per the Assessment use-case.

3. Questions, Items and Responses

The terminology adopted for the Q&TI is that an *Item* is defined as the fundamental block that contains one or more questions and responses. As such the concept of an *Item-type*, or for that matter question-type, is inappropriate and so the fundamental reference identity will be based upon *Response-type*. The *Response-type* is the unique identifier for the type of response required from the user e.g. a selection for a multiple-choice question or a string for a fill-in-blank question.

3.1 A Response-type Taxonomy

The adopted response-type taxonomy is shown in Figure 3.1. An IMS Response-type can be *Basic* or *Composite* (the third category is the Proprietary group):

- Basic – one that contains only a single type of response;
- Composite – a composite response-type refers to a response that acts as a *container* for (sub-) response, normally different combinations of the basic response-types. The series of the sub-response-types are usually related to each other thereby constructing a thematic item.

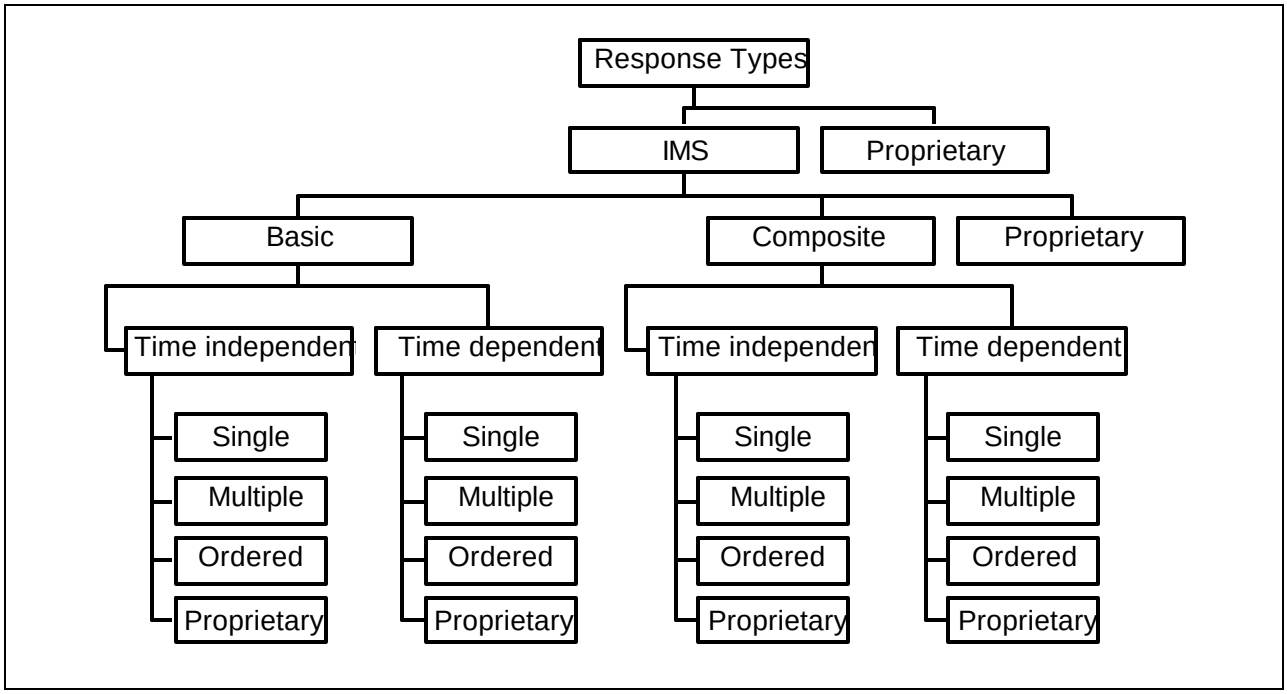


Figure 3.1 A response-type taxonomy.

The taxonomies below the Basic and Composite categories are identical. The next sub-division is based upon:

- Time Dependent – the time taken to respond is important and must be recorded. This could be used by response-types which set a sequence of events to be completed in a predefined period or where the sequence of response-types is determined by the time taken to complete certain responses;
- Time Independent – the time taken to respond is not significant;
- The final level of categorisation in Figure 3.1 is based upon the number of actions required from the user. This categorisation gives rise to Table 3.1.

Table 3.1 User action classification.

Response-type	Basic	Composite
Single	A single user response with each item consisting of a single response-type.	A single user response with each item consisting of more than one response-type. Some of the responses will therefore be 'null'.
Multiple	One or more user responses with each item consisting of a single response-type.	One or more user responses with each item consisting of more than one response-type. Some of the responses may be 'null'.
Ordered	One or more user responses with each item consisting of a single response-type, and the order of selection being significant.	One or more user responses with each item consisting of more than one response-type, and the order of the selection being significant. Some of the responses may be 'null'.

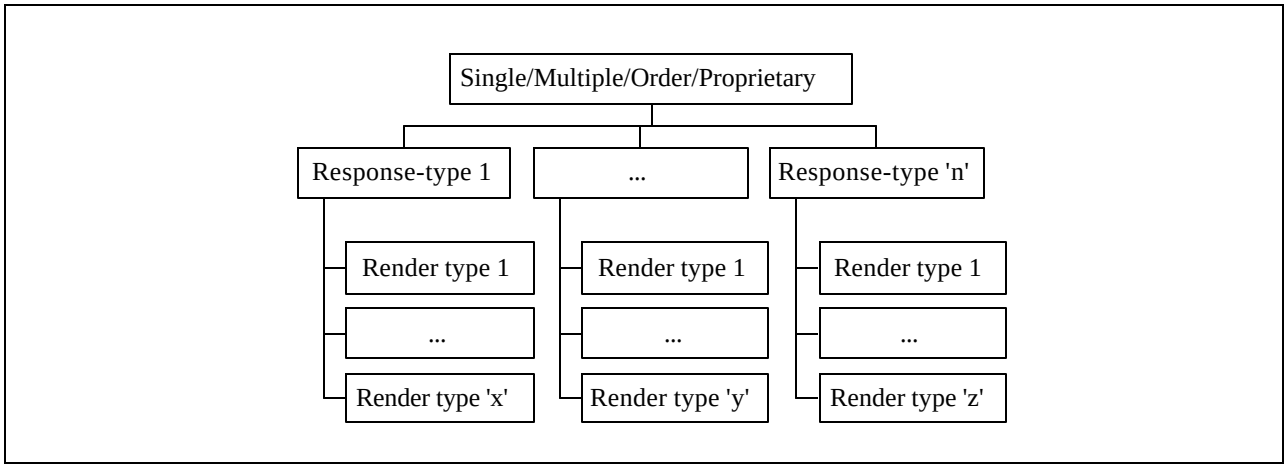
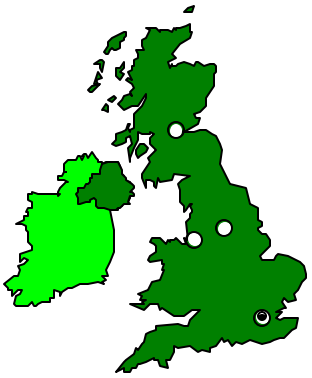


Figure 3.2 The relationship between response-type and rendering.

Which *city* is the capital of *England* ?

- ○ Sheffield
- ◉ London
- ○ Manchester
- ○ Edinburgh

Figure 3.3a Standard text-based rendering of a multiple choice question.



Which *city* is the capital of *England*?

Figure 3.3b Hot-spot rendering of a multiple choice question.

The next level of taxonomy of the Response-type is shown in Figure 3.2. In Figure 3.2 the relationship between the response type and the different presentation formatting, or rendering, is shown. For each of the classifications there are a number of Response-types and for each Response-type there are one or more ways of rendering that response selection. An example of this multiple rendering is shown in Figures 3.3a and 3.3b. In these two examples the same question is asked ('Which city is the capital of England ?') but it is presented/rendered in two different formats[1]:

- Figure 3.3a – using a standard list of text responses with radio buttons;
- Figure 3.3b – using a graphic with marked hot-spots.

The feature of these two renderings is that the same generic action is required of the user – the identification of one correct piece of information from several possible options. The classification scheme is independent of the possible rendering formats because this is a reflection of the rendering engine and the educational objectives. The reason for adopting this form of categorisation is that it is independent of the actual response-types and focuses on the actions required of the user. This means that:

- New response-types can be readily added without altering the classification scheme;
- Rendering is independent of the classification schemes;
- User actions are accurately represented thereby reflecting the required data flow.

3.2 Response-types

The primary objectives of defining the response-types are to establish a common vocabulary and naming conventions and to establish the underlying data structure requirements.

3.2.1 Basic Response-types

The basic response-types explicitly supported by this specification are listed in Table 3.2. Table 3.2 shows the relationship between the Response-types, the more colloquially identified question types and the Single/Multiple/Ordered classification schemes adopted by this specification. This representation uses the colloquial-types as the rendering forms for the Response-types.

The five Response-types become the core information model response-type objects. The three single/multiple/ordered categories become attributes of the basic response-type class, the five instances of which become the response-types. A range of rendering types can then be applied to these response types i.e. the rendering type is the presentation format of the response-type to the user.

The colloquial question types supported by this specification are[2]:

- True/false – multiple choice question with either a true or false response identified by the response identity;
- Multiple choice – multiple choice question with one of the available choices identified by the response identity;
- Multiple response – multiple choice question with one or more of the choices identified by the response identities;
- Image hot spot (IHS) – the response-type is the location on a graphic identified by the 'x-y' co-ordinates of the point of selection;
- Fill-in-blank (FIB) – formatted entry place for text or integer/decimal/scientific number identified by the entered information. The response-type is either a string or integer/decimal/scientific number respectively for each response identity;
- Select text – identification of text from a presented paragraph or list. The response is the identified string or a mapping to a logical identifier;
- Slider – selection of an integer or real number from a predefined minimum and maximum with a set increment. The response-type is a real or integer number, or a mapping to a logical identifier;

[1] The two examples in Figure 3.3 are based upon different educational objectives but this not a consideration of the specification. The example clearly demonstrates that a multiple-choice question can be rendered in more than one way.
[2] Examples of all of these colloquial question types and their usage in rendering the response-types is given in the IMS Q&TI Best Practice & Implementation Guide [QTI, 00b].

- Drag object – these objects are moved into predefined object locations. The response type is identified by the pairing of the source object with the target object identities;

Table 3.2 Basic response-types[3].

Response-type	Data Structure	Rendering Formats		
		Single	Multiple	Ordered
Logical Identifier (LID)	The response-type identity or list of identities. The order of the list is first choice, second choice, etc.	Multiple choice True/false Slider	Multiple response	Order objects Connect-the-points Match item Drag object Drag target
X-Y Co-ordinates (XY)	The 'x-y' co-ordinates of the centre of the object for each response identity or a list of 'x-y' co-ords. The order of the list is first choice, second choice, etc.	Image hot spot	Order objects	Connect-the-points
String (STR)	The typed string for each response identity.	Fill-in-blank Select text Short answer Essay		
Numerical (NUM)	The entered number for each response identity.	Fill-in-blank Slider		
Logical Groups (GRP)	The response identity and group identity tuples for each matched set of objects.		Match item Drag object Drag target	

- Drag target – objects are dropped into the target object. The response-type is identified by the pairing of the target object with the moved object identities;
- Ordered Objects – the re-ordering of scrambled text or text lines or a set of objects have to be moved to pre-defined locations on a page. The response is identified by either the set of 'x-y' co-ordinates of the response identities or their logical group;
- Match item – object from each list has to be grouped together. The response-type is an n-tuple of the set of matched items such that for each object its response identity and group number are recorded;
- Connect the points – the ordered connection of a set of points. The response-type is a set of 'x-y' co-ordinates or LIDs.

All of these colloquial question types can be supported by the five response-types listed in Table 3.2. In many cases the response-types can be rendered using different colloquial question types and so the rendering engine must be supplied with sufficient information to map back to the response-type. It is the response type that is used to drive the scoring and feedback mechanism.

[3] Examples of all of these Response-types is given in the IMS Q&TI Best Practice & Implementation Guide [QTI, 00b].

3.2.2 Composite Response-types

Composite Response-types are responses in which the user will have to answer two or more basic response-types (these basic types may be the same)[4]. Examples of two composite Response-types are shown in Figure 3.4 (based upon several response-types of the same type) and 3.5 (based upon two different response-types – multiple choice and FIB).

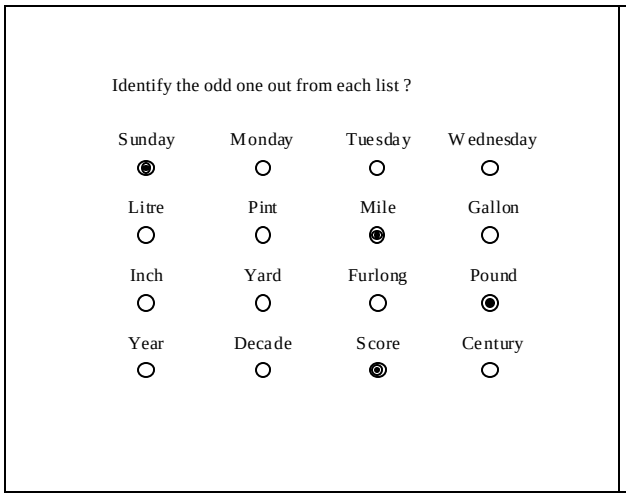


Figure 3.4 Composite response-type based upon the same basic response-types.

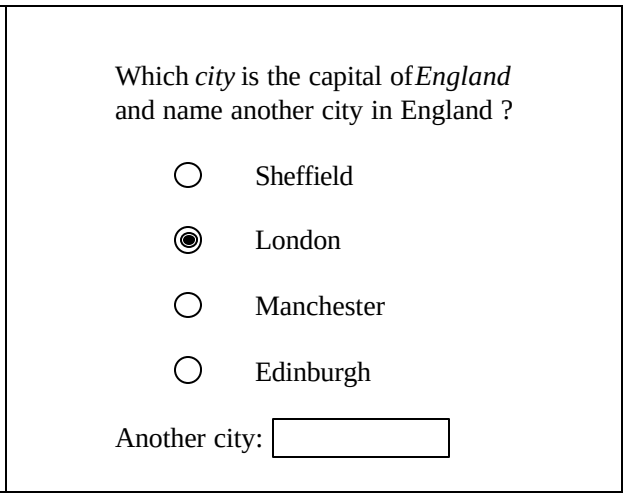


Figure 3.5 Composite response-type based upon the different basic response-types.

The range of possible composite types is considerable and as such no attempt is made to identify all of them.

3.3 Proprietary Extensions

A key requirement for the specification is its support for proprietary response-types and rendering formats. The points at which the proprietary extensions fit within the response-type taxonomy are clearly denoted in Figure 3.1:

- As an alternative to the set of IMS types;
- As an alternative to the *Basic* and *Composite* classifications;
- As an alternative to the Single/Multiple/Ordered classifications.

Further extensions are possible in the range of rendering types as shown in Figure 3.2. The final issue is whether or not the range of basic response-types, listed in Table 3.2, need to be extended. The XML binding will describe a mechanism by which proprietary extensions are available should new response-types be required by vendors.

The process by which proprietary extensions can be supported is further defined in the IMS Q&TI XML Best Practice & Implementation Guide [QTI, 00b].

[4] The difference between a basic response-type that requires multiple responses e.g. multiple response, or a composite response-type based upon several of the same response-types is an artifact of the adopted definitions. If the response-type does NOT exist as a basic type then multiple entries are only possible through the construction of a composite response-type. At some later point IMS may decide to adopt this as a basic multiple response-type.

4. Basic Information Model

The underlying logical data structures for the Q&TI are shown in Figure 4.1. This representation shows the relationship between the ASI elements. This relationship is summarised as:

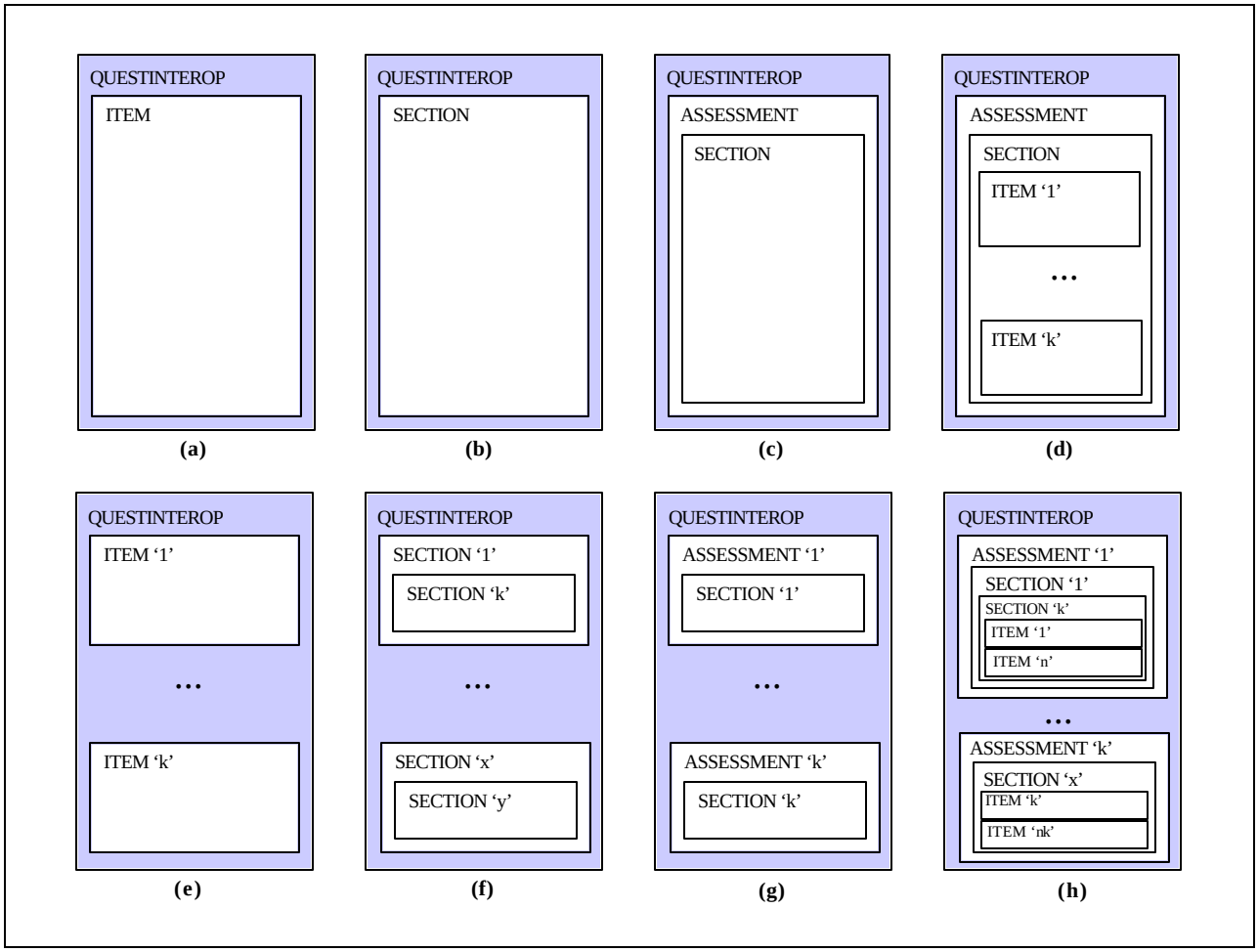


Figure 4.1 The principle Q&TI data structures.

- An *Assessment* consists of at least one *Section* (c);
- A *Section* may contain other *Sections* (b) and (f);
- A *Section* may contain one or more *Items* (d) and (h) – this permits the null Section definition.

While the basic data structure definition at the root level is simple it is extremely flexible. As such the data structure can be used to import/export data structures that consist of:

- One or more assessments only (c) and (g);
- One or more sections only (b) and (f);
- One or more items only (a) and (e);
- Any number and combination of assessments, sections and items (d) and (h);
- An assessment may or may not contain more than one section (c) and (g);
- A section may or may not contain items (b), (c), (d), (f), (g) and (h).

4.1 Underlying Object Model

The conceptual object model for the Q&TI is shown in Figure 4.2.

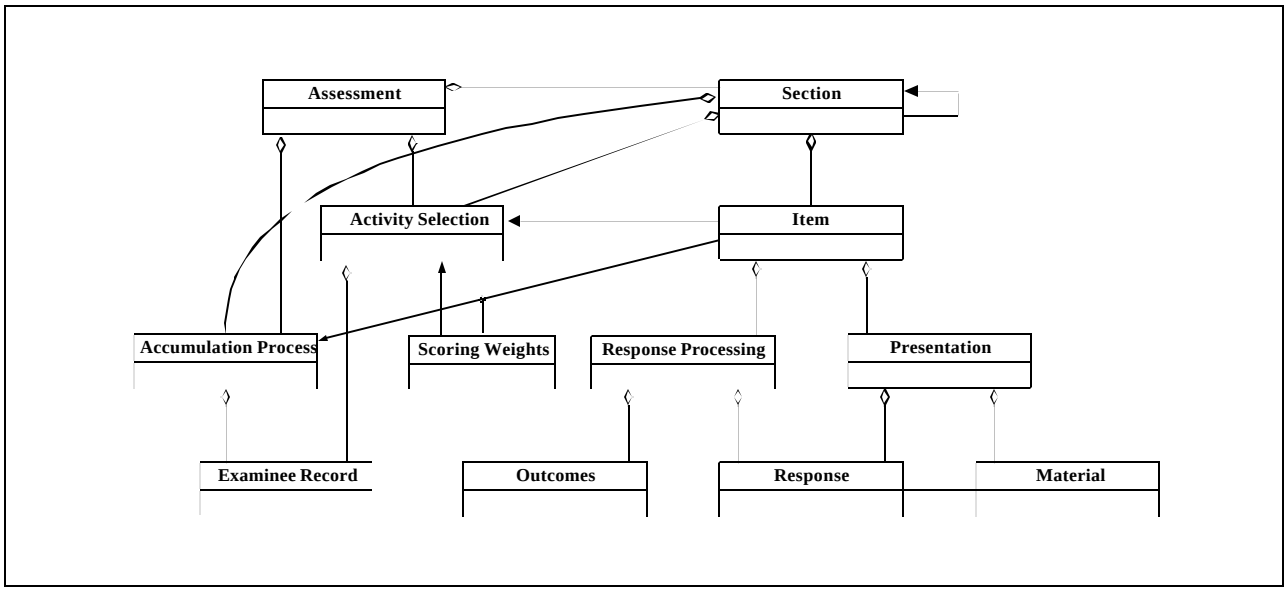


Figure 4.2 The underlying object-based information model.

The objects in this model and their key behaviours are:

- Assessment – the object that represents the *Assessment* data structure;
- Section – the object that represents the *Section* data structure;
- Item – the object that represents the *Item* data structure;
- Activity Selection – selection of the next activity determined by the progress and results obtained upto the moment of activity selection;
- Accumulation Process – the reconciliation of all the evaluation outputs to produce an overall Assessment/Section evaluation;
- Scoring Weights – the scoring weights that are to be assigned to the results output from the response processing;
- Response Processing – the processing and evaluation of the user responses;
- Presentation – the rendering of the content and the possible responses;
- Examinee Record – the set of collated results that are output from the complete process. This is a 'life-long' record in that it contains the historical progress of the individual;
- Outcomes – the set of outcomes that are to be evaluated by the response processing object. These determine the scoring metrics to be applied to the response evaluations;
- Response – the responses that are supplied by the user of the Items i.e. the input user selections;
- Material – the content that is to be displayed.

The full object model is described in Appendix A. The current scope of Version 1 is defined by the Assessment, Section, Item, Presentation, Response Processing, Outcomes, Response and Material objects shown in Figure 4.2

4.2 Response-types

Within an Item there is a complex set of data structures based upon the Response-type. The information returned by the basic Response-types can be defined in terms of lists of objects, namely [5]:

- Logical identifier (LID)
  - Single = {identifier}, {duration}
  - Multiple = {identifier, identifier, …, identifier, duration}, {duration}
  - Ordered = {event_1_identfier, event_2_identifer,…, event_k_identifier}, {duration}
- X-Y co-ordinates (XY)
  - Single = {{identifier, xcoord, ycoord}}, {duration}
  - Multiple = {{identifier, xcoord, ycoord}, {identifier, xcoord, ycoord},…,{identifier, xcoord, ycoord}}, {duration}
  - Ordered = {{event_1_identifier, xcoord, ycoord}, {event_2_identifier, xcoord, ycoord},…,{event_k_identifier, xcoord, ycoord}}, {duration}
- String (STR)
  - Single = {{identifier, string}}, {duration}
  - Multiple = {{identifier, string}, {identifier, string},…, {identifier, string}}, {duration}
  - Ordered = {{event_1_identfier, string}, {event_2_identifer, string},…, {event_k_identifier, string}}, {duration}
- Numerical (NUM)
  - Single = {{identifier, number}}, {duration}
  - Multiple = {{identifier, number}, {identifier, number},…, {identifier, number}}, {duration}
  - Ordered = {{event_1_identfier, number}, {event_2_identifer, number},…, {event_k_identifier, number}}, {duration}
- Logical group (GRP)
  - Single = {{{identifier, groupid}, {identifier, groupid}}}, {duration}
  - Multiple = {{{identifier, groupid}, {identifier, groupid},…,{identifier, groupid}}, {{identifier, groupid}, {identifier, groupid},…,{identifier, groupid}},…,{{identifier, groupid}, {identifier, groupid}, …,{identifier, groupid}}}, {duration}
  - Ordered = {{{event_1_identifier, groupid}, {event_1_identifier, groupid},…, {event_1_identifier, groupid}}, {{event_2_identifier, groupid}, {event_2_identifier, groupid},…,{event_2_identifier, groupid}},…, {{event_k_identifier, groupid}, {event_k_identifier, groupid},…, {event_k_identifier, groupid}}}, {duration}

In each case the Response-type clause identifier is used to tag the data-set thereby ensuring that the scoring attributes can be correlated to the generating response.

The {duration} element is the period between the item being triggered and the response(s) being supplied. The period is defined as complete when the next Item is invoked or when some other pre-defined termination sequence is entered by the user (the generation of this value is a vendor specific feature).

4.3 Content

In many instances the material to be displayed to the user is not just text.

4.3.1 Images

The presentation of images to the user requires the definition of the anchor point. The anchor point is defined by the co-ordinate of the top left-hand corner, in terms X0, Y0. The other two attributes are the 'height' and 'width' of the image. Definition of both the height and width should cause the image to be presented in that aspect ratio.

[5] The 'kth' identifier in the lists denotes the last case.

Omission of either the height or width will be taken to imply that the missing size must be determined automatically by maintaining the original aspect ratio of the image and using the supplied value as the reference length from which the missing length will be determined. The reference size of the display is assumed to be 800x600 pixels at 72dpi. This means that some scaling may have to be performed when using other types of output device.

An example of a multi-image screen is shown in Figure 4.3. The two images have their size and location defined by X0, Y0 and width and height. The X0 and Y0 points are defined with respect to the top left hand corner of the screen. The two hotspot images are also defined in a similar manner. In the case of overlapping images the order of precedence is defined by the order of the *response_label* elements - the first declared has the highest precedence.

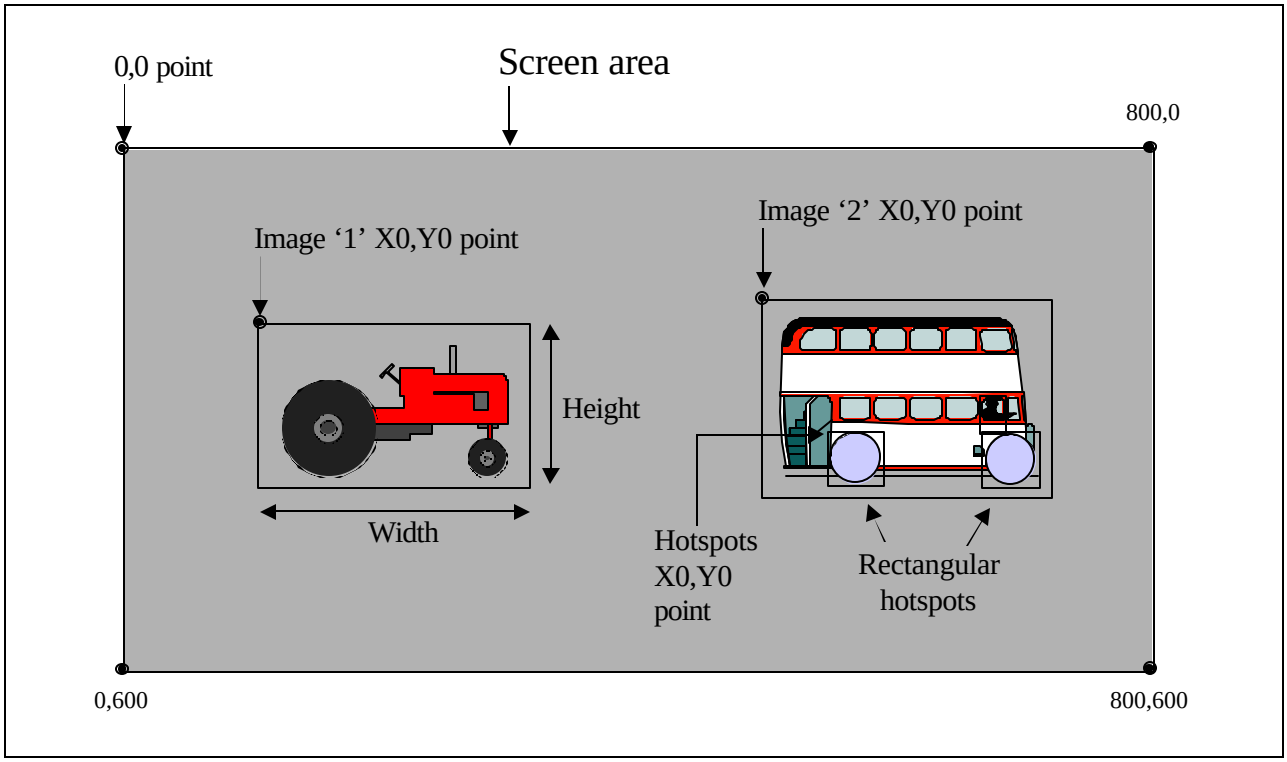


Figure 4.3 Multi-image screen layout reference.

4.3.2 Audio

To be completed in V2.0.

4.3.3 Video

To be completed in V2.0.

5. Conceptual Description of the Data Objects

The tables in this Section provide a conceptual, informative description of the elements in the data objects. The columns in these tables refer to:

No: The number of the data element. An element may be composed of sub-elements. The numbering scheme reflects these relationships.

Name: The descriptive name of the element.

Explanation: A brief functional description of the element.

Required: Indicates if the element is required:

- **M** = Mandatory Element that must be included in the data object, if the element at the higher level is included;
- **C** = Conditional Element. Existence is dependent on values of other Elements;
- **O** = Optional Element.

Multi: Multiplicity of the element:

- Blank = single instance;
- Number = maximum number of times the element is repeatable;
- **n** = multiple occurrences allowed, no limit;
- Repeatability of an element implies that all sub-elements repeat with the same element.

Domain: A description of the set of valid values for the sub-element:

- Coding schemes using numerical values;
- The set of values as defined in the Domain i.e. making it closed. The list of values cannot be extended to include values not defined in the specification. If there is a need for values not included in the domain set of values then the extension should be done defining a new element under the Extension element that is a part of each data object definition.

Type: A description of formatting rules for the data element. Type includes the maximum length of the element:

- **ID** = element used to uniquely identify an object;
- **Code** = element value from a list of codes;
- **Description** = descriptive element, human language
- **Flag** = binary flag
- **Enumerated** = list of predefined non-numeric options
- The international character set specified by ISO 10646 will be used for all fields.

Note: Additional descriptive information about the element.

The description of the data objects has four sub-sections:

- Assessment – describes the assessment data structure;
- Section – describes the section data structure;
- Item – describes the item data structure;
- Common – describes the elements used in more than one of the above data structures.

Note on Extensibility

This specification includes several points where proprietary extensions can be defined for each data object. Extensions are to be implemented in structures that are sub-elements. This applies to all extensions, including extensions to valid codes for elements that have a domain set of valid values as defined as part of the specification. Examples of valid extensions are provided in the IMS Question & Test Interoperability Best Practices & Implementation Guide [QTI, 00b].

5.1 ASSESSMENT Data Object

An *Assessment* object contains all of the information to make the use of individual *Items* meaningful i.e. apart from the *Sections* the object includes the relationships between the *Sections*, the group evaluation processing and the corresponding feedback.

Table 5.1 Assessment data object detailed description.

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
1.1	title	As per structure 6.2					
1.2	ident	As per structure 6.3					
1.3	qticomment	Comments on the Assessment.	O		As per structure 4.6		
1.4	duration	The duration of the Assessment.	O		As per structure 4.7		
1.5	assessmentmetadata	The Assessment meta-data as listed in Section 6.1.	O				Will include only those entries that are mandatory or which are optional but defined.
1.5.1	qmd_absolutescore	Range of scoring for the Assessment.	O		As per structure 5.1		
1.5.2	qmd_assessmenttype	The role of the Assessment.	O		As per structure 5.2		
1.5.3	qmd_feedbackavailable	Whether or not feedback is available.	O		As per structure 5.4		
1.5.4	qmd_hintsavailable	Whether or not hints are available.	O		As per structure 5.5		
1.5.5	qmd_scoretype	The type of scoring used.	M		As per structure 5.13		
1.5.6	qmd_solutionsavailable	Whether or not solutions are available.	O		As per structure 5.15		

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
1.5.7	qmd_sectionselection	Support for Section selection.	O		As per structure 5.16		
1.5.8	qmd_sectionsequence	Support for Section sequencing.	O		As per structure 5.17		
1.5.9	qmd_itemselection	Support for Item selection.	O		As per structure 5.18		
1.5.10	qmd_itemsequence	Support for Item sequencing.	O		As per structure 5.19		
1.5.11	qmd_timelimit	The number of minutes or an unlimited duration.	O		As per structure 5.22		
1.5.12	qmd_toolvendor	The name of the vendor of the tool creating the Assessment.	O		As per structure 5.23		
1.5.13	qmd_material	The type of material used within the Item.	O	n	As per structure 5.25		
1.6	objectives	The Assessment objectives per view of the system.	O	n	As per structure 4.11		
1.7	assessmentcontrol	Control of the capabilities to be permitted to operate within the Assessment.	O	n	There is no PCDATA content for this element.		These switches should be used to control the operation of the Assessment related conditions. Each view can have its own switch definition.
1.7.1	view	As per structure 6.1					
1.7.2	solutionswitch	As per structure 6.4					
1.7.3	hintswitch	As per structure 6.5					

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
1.7.4	feedbackswitch	As per structure 6.6					
1.7.5	qticomment	Comments on the Assessment control.	O		As per structure 4.6		
1.8	assessprocessing **(For further study in V2.0).**	Assessment accumulated processing and feedback.	O				This element defines the standard Assessment processing features. Proprietary alternatives are available
1.8.1	scoremodel	As per structure 6.20					
1.8.2	qticomment	Comments on the Assessment processing.	O		As per structure 4.6		
1.8.3	scores	As per structure 4.10					
1.8.4	scorecondition	As per structure 4.9					
1.8.5	condition_extension	Proprietary extension of the evaluation of the scores to determine the responses.	O			ANY	All extensions to the processing for new conditions are to be implemented as sub-elements under this element (see the Q&TI Best Practice Guide for the naming convention).
1.9	assessproc_extension	Proprietary alternative Assessment processing extension.	O			ANY	All proprietary alternatives to Assessment processing are to be implemented as sub-elements under this element (see the Q&TI Best Practice Guide for the naming convention).
1.10	assessfeedback	Feedback of the Assessment scoring.	M	n			A response will be defined for each view.
1.10.1	title	As per structure 6.2					
1.10.2	ident	As per structure 6.3					

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
1.10.3	view	As per structure 6.1					
1.10.4	qticomment	Comments on the Assessment feedback to be used.	O		As per structure 4.6		
1.10.5	material	The content to be presented due to the score value.	O		As per structure 4.1		
1.11	sectionselection **(For further study in V2.0).**	To enable the appropriate Sections to be selected from the Section-pool.	O	n	TBD	TBD	TBD
1.12	sectionsequence **(For further study in V2.0).**	To sequence the utilisation of the selection blocks.	O		TBD	TBD	TBD
1.13	sectionref	To pull into scope Sections that are not defined within this Assessment block.	O	n			The referenced Section must be available somewhere otherwise execution errors will occur. Binding is outside the scope of this specification.
1.13.1	linkrefid	As per structure 6.14					
1.14	section	The Section data object (see Section 5.2).	M	n			There will be at least one Section per Assessment and Sections can contain Sections.

5.2 SECTION Data Object

A *Section* object contains all of the information to meaningfully group together *Items* i.e. apart from the *Items* the object includes the relationships between the *Items* and the selection criteria of the Items.

Table 5.2 Section data object detailed description.

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
2.1	title	As per structure 6.2					
2.2	ident	As per structure 6.3					
2.3	qticomment	Comments on the Section.	O		As per structure 4.6		
2.4	duration	The duration of the Section.	O		As per structure 4.7		
2.5	sectionmetadata	The Section meta-data as listed in Section 6.2.	O				Will include only those entries that are mandatory or which are optional but defined.
2.5.1	qmd_numberofitems	The number of Items contained by the object.	M		As per structure 5.9		
2.5.2	qmd_sectionsincluded	Whether or not Sections are included available.	M		As per structure 5.14		
2.5.3	qmd_sectionselection	Support for Section selection.	O		As per structure 5.16		
2.5.4	qmd_sectionsequence	Support for Section sequencing.	O		As per structure 5.17		
2.5.5	qmd_itemselection	Support for Item selection.	O		As per structure 5.18		
2.5.6	qmd_itemsequence	Support for Item sequencing.	O		As per structure 5.19		

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
2.5.7	qmd_timelimit	The number of minutes or an unlimited duration.	O		As per structure 5.22		
2.5.8	qmd_material	The type of material used within the Item.	O		As per structure 5.25		
2.6	objectives	The Section objectives per view of the system.	O	n	As per structure 4.11		
2.7	sectionprecondition **(For further study in V2.0).**	The preconditions that control whether or not the Section is utilised.	O	n	TBD	TBD	TBD
2.8	sectionpostcondition **(For further study in V2.0).**	The postconditions that control whether or not the Section is utilised.	O	n	TBD	TBD	TBD
2.9	sectioncontrol	Control of the capabilities to be permitted to operate within the Section.	O	n			These switches should be used to control the operation of the Section related conditions. A definition can be made for each view.
2.9.1	view	As per structure 6.1					
2.9.2	solutionswitch	As per structure 6.4					
2.9.3	hintswitch	As per structure 6.5					
2.9.4	feedbackswitch	As per structure 6.6					
2.9.5	qticomment	Comments on the Section control.	O		As per structure 4.6		

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
2.10	sectionselection **(For further study in V2.0).**	To enable the appropriate Sections to be selected from the Section-pool.	O	n	As per structure 1.11		
2.11	sectionsequence **(For further study in V2.0).**	To sequence the utilisation of the selection blocks.	O	n	As per structure 1.12		
2.12	sectionref	To pull into scope Sections that are not defined within this Section block.	O	n	As per structure 1.13		
2.12.1	linkrefid	As per structure 6.14					
2.13	section	Self reference for recursive Sections.	O	n			
2.14	itemselection **(For further study in V2.0).**	To enable the appropriate Items to be selected from the Item-pool.	O	n	TBD	TBD	TBD
2.15	itemsequence **(For further study in V2.0).**	To sequence the utilisation of the Items.	O	n	TBD	TBD	TBD
2.16	itemref	To pull into scope the Items that are not defined within this Section block.	O	n			The referenced Item must be available somewhere otherwise execution errors will occur. Binding is outside the scope of this specification.
2.16.1	linkrefid	As per structure 6.14					
2.17	item	The ITEM data object (see Section 5.3)	O	n			There may be zero, one or more Items per Section.

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
2.18	sectionprocessing **(For further study in V2.0).**	Processing of the Section accumulated responses and scores.	O				This element defines the standard Section processing features. Proprietary alternatives are available
2.18.1	scoremodel	As per structure 6.20					
2.18.2	qticomment	Comments on the Assessment processing.	O		As per structure 4.6		
2.18.3	scores	As per structure 4.10					
2.18.4	scorecondition	As per structure 4.9					
2.18.5	condition_extension	Proprietary extension of the evaluation of the scores to determine the responses.	O			ANY	All extensions to the processing for new conditions are to be implemented as sub-elements under this element (see the Q&TI Best Practice Guide for the naming convention).
2.19	sectionproc_extension	Proprietary alternative Section processing extension.	O			ANY	All proprietary alternatives to Section processing are to be implemented as sub-elements under this element (see the Q&TI Best Practice Guide for the naming convention).
2.20	sectionfeedback	Feedback of the Section scoring.	M	n			A response will be defined for each view.
2.20.1	title	As per structure 6.2					
2.20.2	ident	As per structure 6.3					
2.20.3	view	As per structure 6.1					
2.20.4	qticomment	Comments on the Section feedback to be used.	O		As per structure 4.6		

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
2.20.5	material	The content to be presented due to the score value.	O		As per structure 4.1		

5.3 ITEM Data Object

An *Item* object contains all of the information for the presentation of a question and its subsequent processing to the user. The structure of the *Item* includes the actual question and its presentation format, the range of possible responses, the ways in which the responses are to be processed, and the possible solutions and hints to the *Item.*

Table 5.3 Item data object detailed description.

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
3.1	title	As per structure 6.2					
3.2	ident	As per structure 6.3					
3.3	label	As per structure 6.7					
3.4	maxattempts	The number of attempts permitted.	O			Integer 2	
3.5	qticomment	Comments on the Item.	O		As per structure 4.6		
3.6	duration	The duration of the Item.	O		As per structure 4.7		
3.7	itemmetadata	The Item metadata as listed in Section 6.3.	O				Will include only those entries that are mandatory or which are optional but defined.
3.7.1	qmd_computerscored	Whether or not the Item can be scored by computer.	O		As per structure 5.3		
3.7.2	qmd_feedbackavailable	Whether or not feedback is available.	O		As per structure 5.4		
3.7.3	qmd_hintsavailable	Whether or not hints are available.	O		As per structure 5.5		
3.7.4	qmd_itemtype	The type of Item used.	M		As per structure 5.6		

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
3.7.5	qmd_levelofdifficulty	The education level for which the Item is intended.	O		As per structure 5.7		
3.7.6	qmd_maximumscore	The maximum score possible from that Item.	M		As per structure 5.8		
3.7.7	qmd_renderingtype	The type of rendering used within the Item.	M	n	As per structure 5.10		
3.7.8	qmd_responsetype	The class of response expected for the Item.	M	n	As per structure 5.11		
3.7.9	qmd_scoringavailable	Whether or not scoring is available.	O		As per structure 5.12		
3.7.10	qmd_solutionsavailable	Whether or not solutions are available.	O		As per structure 5.15		
3.7.11	qmd_sectionselection	Support for Section selection.	O		As per structure 5.16		
3.7.12	qmd_sectionsequence	Support for Section sequencing.	O		As per structure 5.17		
3.7.13	qmd_itemselection	Support for Item selection.	O		As per structure 5.18		
3.7.14	qmd_itemsequence	Support for Item sequencing.	O		As per structure 5.19		
3.7.15	qmd_status	The status of the Item.	O		As per structure 5.20		
3.7.16	qmd_timedependence	Whether or not the response are timed.	O		As per structure 5.21		

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
3.7.17	qmd_timelimit	The number of minutes or an unlimited duration.	O		As per structure 5.22		
3.7.18	qmd_toolvendor	The name of the vendor of the tool creating the Assessment.	O		As per structure 5.23		
3.7.19	qmd_topic	A brief description of the topic covered by the Item.	O		As per structure 5.24		
3.7.20	qmd_material	The type of material used within the Item.	O	n	As per structure 5.25		
3.7.21	qmd_typeofsolution	The type of solution available in the Item.	O		As per structure 5.26		
3.7.21	qmd_weighting	The type of solution available in the Item.	O		As per structure 5.27		
3.8	objectives	The Item objectives per view of the system.	O	n	As per structure 4.11		
3.9	itemprecondition **(For further study in V2.0).**	The preconditions that control whether or not the Item is utilised.	O	n	TBD	TBD	TBD

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
3.10	itempostcondition **(For further study in V2.0).**	The postconditions that control whether or not the Item is utilised.	O	n	TBD	TBD	TBD
3.11	itemcontrol	Control of the capabilities to be permitted to operate within the Item.	O	n			These switches should be used to control the operation of the Item related conditions. A definition can be made for each view.
3.11.1	view	As per structure 6.1					
3.11.2	solutionswitch	As per structure 6.4					
3.11.3	hintswitch	As per structure 6.5					
3.11.4	feedbackswitch	As per structure 6.6					
3.12	itemrubric	The view specific description of the Item.	O	n			This will normally contain instructions pertaining to the Item.
3.12.1	view	As per structure 6.1					
3.12.2	material	The content of the rubric.	M		As per structure 4.1		
3.13	presentation	The container for the responses (basic or composite) plus the rendering.	O				Only one view of the presentation is available.
3.13.1	ident	As per structure 6.3					
3.13.2	label	As per structure 6.7					
3.13.3	qticomment	Comments on the Presentation.	O		As per structure 4.6		
3.13.4	material	The content of the responses.	O		As per structure 4.1		This may or may not be a part of the question itself.

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
3.13.5	response_lid	The logical identifier response-type.	O	n			As defined in the Q&TI Information Model.
3.13.5.1	ident	As per structure 6.3					
3.13.5.2	rcardinality	As per structure 6.16					
3.13.5.3	rtiming	As per structure 6.17					
3.13.5.4	material	The content of the response types.	O		As per structure 4.1		This will form part of the question itself.
3.13.5.5	render_choice	Rendering of the classical multiple choice/multiple response and true/false questions.	O				
3.13.5.5.1	shuffle	Whether or not the possible selections should be shuffled for presentation.	O		Yes (default) No	Enumerated	Default value is “No”.
3.13.5.5.2	minnumber	As per structure 6.21					
3.13.5.5.3	maxnumber	As per structure 6.22					
3.13.5.5.4	material	The content of the responses.	O		As per structure 4.1		This will be a part of the question itself.
3.13.5.5.5	response_label	A possible response that can be selected.	M	n		May contain #PCDATA.	
3.13.5.5.5.1	ident	As per structure 5.3					
3.13.5.5.5.2	rshuffle	Determines if the response can be shuffled.	O		Yes No (default)	Enumerated	Default is “No”.

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
3.13.5.5.5.3	rarea	The type of area used to denote the hot spot.	O		Ellipse Rectangle Bounded	Enumerated	Information describing the key points must be given. The ellipse is 'x,y,r1,r2', the rectangle is 'x0,y0,height,width' and the bounded area is 'x1y1,…,xnyn'.
3.13.5.5.5.4	rrange	The accuracy of the numerical result required.	O		Exact (default) Range	Enumerated	'Exact' means exactly whereas 'Range' is followed by the range permitted about the given value.
3.13.5.5.5.5	material	The content of the response-label.	O		As per structure 4.1		This will form the response.
3.13.5.5.6	response_na	Proprietary extension for not attempted response.	O			ANY	All NA extensions are to be implemented as sub-elements under this element (see the Q&TI Best Practice Guide for the naming convention).
3.13.5.6	render_hotspot	Rendering of the material using an image(s).	O				The images to which the responses are referenced.
3.13.5.6.1	minnumber	As per structure 6.21					
3.13.5.6.2	maxnumber	As per structure 6.22					
3.13.5.6.3	showdraw	Informs the rendering system that the points identified by the user are to be displayed connected using some mechanism.	O		Yes No (default)	Enumerated	
3.13.5.6.4	material	The content of the responses.	O		As per structure 4.1		This will be a part of the question itself.
3.13.5.6.5	response_label	As per structure 3.13.5.5.5					
3.13.5.6.6	response_na	As per structure 3.13.5.5.6					

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
3.13.5.7	render_slider	Rendering of the response as a slider.	O				The form of the slider is host dependent.
3.13.5.7.1	orientation	The orientation of the slider.	O		Horizontal Vertical	Enumerated	The physical style of the slider is vendor dependent.
3.13.5.7.2	lowerbound	The lowest value shown by the slider.	M			Numerical 16	This value must be less than 'upperbound'.
3.13.5.7.3	upperbound	The highest value shown by the slider.	M			Numerical 16	This value must be greater that 'lowerbound'.
3.13.5.7.4	step	The increment value of the slider.	O			Numerical 16	
3.13.5.7.5	startval	The setting at which the slider is set when displayed.	O			Numerical 16	Must be in the range of LowerBound to UpperBound.
3.13.5.7.6	steplabel	Display of the units on the slider.	O		Yes (default) No	Enumerated	Default setting is "Yes".
3.13.5.7.7	minnumber	As per structure 6.21					
3.13.5.7.8	maxnumber	As per structure 6.22					
3.13.5.7.9	response_label	As per structure 3.13.5.5.5					
3.13.5.7.10	response_na	As per structure 3.13.5.5.6					
3.13.5.8	render_fib	Rendering of the material using a FIB format.	O				
3.13.5.8.1	charset	The character-set to be used for the entry.	O		CDATA string describing the character set.	As per MIME in RFC1521.	Default setting is "us-ascii".

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
3.13.5.8.2	encoding	The coding to be used for the text.	O		CDATA string describing the encoding.	String	Default setting is “UTF-8”. Typical entries are given in the Best Practice & Implementation Guide.
3.13.5.8.3	fibtype	The type of information expected.	O		String (default) Integer Decimal Scientific Boolean	Enumerated	Default setting is “String”.
3.13.5.8.4	rows	The number of rows available for the entry.	O		1-999	Integer 3	
3.13.5.8.5	columns	The number of columns available for the entry.	O		1-999	Integer 3	
3.13.5.8.6	maxchars	The maximum number of characters that can be entered.	O		1-9999999	Integer 8	
3.13.5.8.7	prompt	The style of holder presented to contain the material.	O		Box (default) Dashline Asterisk Underline	Enumerated	Default setting is ‘Box”.
3.13.5.8.8	minnumber	As per structure 6.21					
3.13.5.8.9	maxnumber	As per structure 6.22					
3.13.5.8.10	response_label	As per structure 3.13.5.5.5					
3.13.5.8.11	response_na	As per structure 3.13.5.5.6					

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
3.13.5.9	render_extension	Proprietary extensions facility.	O			ANY	All extensions to the render-type are to be implemented as sub-elements under this element (see the Q&TI best Practice Guide for the naming convention).
3.13.6	response_xy	The X-Y co-ordinate response-type.	O	n			As defined in the Q&TI Information Model.
3.13.6.1	ident	As per structure 6.3					
3.13.6.2	rcardinality	As per structure 6.16					
3.13.6.3	rtiming	As per structure 6.17					
3.13.6.4	material	The content of the response types.	O		As per structure 4.1		This will form part of the question itself.
3.13.6.5	render_choice	As per 3.13.5.5					
3.13.6.6	render_hotspot	As per 3.13.5.6					
3.13.6.7	render_slider	As per 3.13.5.7					
3.13.6.8	render_fib	As per 3.13.5.8					
3.13.6.9	render_extension	As per 3.13.5.9					
3.13.7	response_str	The string response-type.	O	n			As defined in the Q&TI Information Model.
3.13.7.1	ident	As per structure 6.3					
3.13.7.2	rcardinality	As per structure 6.16					
3.13.7.3	rtiming	As per structure 6.17					
3.13.7.4	material	The content of the response types.	O		As per structure 4.1		This will form part of the question itself.
3.13.7.5	render_choice	As per 3.13.5.5					
3.13.7.6	render_hotspot	As per 3.13.5.6					
3.13.7.7	render_slider	As per 3.13.5.7					

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
3.13.7.8	render_fib	As per 3.13.5.8					
3.13.7.9	render_extension	As per 3.13.5.9					
3.13.8	response_num	The numerical response-type.	O	n			As defined in the Q&TI Information Model.
3.13.8.1	ident	As per structure 6.3					
3.13.8.2	rcardinality	As per structure 6.16					
3.13.8.3	rtiming	As per structure 6.17					
3.13.8.4	numtype	The type of number to be entered.	M		Integer Decimal Scientific	Enumerated.	
3.13.8.4	material	The content of the response types.	O		As per structure 4.1		This will form part of the question itself.
3.13.8.5	render_choice	As per 3.13.5.5					
3.13.8.6	render_hotspot	As per 3.13.5.6					
3.13.8.7	render_slider	As per 3.13.5.7					
3.13.8.8	render_fib	As per 3.13.5.8					
3.13.8.9	render_extension	As per 3.13.5.9					
3.13.9	response_grp	The logical group response-type.	O	n			As defined in the Q&TI Information Model.
3.13.9.1	ident	As per structure 6.3					
3.13.9.2	rcardinality	As per structure 6.16					
3.13.9.3	rtiming	As per structure 6.17					
3.13.9.4	material	The content of the response types.	O	n	As per structure 4.1		This will form part of the question itself.
3.13.9.5	render_choice	As per 3.13.5.5					
3.13.9.6	render_hotspot	As per 3.13.5.6					

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
3.13.9.7	render_slider	As per 3.13.5.7					
3.13.9.8	render_fib	As per 3.13.5.8					
3.13.9.9	render_extension	As per 3.13.5.9					
3.13.10	response_extension	The proprietary response extension facility.	O			ANY	All extensions to the response-type are to be implemented as sub-elements under this element (see the Q&TI Best Practice Guide for the naming convention).
3.14	resprocessing	The container for the processing of the responses.	O				This element defines the standard Item processing features. Proprietary alternatives are available.
3.14.1	qticomment	Comments on the Response processing.	O		As per structure 4.6		
3.14.2	outcomes	The container for the declaration of the variables returned for response scoring.	M				
3.14.2.1	qticomment	Comments on the Outcomes.	O		As per structure 4.6		
3.14.2.2	decvar	Declaration of the score variables.	M	n	As per structure 4.3.		
3.14.2.3	interpretvar	Interpretation of the variable comments.	O	n	As per structure 4.5.		

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
3.14.3	respcondition	Evaluation of the response with respect to the defined conditions.	M	n			A series of conditions could be applied depending on the number and type of responses.
3.14.3.1	title	As per structure 6.2					
3.14.3.2	continue	As per structure 6.15					
3.14.3.3	qticomment	Comments on the Response Condition.	O		As per structure 4.6		
3.14.3.4	conditionvar	Conditions applied to the scores to determine the feedback.	M	n	As per structure 4.4.		
3.14.3.5	setvar	Manipulation of the declared scoring variables.	O	n	As per structure 4.3		
3.14.3.6	displayfeedback	Display trigger for the Item feedback.	O	n	As per structure 4.8.		
3.14.4	respcond_extension	Proprietary extension of the evaluation of the scores to determine the responses.	O			ANY	All extensions to the Item processing for new conditions are to be implemented as sub-elements under this element (see the Q&TI Best Practice Guide for the naming convention).
3.15	itemproc_extension	Proprietary alternative Item processing extension.	O			ANY	All proprietary alternatives to Item processing are to be implemented as sub-elements under this element (see the Q&TI Best Practice Guide for the naming convention).

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
3.16	itemfeedback	Feedback of the Item scoring and other types of feedback.	M	n			A response will be defined for each view and each type of feedback.
3.16.1	title	As per structure 6.2					
3.16.2	ident	As per structure 6.3					
3.16.3	view	As per structure 6.1					
3.16.4	material	The content to be presented due to the score value.	O		As per structure 4.1		
3.16.5	solution	The solutions available to the different views.	O				Different solutions can be available for tutors, etc.
3.16.5.1	feedbackstyle	As per structure 6.23					
3.16.5.2	view	As per structure 6.1					
3.16.5.3	qticomment	Comments on the available solutions.	O		As per structure 4.6		
3.16.5.4	solutionmaterial	Container for the set of contents to be revealed as the solution.	M	n			It is this level which acts as either the incremental or multiple content presented.
3.16.5.4.1	material	The content of the actual solutions.	M		As per structure 4.1		
3.16.6	hint	The hints available to the different views.	O				Different hints can be available for tutors, etc.
3.16.6.1	feedbackstyle	As per structure 6.23					
3.16.6.2	view	As per structure 6.1					

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
3.16.6.3	qticomment	Comments on the available hints.	O		As per structure 4.6		
3.16.6.4	hintmaterial	Container for the set of contents to be revealed as the hint.	M	n			It is this level which acts as either the incremental or multilevel content presented.
3.16.6.4.1	material	The content of the actual hints.	M		As per structure 4.1		

5.4 Common Data Objects (Elements)

Table 5.4 describes the data objects commonly used with the Assessment, Section and Item objects.

Table 5.4 Common object detailed description.

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
4.1	material	The content container for all of the material to be displayed.	O				This will always require one sub-elements.
4.1.1	qticomment	Comments on the Material.	O		As per structure 4.6		
4.1.2	mattext	Text to be presented.	O	n		PCDATA	
4.1.2.1	ident	As per structure 6.3					
4.1.2.2	label	As per structure 6.7					
4.1.2.3	texttype	The type of text to be displayed.	O		CDATA in format ‘text/****’.	String 32 As per MIME under RFC1521.	Default set as “text/plain”. The Best Practice & Implementation Guide describes the typical range of values.

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
4.1.2.4	charset	The character set to be used.	O		CDATA in the form defined by RFC1521.	String 32 As per MIME under RFC1521.	Default set as “us-ascii”. The Best Practice & Implementation Guide describes the typical range of values.
4.1.2.5	uri	As per structure 6.8					
4.1.3	matimage	An image to be presented.	O	n		PCDATA	The image could be an embedded within the file itself.
4.1.3.1	ident	As per structure 6.3					
4.1.3.2	label	As per structure 6.7					
4.1.3.3	imagtype	The type of image file to be displayed.	O		CDATA string in the form ‘image/****’.	As per MIME definitions RFC1521 and Q&TI extensions.	Default set as “image/jpeg”. The Best Practice & Implementation Guide describes the typical range of values.
4.1.3.4	uri	As per structure 6.8					
4.1.3.5	x0	As per structure 6.9					
4.1.3.6	y0	As per structure 6.10					
4.1.3.7	height	As per structure 6.11					
4.1.3.8	width	As per structure 6.12					
4.1.3.9	embedded	As per structure 6.13					
4.1.4	mataudio **(For further study in V2.0).**	Audio to be played.	O	n			The embedded audio will be the sampled waveform.
4.1.4.1	ident	As per structure 6.3					
4.1.4.2	label	As per structure 6.7					

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
4.1.4.3	audiotype	The type of audio file to be played.			CDATA string in the form 'audio/****'.	As per MIME under RFC1521 and Q&TI extensions.	Default setting is "audio/base". The Best Practice & Implementation Guide describes the typical range of values.
4.1.4.4	uri	As per structure 6.8					
4.1.4.5	embedded	As per structure 6.13					
4.1.5	matvideo **(For further study in V2.0).**	Video to be played.	O	n			
4.1.5.1	ident	As per structure 6.3					
4.1.5.2	label	As per structure 6.7					
4.1.5.3	videotype	The type of video file to be played.			CDATA string in the form 'video/****'.	As per the MIME definitions under RFC1521 and with Q&TI extensions.	The Best Practice & Implementation Guide describes the typical range of values.
4.1.5.4	x0	As per structure 6.9					
4.1.5.5	y0	As per structure 6.10					
4.1.5.6	height	As per structure 6.11					
4.1.5.7	width	As per structure 6.12					
4.1.5.8	uri	As per structure 6.8					
4.1.5.9	embedded	As per structure 6.13					
4.1.6	matapplet **(For further study in V2.0).**	Java applet to be executed.	O	n	TBD.	TBD.	TBD.
4.1.6.1	ident	As per structure 6.3					
4.1.6.2	label	As per structure 6.7					

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
4.1.6.3	x0	As per structure 6.9					
4.1.6.4	y0	As per structure 6.10					
4.1.6.5	height	As per structure 6.5					
4.1.6.6	width	As per structure 6.12					
4.1.6.3	uri	As per structure 6.8					
4.1.6.4	embedded	As per structure 6.13					
4.1.7	matapplication **(For further study in V2.0).**	An application to be executed.	O	n	TBD.	TBD.	TBD.
4.1.7.1	ident	As per structure 6.3					
4.1.7.2	label	As per structure 6.7					
4.1.7.3	apptype	The type of application to be executed.	M			As per the MIME definitions under RFC1521.	The Best Practice & Implementation Guide describes the typical range of values.
4.1.7.4	uri	As per structure 6.8					
4.1.8	mat_extension	Proprietary material extension.	O			ANY	All extensions to the response-type are to be implemented as sub-elements under this element (see the Q&TI Best Practice Guide for the naming convention).
4.1.9	matref	To pull into scope material that is defined elsewhere.	O	n			The referenced material must be available elsewhere otherwise execution errors will occur. Binding is outside the scope of this specification.
4.1.9.1	linkrefid	As per structure 6.14					

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
4.1.10	altmaterial	Alternative material to be displayed in case the linked material cannot be rendered.	O				This alternative material should not be of the same type as the original otherwise it too will not be rendered.
4.1.10.1	linkrefid	As per structure 6.14					
4.1.10.2	qticomment	Comments of the alternative material.	O		As per structure 4.6		
4.1.10.3	mattext	Text to be presented.	O	n	As per structure 4.1.2		
4.1.10.4	matimage	An image to be presented.	O	n	As per structure 4.1.3		
4.1.10.5	mataudio	Audio to be played.	O	n	As per structure 4.1.4		
4.1.10.6	matvideo	Video to be played.	O	n	As per structure 4.1.5		
4.1.10.7	matapplet	Java applet to be executed.	O	n	As per structure 4.1.6		
4.1.10.8	matapplication	An application to be executed.	O	n	As per structure 4.1.7		
4.1.10.9	mat_extension	Proprietary material extension.	O		As per structure 4.1.8		
4.1.10.10	matref	To pull into scope material that is defined elsewhere.	O	n	As per structure 4.1.9		
4.2	decvar	Declaration of a variable to be used for scoring.	M	n			Each type of variable must be declared before it is used.

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
4.2.1	varname	As per structure 6.18.					
4.2.2	vartype	The type of variable.	M		String Integer (default) Decimal Scientific Boolean Enumerated Set	Enumerated.	Default is set to 'integer'.
4.2.3	defaultval	The default value for the variable.	O			Numerical 32 String 33 True/False	Can be set to any value. Default is set to '0'.
4.2.4	minvalue	The minimum value permitted for a numeric score.	O			Numerical 32	Applies to the value of the score after all of the item processing has been completed.
4.2.5	maxvalue	The maximum score permitted for a numeric score.	O			Numerical 32	Applies to the value of the score after all of the item processing has been completed.
4.2.6	members	The set of enumerated values.	O			String 1024	Each member within the set must be delimited using the '|' character.
4.3	setvar	The type of processing to be applied to the variable.	O	n	The value to be allocated according to the 'Action'.	#PCDATA	One must be defined for each variable to be altered due to the condition.

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
4.3.1	action	The action to be applied.	M		Set (default) Add Subtract Multiply Divide	Enumerated	The default setting is “Set”.
4.3.2	varname	As per structure 6.18					
4.4	conditionvar	The criteria to be applied as part of the actual evaluation of the response.	M				Each of the condition provides a boolean test. Consecutive conditions are linked as an ‘and’ condition.
4.4.1	varequal	Equivalence test on the variable.	O	n	The comparison value itself.	#PCDATA	‘True’ is returned if equivalent.
4.4.1.1	respident	As per structure 6.19					
4.4.1.2	case	As per structure 6.24					
4.4.2	varlt	Less than test of the variable.	O	n	The comparison value itself.	#PCDATA	‘True’ is returned if the value is less than the comparator.
4.4.2.1	respident	As per structure 6.19					
4.4.3	varlte	Less than or equal test on the variable.	O	n	The comparison value itself.	#PCDATA	‘True’ is returned if the value is less than or equal to the comparator.
4.4.3.1	respident	As per structure 6.19					
4.4.4	vargt	Greater than test of the variable.	O	n	The comparison value itself.	#PCDATA	‘True’ is returned if the value is greater than to the comparator.
4.4.4.1	respident	As per structure 6.19					
4.4.5	vargte	Greater than or equal test on the variable.	O	n	The comparison value itself.	#PCDATA	‘True’ is returned if the value is greater than or equal to the comparator.

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
4.4.5.1	respident	As per structure 6.19					
4.4.6	varsubset	Test for containment in a list, set, string, etc.	O	n			'True' is returned if the value is contained within the comparator.
4.4.6.1	respident	As per structure 6.19					
4.4.6.2	case	As per structure 6.24					
4.4.6.3	setmatch	Defines the nature of the set comparison.	O		Exact (default) Partial	Enumerated	The comparison set must be enclosed in {} parentheses and elements are separated by commas.
4.4.7	varinside	The XY co-ordinate is inside an area.	O	n	CDATA of the co-ordinates of the areas: Ellipse x,y,height,width Rectangle x0,y0,height, width Bounded x1,y1, x2,y2,…,xk,yk.	Numeric 4	The set of XY co-ordinates defining the area. 'True' is returned if the XY co-ordinate is within the area.
4.4.7.1	respident	As per structure 5.19					
4.4.7.2	areatype	The type of area against which the co-ordinate is to be tested.	M		Ellipse Rectangle Bounded	Enumerated	The ellipse is defined by the values x,y,height,width. The rectangle is defined by the values x0,y0,height,width. The bounded area is defined by the ordered set of pairs of co-ordinates 'x1,y1, x2, y2,…,xk,yk'.

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
4.4.8	var_extension	A proprietary extension facility.	O			ANY	All extensions to the response-type are to be implemented as sub-elements under this element (see the Q&TI Best Practice Guide for the naming convention).
4.4.9	durequal **(For further study in V2.0).**	Equivalence test on the response duration.	O	n	TBD.	TBD.	TBD.
4.4.10	durlt **(For further study in V2.0).**	Less than test of the response duration.	O	n	TBD.	TBD.	TBD.
4.4.11	durlte **(For further study in V2.0).**	Less than or equal test on the response duration.	O	n	TBD.	TBD.	TBD.
4.4.12	durgt **(For further study in V2.0).**	Greater than test of the response duration.	O	n	TBD.	TBD.	TBD.
4.4.13	durgte **(For further study in V2.0).**	Greater than or equal test on the response duration.	O	n	TBD.	TBD.	TBD.
4.4.14	not	The logical 'NOT' operator.	O				This inverts the logic of the enclosed elements e.g. not(varequal) becomes the not equal to element.
4.4.14.x	Contains **one** of the following elements: varequal, varlt, varlte, vargt, vargte, varsubset, varinside, var_extension, durequal, durlt, durlte, durgt, durgte, and, or.						
4.4.15	and	The logical 'AND' operator.	O				This provides the AND condition across all of the contained element operators.
4.4.15.x	Contains **two or more** of the following elements: varequal, varlt, varlte, vargt, vargte, varsubset, varinside, var_extension, durequal, durlt, durlte, durgt, durgte, and, or, not.						

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
4.4.16	or	The logical 'OR' operator.	O				This provides the OR condition across all of the contained element operators.
4.4.16.x	Contains **two or more** of the following elements: varequal, varlt, varlte, vargt, vargte, varsubset, varinside, var_extension, durequal, durlt, durlte, durgt, durgte, and, or, not.						
4.4.17	unanswered	Unanswered condition test.	O				This should be used to trap response which are not attempted or for which no response is returned.
4.4.17.1	respident	As per structure 6.19					
4.4.18	other	Other condition test.	O				This should be used to trap conditions that are otherwise undefined.
4.5	interpretvar	The interpretation to be applied to the variable in terms relevant to an actor.					At present this element will be a comment string however it will be further developed in version 2.0.
4.5.1	varname	As per structure 6.18					
4.5.2	view	As per structure 6.1					
4.5.3	material	The material used to describe the variables.	O		As per structure 4.1		
4.6	qticomment	The comments used to annotate the XML file.	O				Comments should be used to aid human readability of the XML file itself.
4.7	duration	The duration permitted for the activity.	O		The underlying string structure is: YYYY:MM:DDT HH:MM:SS	#PCDATA	As defined by the ISO8601.

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
4.8	displayfeedback	The trigger for displaying feedback.	O				
4.8.1	feedbacktype	The type of feedback to be displayed.	M		Response (default) Solution Hint	Enumerated	The default value is 'Response'.
4.8.2	linkrefid	As per structure 6.14					
4.9	scorecondition	Evaluation of the scores to determine the responses.	M	n			A series of conditions could be applied depending on the number of scores to be processed.
4.9.1	title	As per structure 6.2					
4.9.2	continue	As per structure 6.15					
4.9.3	qticomment	Comments on the assessment condition.	O		As per structure 4.6		
4.9.4	conditionvar	Conditions applied to the scores to determine the feedback.	M	n	As per structure 4.4		
4.9.5	setvar	Manipulation of the declared scoring variables.	O	n	As per structure 4.3		
4.9.6	displayfeedback	Display trigger for the Assessment feedback.	O	n	As per structure 4.8.		

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
4.9.7	scorecondition_extension	Proprietary extension for scoring conditions.	O			ANY	All proprietary alternatives to score conditions are to be implemented as sub-elements under this element (see the Q&TI Best Practice Guide for the naming convention).
4.10	scores	To create the variables required for the assessment accumulated scores.	M				The assessment accumulated processing variables group.
4.10.1	qticomment	Comments on the scoring system.	O		As per structure 4.6		
4.10.2	decvar	Declaration of the score variables.	M	n	As per structure 4.3		
4.10.3	interpretvar	Interpretation of the variable comments.	O	n	As per structure 4.5		
4.11	objectives	The objectives of the object being described (ASI).	O	n			These objectives are defined with respect to a view.
4.11.1	view	As per structure 6.1					
4.11.2	qticomment	Comments on the Assessment objectives.	O		As per structure 4.6		
4.11.3	material (As per structure 4.1)	The content of the Assessment objectives.	M		As per structure 4.1		

5.5 Meta-data Objects

Table 5.5 describes the data attributes commonly used with the Assessment, Section and Item objects.

Table 5.5 Meta-data object detailed description.

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
5.1	qmd_absolutescore	Range of scoring for the Assessment.	O		PCDATA	String	The range of scores that the user may attain i.e. max score and min score.
5.2	qmd_assessmenttype	The role of the Assessment.	O		PCDATA	String	The options are: "Examination", "Survey", "Tutorial", "Self-assessment", "Proprietary".
5.3	qmd_computerscored	Whether or not the Item can be scored by computer.	O		PCDATA	String	Yes/No entry.
5.4	qmd_feedbackavailable	Whether or not feedback is available.	O		PCDATA	String	Yes/No entry.
5.5	qmd_hintsavailable	Whether or not hints are available.	O		PCDATA	String	Yes/No entry.
5.6	qmd_itemtype	The type of Item used.	M		PCDATA	String	The options are: "Logical Identifier", "XY co-ordinate", "String", "Numerical" and "Logical Group".
5.7	qmd_levelofdifficulty	The education level for which the Item is intended.	O		PCDATA	String	The options are: "Pre-school", "School" or "HE/FE", "Vocational" and "Professional Development".
5.8	qmd_maximumscore	The maximum score possible from that Item.	M		PCDATA	Numeric	An integer or real number.
5.9	qmd_numberofitems	The number of Items contained by the object.	M		PCDATA	Integer 4	An integer number.

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
5.10	qmd_renderingtype	The type of rendering used within the Item.	M	n	PCDATA	String	The options are: "Choice", "Hotspot", "Slider", "String", and "Proprietary".
5.11	qmd_responsetype	The class of response expected for the Item.	M	n	PCDATA	String	The options are: "Single", "Multiple" or "Ordered".
5.12	qmd_scoringavailable	Whether or not scoring is available.	O		PCDATA	String	Yes/No entry.
5.13	qmd_scoretype	The type of scoring used.	M		PCDATA	String	The options are: "Absolute", "Percentage", "Unscored" and "Multidimensional".
5.14	qmd_sectionsincluded	Whether or not Sections are included available.	M		PCDATA	String	Yes/No entry.
5.15	qmd_solutionsavailable	Whether or not solutions are available.	O		PCDATA	String	Yes/No entry.
5.16	qmd_sectionselection	Support for Section selection.	O		PCDATA	String	Yes/No entry.
5.17	qmd_sectionsequence	Support for Section sequencing.	O		PCDATA	String	Yes/No entry.
5.18	qmd_itemselection	Support for Item selection.	O		PCDATA	String	Yes/No entry.
5.19	qmd_itemsequence	Support for Item sequencing.	O		PCDATA	String	Yes/No entry.
5.20	qmd_status	The status of the Item.	O		PCDATA	String	The options are: "Experimental", "Normal" or "Retired".
5.21	qmd_timedependence	Whether or not the response are timed.	O		PCDATA	String	Yes/No entry.
5.22	qmd_timelimit	The number of minutes or an unlimited duration.	O		PCDATA	String	Either an integer number of minutes or the string "Unlimited".

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
5.23	qmd_toolvendor	The name of the vendor of the tool creating the Assessment.	O		PCDATA	String	
5.24	qmd_topic	A brief description of the topic covered by the Item.	O		PCDATA	String	Text-based description of the Item's topic.
5.25	qmd_material	The type of material used within the Item.	O	n	PCDATA	String	The style of the list is as per the MIME formats. The full range of text, video, audio, etc. formats used.
5.26	qmd_typeofsolution	The type of solution available in the Item.	O		PCDATA	String	The options to be used are: "Complete", "Incremental", "Multilevel" and "Proprietary".
5.27	qmd_weighting	The weighting used for the Item scoring.	O		PCDATA	Numerical	The weighting factor that is to be applied to the Item when it is used for aggregated response processing.

5.6 Common Data Objects (Attributes)

Table 5.6 describes the data attributes commonly used with the Assessment, Section and Item objects.

Table 5.6 Common attribute detailed description.

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
6.1	view	The view to which the interpretation is applied.	O	n	All (default) Administrator AdminAuthority Assessor Author Candidate InvigilatorProctor Psychometrician Scorer Tutor	Enumerated	The 'All' view is the default value.
6.2	title	The title of the object.	O			Description String 256	Should be a representative description of the object.
6.3	ident	Unique identity of the object.	M			String 33	A unique identifier. See the QTI Best Practice Guide for naming and scoping rules.
6.4	solutionswitch	To enable/disable the provision of solutions.	O		Yes (default) No	Enumerated	Default setting is "Yes". Over-rides all other settings defined within the scope.
6.5	hintswitch	To enable/disable the provision of hints.	O		Yes (default) No	Enumerated	Default setting is "Yes". Over-rides all other settings defined within the scope.
6.6	feedbackswitch	To enable/disable the selection of Feedback.	O		Yes (default) No	Enumerated	Default setting is "Yes". Over-rides all other settings defined within the scope.

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
6.7	label	A content label.	O			String 256	This label will be used to allow content sensitive search and editing.
6.8	uri	The location of the object.	O		CDATA string defining the link.	String 256 As per RFC1630.	
6.9	x0	Top left hand side X-co-ordinate.	O		0-9999	Integer 4	Aspect ratio is maintained.
6.10	y0	Top left hand side Y-co-ordinate.	O		0-9999	Integer 4	Aspect ratio is maintained.
6.11	height	The length of the y-axis side.	O		0-9999	Integer 4	Aspect ratio is maintained.
6.12	width	The length of the x-axis side.	O		0-9999	Integer 4	Aspect ratio is maintained.
6.13	embedded	The encoding used for embedded images.	O		CDATA string describing the encoding.	Enumerated	Default setting is “Base64”.
6.14	linkrefid	The identifier of the material to be referenced.	M			String 33	Consistency checking is beyond the scope of this specification. Usage rules are given in the Q&TI Best Practice Guide.
6.15	continue	Next sequence in the processing.	O		Yes No (default)	Enumerated	Default setting is “No”.
6.16	rcardinality	The category of the number of responses expected.	O		Single (default) Multiple Ordered	Enumerated	Default is “Single”.
6.17	rtiming	Defines if the duration of the user’s response is to be recorded.	O		Yes No (default)	Enumerated	Default is “No”.

No.	Name	Explanation	Reqd	Mult	Domain	Type	Note
6.18	varname	The name of the variable to be declared.	M			String 16	Default is set as 'SCORE".
6.19	respident	The identity of the Response type.	M			String 33	The *respident* must have been declared as part of a *response_label*.
6.20	scoremodel	The type of scoring model being adopted.	M		CDATA string describing the model.	String 33	Default string is "SumofScores".
6.21	minnumber	The minimum numb er of responses expected.	O			Numeric 2	
6.22	maxnumber	The maximum number of responses expected.	O			Numeric 2	
6.23	feedbackstyle	The manner in which the hint is to be revealed.	O		Complete (default) Incremental Multilevel Proprietary	Enumerated	The default setting is 'Complete'.
6.24	case	Defines the nature of the comparison.	O		Nocase YesCase (default)	Enumerated	'Nocase' means case insensitive and 'Yescase' means case sensitive.

6. Meta-data Descriptions

There are three sets of meta-data descriptions:

- Assessment – describing the Assessments;
- Section – describing the Sections;
- Item– describing the Items.

In the tables the entry is defined as either Mandatory ('M') or Optional ('O'). If an entry is defined as 'Fixed' then only the defined value is to be used. The contents and meaning of the *General*, *Life-cycle*, *MetaMeta-data*, *Technical*, *Educational*, *Rights*, *Relation*, *Annotation* and *Classification* are given in the IMS Meta-data Specifications.

6.1 Assessment Meta-data

The Assessment meta-data description is given in Table 6.1. The relationship between all of the descriptions is given in Table 6.4.

Table 6.1 Assessment meta-data list.

Field	IMS Class	Definition	Assess Class
General			
Resource Identifier	M	A string or number that uniquely identifies this resource.	M
Title	M	The title of the resource.	M
Catalogue	M	The catalogue name.	O
Catalogue Entry	M	The entry in the catalogue.	O
Language	M	The language the resource is presented in, ex. US-en. Default: US-en.	M
Description	M	A textual description of the contents of the resource.	M
Keywords	O	On or more exemplifying the contents of the course.	O
Coverage	M	The coverage of the instructional unit, (use of this field is very experimental).	N/A
Structure	O	The structure of the resource. Value: XML.	M/Fixed
Aggregation Level	O	The level to which the material is aggregated.	O
Lifecycle			
Version	M	The version of the resource.	O
Status	O	The status of the material.	O
Contribute Role	M	The role of the entity serving as the learning resource: – Curriculum – Course – Unit – Topic – Lesson – Fragment – NA (Not applicable)	N/A

Field	IMS Class	Definition	Assess Class
Contribute Entity	M	The entity name for the contribution.	N/A
Contribute Date/time	M	The date of the entry of the contribution.	N/A
MetaMeta-data			
Catalogue	O	The name of the catalogue being used.	N/A
Catalogue Entry	O	The entry in the named catalogue.	N/A
Contribute Role	O	The role of the entity serving as the learning resource: – Curriculum – Course – Unit – Topic – Lesson – Fragment – NA (Not applicable)	N/A
Contribute Entity	O	The entity itself.	N/A
Contribute Date-time	O	The time of the entity entry.	N/A
Language	M	The language the resource is presented in, ex US-en. Default: US-en.	M
Meta-data Schema	M	Information about Meta-data	N/A
Technical			
Format	M	The format of the resource, ex. Book, html etc. Value: XML	M/Fixed
Size	O	The size of the material.	O
Location	O	The URL showing where the resource can be retrieved	N/A
Requirements Type	O	The type of requirements.	O
Requirements Name	O	The requirements.	O
Minimum Version	O	The minimum set of requirements to use this material.	O
Maximum version	O	The perfect set of requirements to use this material.	O
Installation Remarks	O	Remarks concerning the installation of the material.	O
OtherPlatformReqs	O	Other platform requirements.	O
Duration	O	The expected duration of the materials.	O
Educational			
Interactivity Type	O	The type of interactivity used by the materials.	O
Resource Type	M	The type of the resource, ex. Tutorial. Value: Assessment.	M/Fixed
Interactivity Level	O	The level of interaction between the user and the container • Low • Medium • High	N/A

Field	IMS Class	Definition	Assess Class
Semantic Density	O	Density of the materials.	N/A
End-user Role	O	The intended role of the end-user.	O
Learning Context	O	The context for the learning materials.	O
Typical Age Range	O	The age range for whom the materials are relevant.	O
Difficulty	O	The difficulty of the material.	O
Learning Time	O	The typical time for completing the materials.	O
Description	O	A description of the learning materials.	O
Language	O	The language used for the materials.	O
Rights			
Cost	Conditional	The price of using a particular offering	O
Use Rights	M	What a user can do with the offering: • Restricted • Use • Aggregatable • Disaggregatable • Distributable • Editable	O
Description	M	The description of the rights.	O
Relation			
Kind	O	The nature of the relationship between the named resource and this resource.	O
Resource	O	An identifier of a second resource and it's relationship with this resource.	N/A
Annotation			
Person	O	The individual making the annotations.	O
Date	O	The date/time of the annotations.	O
Description	O	The annotations themselves.	O
Classification			
Purpose	O	Learning objectives met by the container.	O
Taxon Source	O	The taxonomy source.	O
Taxon ID	O	The entry identity under the taxonomy.	O
Taxon Entry	O	The taxonomy entry itself.	O
Description	M	A description of the classification.	O
Keywords	M	One or more words exemplifying the contents of the course.	N/A
Assessment Specific			
qmd_absolutescore	N/A	The range of scores which the user may attain (Min Score,	O

Field	IMS Class	Definition	Assess Class
		Max Score).	
qmd_assessmenttype	N/A	The type of assessment role: • Examination • Survey • Tutorial • Self-assessment.	O
qmd_feedbackavailable	N/A	Whether or not the feedback is to be made available. Value: [Yes/No] with default=Yes.	O
qmd_hintsavailable	N/A	Whether or not the hints are to be made available [Yes/No].	O
qmd_scoretype	N/A	The scoring classification: • Absolute • Percentage • Unscored • Multidimensional	M
qmd_solutionsavailable	N/A	Whether or not the solutions are to be made available. Value: [Yes/No] with default=Yes.	O
qmd_sectionselection	N/A	Whether or not Section selection is available. Value: [Yes/No] with default=Yes.	O
qmd_sectionsequence	N/A	Whether or not Section sequencing is available. Value: [Yes/No] with default=Yes.	O
qmd_itemselection	N/A	Whether or not Item selection is available. Value: [Yes/No] with default=Yes.	O
qmd_itemsequence	N/A	Whether or not Item sequencing is available. Value: [Yes/No] with default=Yes.	O
qmd_material	N/A	Listing of the types of content supplied in the Item: • Text/basic • Text/rtf • Text/html • Text/xhtml • Image/gif • Image/jpeg • Audio/aicc • Audio/wav • Video/quicktime 3 • Video/quicktime 4 • Video/avi • Video/mpeg 1 • Video/mpeg2 • Video/mpeg4 • Applet/java • Application	O
qmd_timelimit	N/A	The number of minutes or an unlimited duration.	O
qmd_toolvendor	N/A	Name of the vendor of the tool creating the Assessments.	O

6.2 Section Meta-data

The Section meta-data description is given in Table 6.2. The relationship between all of the descriptions is given in Table 6.4.

Table 6.2 Section meta-data list.

Field	IMS Class	Definition	Section Class
General			
Resource Identifier	M	A string or number that uniquely identifies this resource.	M
Title	M	The title of the resource.	M
Catalogue	M	The catalogue name.	O
Catalogue Entry	M	The entry in the catalogue.	O
Language	M	The language the resource is presented in, ex. US-en. Default: US-en.	M
Description	M	A textual description of the contents of the resource.	M
Keywords	O	On or more exemplifying the contents of the course.	O
Coverage	M	The coverage of the instructional unit, (use of this field is very experimental).	N/A
Structure	O	The structure of the resource. Value: XML.	M/Fixed
Aggregation Level	O	The level to which the material is aggregated.	O
Lifecycle			
Version	M	The version of the resource.	O
Status	O	The status of the material.	O
Contribute Role	M	The role of the entity serving as the learning resource: – Curriculum – Course – Unit – Topic – Lesson – Fragment – NA (Not applicable)	N/A
Contribute Entity	M	The entity name for the contribution.	N/A
Contribute Date/time	M	The date of the entry of the contribution.	N/A
MetaMeta-data			
Catalogue	O	The name of the catalogue being used.	N/A
Catalogue Entry	O	The entry in the named catalogue.	N/A
Contribute Role	O	The role of the entity serving as the learning resource: – Curriculum – Course	N/A

Field	IMS Class	Definition	Section Class
		– Unit – Topic – Lesson – Fragment – NA (Not applicable)	
Contribute Entity	O	The entity itself.	N/A
Contribute Date-time	O	The time of the entity entry.	N/A
Language	M	The language the resource is presented in, ex. US-en. Default: US-en.	M
Meta-data Schema	M	Information about Meta-data	N/A
Technical			
Format	M	The format of the resource, ex. Book, html etc. Value: XML	M/Fixed
Size	O	The size of the material.	O
Location	O	The URL showing where the resource can be retrieved	N/A
Requirements Type	O	The type of requirements.	O
Requirements Name	O	The requirements.	O
Minimum Version	O	The minimum set of requirements to use this material.	O
Maximum version	O	The perfect set of requirements to use this material.	O
Installation Remarks	O	Remarks concerning the installation of the material.	O
OtherPlatformReqs	O	Other platform requirements.	O
Duration	O	The expected duration of the materials.	O
Educational			
Interactivity Type	O	The type of interactivity used by the materials.	O
Resource Type	M	The type of the resource, ex. Tutorial. Value: Section.	M/Fixed
Interactivity Level	O	The level of interaction between the user and the container • Low • Medium • High	N/A
Semantic Density	O	Density of the materials.	N/A
End-user Role	O	The intended role of the end-user.	O
Learning Context	O	The context for the learning materials.	O
Typical Age Range	O	The age range for whom the materials are relevant.	O
Difficulty	O	The difficulty of the material.	O
Learning Time	O	The typical time for completing the materials.	O
Description	O	A description of the learning materials.	O

Field	IMS Class	Definition	Section Class
Language	O	The language used for the materials.	O
Rights			
Cost	Conditional	The price of using a particular offering	O
Use Rights	M	What a user can do with the offering: • Restricted • Use • Aggregatable • Disaggregatable • Distributable • Editable	O
Description	M	The description of the rights.	O
Relation			
Kind	O	The nature of the relationship between the named resource and this resource.	O
Resource	O	An identifier of a second resource and it's relationship with this resource.	N/A
Annotation			
Person	O	The individual making the annotations.	O
Date	O	The date/time of the annotations.	O
Description	O	The annotations themselves.	O
Classification			
Purpose	O	Learning objectives met by the container.	O
Taxon Source	O	The taxonomy source.	O
Taxon ID	O	The entry identity under the taxonomy.	O
Taxon Entry	O	The taxonomy entry itself.	O
Description	M	A description of the classification.	O
Keywords	M	One or more words exemplifying the contents of the course.	N/A
Section Specific			
qmd_numberofitems	N/A	The number of Items directly referenced within the Section.	M
qmd_sectionsincluded	N/A	Whether or not other Sections are defined within the Section [Yes/No].	M
qmd_sectionselection	N/A	Whether or not Section selection is available. Value: [Yes/No] with default=Yes.	O
qmd_sectionsequence	N/A	Whether or not Section sequencing is available. Value: [Yes/No] with default=Yes.	O
qmd_itemselection	N/A	Whether or not Item selection is available. Value: [Yes/No] with default=Yes.	O

Field	IMS Class	Definition	Section Class
qmd_itemsequence	N/A	Whether or not Item sequencing is available. Value: [Yes/No] with default=Yes.	O
qmd_material	N/A	Listing of the types of content supplied in the Item: • Text • Text/rtf • Text/html • Text/xhtml • Image/gif • Image/jpeg • Audio/aicc • Audio/wav • Video/quicktime 3 • Video/quicktime 4 • Video/avi • Video/mpeg 1 • Video/mpeg2 • Video/mpeg4 • Applet/java • Application	O
qmd_timelimit	N/A	The number of minutes or an unlimited duration.	O

6.3 Item Meta-data

The Item meta-data description is given in Table 6.3. The relationship between all of the descriptions is given in Table 6.4.

Table 6.3 Item meta-data list.

Field	IMS Class	Definition	Item Class
General			
Resource Identifier	M	A string or number that uniquely identifies this resource.	M
Title	M	The title of the resource.	M
Catalogue	M	The catalogue name.	O
Catalogue Entry	M	The entry in the catalogue.	O
Language	M	The language the resource is presented in, ex. US-en. Default: US-en.	M
Description	M	A textual description of the contents of the resource.	M
Keywords	O	On or more exemplifying the contents of the course.	O
Coverage	M	The coverage of the instructional unit, (use of this field is very experimental).	N/A
Structure	O	The structure of the resource. Value: XML.	M/Fixed
Aggregation Level	O	The level to which the material is aggregated.	O

Field	IMS Class	Definition	Item Class
Lifecycle			
Version	M	The version of the resource.	O
Status	O	The status of the material.	O
Contribute Role	M	The role of the entity serving as the learning resource: – Curriculum – Course – Unit – Topic – Lesson – Fragment – NA (Not applicable)	N/A
Contribute Entity	M	The entity name for the contribution.	N/A
Contribute Date/time	M	The date of the entry of the contribution.	N/A
MetaMeta-data			
Catalogue	O	The name of the catalogue being used.	N/A
Catalogue Entry	O	The entry in the named catalogue.	N/A
Contribute Role	O	The role of the entity serving as the learning resource: – Curriculum – Course – Unit – Topic – Lesson – Fragment – NA (Not applicable)	N/A
Contribute Entity	O	The entity itself.	N/A
Contribute Date-time	O	The time of the entity entry.	N/A
Language	M	The language the resource is presented in, ex. US-en. Default: US-en.	M
Meta-data Schema	M	Information about Meta-data	N/A
Technical			
Format	M	The format of the resource, ex. Book, html etc. Value: XML	M/Fixed
Size	O	The size of the material.	O
Location	O	The URL showing where the resource can be retrieved	N/A
Requirements Type	O	The type of requirements.	O
Requirements Name	O	The requirements.	O
Minimum Version	O	The minimumset of requirements to use this material.	O
Maximum version	O	The perfect set of requirements to use this material.	O
Installation Remarks	O	Remarks concerning the installation of the material.	O

Field	IMS Class	Definition	Item Class
OtherPlatformReqs	O	Other platform requirements.	O
Duration	O	The expected duration of the materials.	O
Educational			
Interactivity Type	O	The type of interactivity used by the materials.	O
Resource Type	M	The type of the resource, ex. Tutorial. Value: Item.	M/Fixed
Interactivity Level	O	The level of interaction between the user and the container • Low • Medium • High	N/A
Semantic Density	O	Density of the materials.	N/A
End-user Role	O	The intended role of the end-user.	O
Learning Context	O	The context for the learning materials.	O
Typical Age Range	O	The age range for whom the materials are relevant.	O
Difficulty	O	The difficulty of the material.	O
Learning Time	O	The typical time for completing the materials.	O
Description	O	A description of the learning materials.	O
Language	O	The language used for the materials.	O
Rights			
Cost	Conditional	The price of using a particular offering	O
Use Rights	M	What a user can do with the offering: • Restricted • Use • Aggregatable • Disaggregatable • Distributable • Editable	O
Description	M	The description of the rights.	O
Relation			
Kind	O	The nature of the relationship between the named resource and this resource.	O
Resource	O	An identifier of a second resource and it's relationship with this resource.	N/A
Annotation			
Person	O	The individual making the annotations.	O
Date	O	The date/time of the annotations.	O
Description	O	The annotations themselves.	O

Field	IMS Class	Definition	Item Class
Classification			
Purpose	O	Learning objectives met by the container.	O
Taxon Source	O	The taxonomy source.	O
Taxon ID	O	The entry identity under the taxonomy.	O
Taxon Entry	O	The taxonomy entry itself.	O
Description	M	A description of the classification.	O
Keywords	M	One or more words exemplifying the contents of the course.	N/A
Item Specific			
qmd_computerscored	N/A	Whether or not the item can be computer scored [Yes/No].	O
qmd_feedbackavailable	N/A	Whether or not the feedback is to be made available. Value: [Yes/No] with default=Yes.	O
qmd_hintsavailable	N/A	Whether or not the hints are to be made available [Yes/No].	O
qmd_itemtype	N/A	The type of Item: • Logical identifier • XY co-ordinate • String • Numeric • Logical group • Composite	M
qmd_levelofdifficulty	N/A	The level of difficulty of the Item: • Pre-school • School • Higher/further education • Vocational • Professional Development	O
qmd_maximumscore	N/A	The maximum score attainable from the Item.	M
qmd_renderingtype	N/A	The type of rendering employed: • Choice • Hot spot • Slider • Text entry	M
qmd_responsetype	N/A	The class of responses required by the Item: • Single • Multiple • Ordered	M
qmd_scoringpermitted	N/A	Whether or not scoring is enabled. Value: [Yes/No] with default=Yes.	O
qmd_solutionsavailable	N/A	Whether or not the solutions are to be made available. Value: [Yes/No] with default=Yes.	O

Field	IMS Class	Definition	Item Class
qmd_status	N/A	The status of the Item: • Experimental • Normal • Retired.	O
qmd_timedependence	N/A	Whether or not the user responses are time dependent. Value: [Yes/No] with default=No.	O
qmd_typeofsolution	N/A	The type of solution supplied by the Item: • Complete • Incremental • Multilevel • Proprietary	O
qmd_topic	N/A	A brief description of the topic covered by the Item.	O
Qmd_weighting	N/A	The weighting of the Item to be applied in scoring.	O
qmd_material	N/A	Listing of the types of content supplied in the Item: • Text • Text/rtf • Text/html • Text/xhtml • Image/gif • Image/jpeg • Audio/aicc • Audio/wav • Video/quicktime 3 • Video/quicktime 4 • Video/avi • Video/mpeg 1 • Video/mpeg2 • Video/mpeg4 • Applet/java • Application	O
qmd_timelimit	N/A	The number of minutes or an unlimited duration.	O
qmd_toolvendor	N/A	Name of the vendor of the tool creating the Assessments.	O

6.4 Meta-data Definition Comparison

A comparison of the meta-data entries is given in Table 6.4.

Table 6.4 Assessment, Section and Item meta-data list comparison.

Field	IMS Class	Assess Class	Section Class	Item Class
General				
Resource Identifier	M	M	M	M
Title	M	M	M	M
Catalogue	M	O	O	O
Catalogue Entry	M	O	O	O
Language	M	M	M	M
Description	M	M	M	M
Keywords	O	O	O	O
Coverage	M	N/A	N/A	N/A
Structure	O	M/Fixed 'XML'	M/Fixed 'XML'	M/Fixed 'XML'
Aggregation Level	O	O	O	O
Lifecycle				
Version	M	O	O	O
Status	O	O	O	O
Contribute Role	M	N/A	N/A	N/A
Contribute Entity	M	N/A	N/A	N/A
Contribute Date/time	M	N/A	N/A	N/A
MetaMeta-data				
Catalogue	O	N/A	N/A	N/A
Catalogue Entry	O	N/A	N/A	N/A
Contribute Role	O	N/A	N/A	N/A
Contribute Entity	O	N/A	N/A	N/A
Contribute Date-time	O	N/A	N/A	N/A
Language	M	M	M	M
Meta-data Schema	M	N/A	N/A	N/A
Technical				
Format	M	M/Fixed 'XML'	M/Fixed 'XML'	M/Fixed 'XML'
Size	O	O	O	O
Location	O	N/A	N/A	N/A

Field	IMS Class	Assess Class	Section Class	Item Class
Requirements Type	O	O	O	O
Requirements Name	O	O	O	O
Minimum Version	O	O	O	O
Maximum version	O	O	O	O
Installation Remarks	O	O	O	O
OtherPlatformReqs	O	O	O	O
Duration	O	O	O	O
Educational				
Interactivity Type	O	O	O	O
Resource Type	M	M/Fixed 'Assessment'	M/Fixed 'Section'	M/Fixed 'Item'
Interactivity Level	O	N/A	N/A	N/A
Semantic Density	O	N/A	N/A	N/A
End-user Role	O	O	O	O
Learning Context	O	O	O	O
Typical Age Range	O	O	O	O
Difficulty	O	O	O	O
Learning Time	O	O	O	O
Description	O	O	O	O
Language	O	O	O	O
Rights				
Cost	Conditional	O	O	O
Use Rights	M	O	O	O
Description	M	O	O	O
Relation				
Kind	O	O	O	O
Resource	O	N/A	N/A	N/A
Annotation				
Person	O	O	O	O
Date	O	O	O	O
Description	O	O	O	O
Classification				
Purpose	O	O	O	O
Taxon Source	O	O	O	O

Field	IMS Class	Assess Class	Section Class	Item Class
Taxon ID	O	O	O	O
Taxon Entry	O	O	O	O
Description	M	O	O	O
Keywords	M	N/A	N/A	N/A
ASI Specific				
qmd_absolutescore	N/A	O	N/A	N/A
qmd_assessmenttype	N/A	O	N/A	N/A
qmd_computerscored	N/A	N/A	N/A	O
qmd_feedbackavailable	N/A	O	N/A	O
qmd_hintsavailable	N/A	O	N/A	O
qmd_itemtype	N/A	N/A	N/A	M
qmd_levelofdifficulty	N/A	N/A	N/A	O
qmd_maximumscore	N/A	N/A	N/A	M
qmd_numberofitems	N/A	N/A	M	N/A
qmd_renderingtype	N/A	N/A	N/A	M
qmd_responsetype	N/A	N/A	N/A	M
qmd_scoringpermitted	N/A	N/A	N/A	O
qmd_scoretype	N/A	M	N/A	N/A
qmd_sectionsincluded	N/A	N/A	M	N/A
qmd_solutionsavailable	N/A	O	N/A	O
qmd_sectionselection	N/A	O	O	N/A
qmd_sectionsequence	N/A	O	O	N/A
qmd_itemselection	N/A	O	O	N/A
qmd_itemsequence	N/A	O	O	N/A
qmd_status	N/A	N/A	N/A	O
qmd_timedependence	N/A	N/A	N/A	O
qmd_typeofsolution	N/A	N/A	N/A	O
qmd_topic	N/A	N/A	N/A	O
qmd_weighting	N/A	N/A	N/A	O
qmd_material	N/A	O	O	O
qmd_timelimit	N/A	O	O	O
qmd_toolvendor	N/A	O	N/A	O

7. Conformance

The purpose of this conformance statement is to provide a mechanism for customers to fairly compare vendors of assessment tools and content. It is not required for a vendor to support every feature to claim conformance, however, a vendor must detail their level of conformance with a "Conformance Statement". For example vendors may choose to supply:

- Data files (source materials), export features, import features and/or repackaging (the collation of multiple files) features;
- Data files (source materials) and/or tools that support items, sections and/or assessments.

7.1 Valid Data Issues

Vendors claiming conformance shall produce, parse, provide and/or "pass through" valid Q&TI data as defined by the DTD including proprietary extensions where applicable. Vendors claiming their system tools export Q&TI shall export valid Q&TI data. Vendors claiming their system tools import Q&TI data shall be able to parse and recognize valid Q&TI data. Vendors claiming their system tools repackage Q&TI data shall be able "pass through" valid Q&TI data whether the tool recognizes the optional elements or not. Vendors claiming their assessment content conforms to this specification shall provide valid Q&TI data.

7.2 Conformance Statement

Vendors claiming conformance must provide a "Conformance Statement", detailing their level of conformance, substantially similar to the information shown below, upon a reasonable request from a member of the IMS, a prospective customer(s).

Table 7.1 Conformance functionality grid.

Functionality		**Level of Support**				
		Data File	Import	Export	Repackage	Explanation of optional functionality supported.
Assessment level element support	*Mandatory*	Y or N	Y or N	Y or N	Y or N	
	Optional	Y or N	Y or N	Y or N	Y or N	
Section level element support	*Mandatory*	Y or N	Y or N	Y or N	Y or N	
	Optional	Y or N	Y or N	Y or N	Y or N	
Item level element support	*Mandatory*	Y or N	Y or N	Y or N	Y or N	
	Optional	Y or N	Y or N	Y or N	Y or N	Optional elements listed here
	Response types	Y or N	Y or N	Y or N	Y or N	Response types listed here, such as multiple choice, multiple response, string response, numeric, xy co-ordinates, etc.
	Material	Y or N	Y or N	Y or N	Y or N	e.g. text, video, audio, image, applet, application, alternative material, referenced material.
	Scoring	Y or N	Y or N	Y or N	Y or N	e.g. scoring models.
	Feedback	Y or N	Y or N	Y or N	Y or N	

Appendix A – Detailed Object Model

A1 Common Class Definitions

The common classes defined are:

- Meta-data – the meta-data description class;
- Objectives – the content objectives class;
- Predicates – selection mechanism class;
- Content – the content to be displayed.

A1.1 Description Class Definition

The Description class encapsulates the IMS Assessment meta-data set as listed in Section 6 of this specification. The composition of the Description class is shown in Figure A1.1.

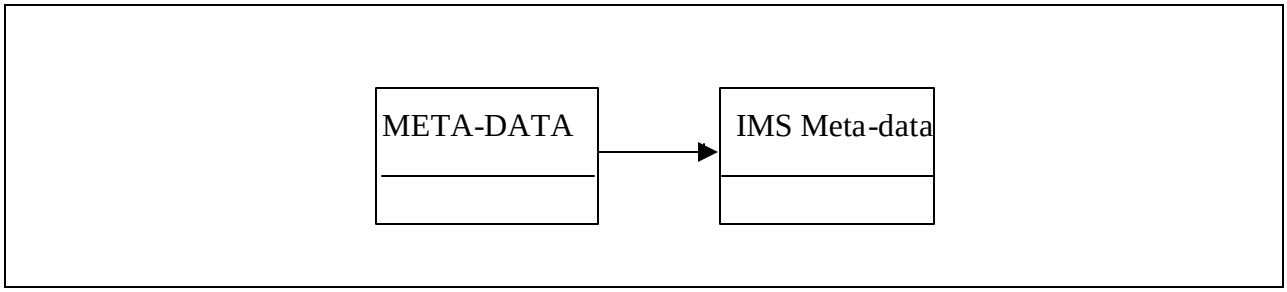


Figure A1.1 Description class representation.

The objects that are derived from the Description class are listed in Table A1.1. The Description class objects table describes:

- Object name – the name of the object based upon the class;
- Source object – the objects to which the class object is related;
- Description – the usage of the object.

The meta-data enclosed in this class is unique to the QTI data structures only i.e. Assessments, Sections and Items. The standard meta-data items as defined in the IMS Meta-data Specifications are included through the normal mechanisms.

Table A1.1 Description class objects.

Object Name	Source Object	Description
assessmentmetadata	assessment	Assessment meta-data.
sectionmetadata	section	Section meta-data.
itemmetadata	item	Item meta-data.

A1.2 Objectives Class Definition

The Objectives class contains the objectives for the Assessment, Section and Item structures and maintains the linkage of these objectives with the IMS Content & Management Specifications. Figure A1.2 shows the Objective class and the attributes are listed in Table A1.2. At present the Objectives are expressed as a set of standard Material objects.

The objectives can be defined according to the 'View' i.e. the actors (see Figure 2.1) using the system. The view mechanism provides a mechanism by which different types of information can be targeted to the different actors.

The objectives class is for further study to ensure that the IMS Content and Management work within the IMS can be adopted.

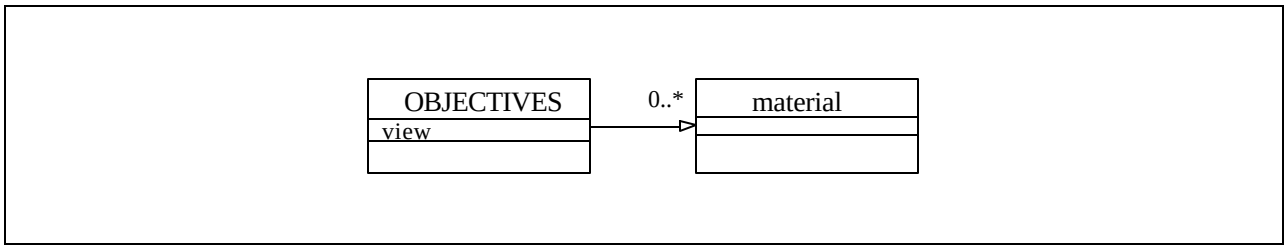


Figure A1.2 Objectives class representation.

The attribute table describes:

- Attribute Name – the name of the attribute;
- Data Type – the data type applied to the attribute;
- Description – a brief description plus the units and range of the data content;
- Req'd – Either mandatory ('M') or option ('O').

Table A1.2 Objective class attributes.

Attribute Name	Data Type	Description	Req'd
view	Enumerated	These are the different user views that are available. These views match the 'Actors' as shown in Figure 2.1. The values are: • All • Administrator • AdminAuthority • Assessor • Author • Candidate • InvigilatorProctor • Psychometrician • Scorer • Tutor	O

A1.3 Predicate Class Definition

The Predicate class contains the information to enable dynamic selection of the possible Sections and Items (a similar selection could be in response to a poor score requiring further assessment. The list of objects derives from the predicate class are listed in Figure A1.4. The predicates are defined as either:

- Preconditions – predicates applied before the object is activated i.e. employed to determine if some start conditions are correct;
- Postconditions – predicates applied after the object has completed its activity i.e. employed to determine if some end conditions have been obeyed.

Table A1.3 Predicate class objects.

Object Name	Source Object	Description
itemprecondition	item	Precondition predicates for Items.
itempostcondition	item	Postconditions predicates for Items.
sectionprecondition	section	Preconditions predicates for Sections.
sectionpostcondition	section	Postconditions predicates for Sections.

The algorithms for the selection of Sections and Items is outside the scope of this specification. Static selection (selection which is independent of user input) will be based upon the meta-data descriptions (Description). Dynamic selection (fixed, independent of user input, or adaptive, dependent on user activity) will be based upon the pre and post conditions placed upon the Section and Item classes as well as the usage of the Selection and Sequence classes applied to the Item and Section classes.

Item and Section Selection and Sequencing is for further study in V2.0.

A1.4 Material Class Definition

The Material class is the parent for several content specific classes, as shown in Figure A1.3. The Sub-elements for the Material class are defined in Table A1.4 and the corresponding attributes are given in Table A1.5.

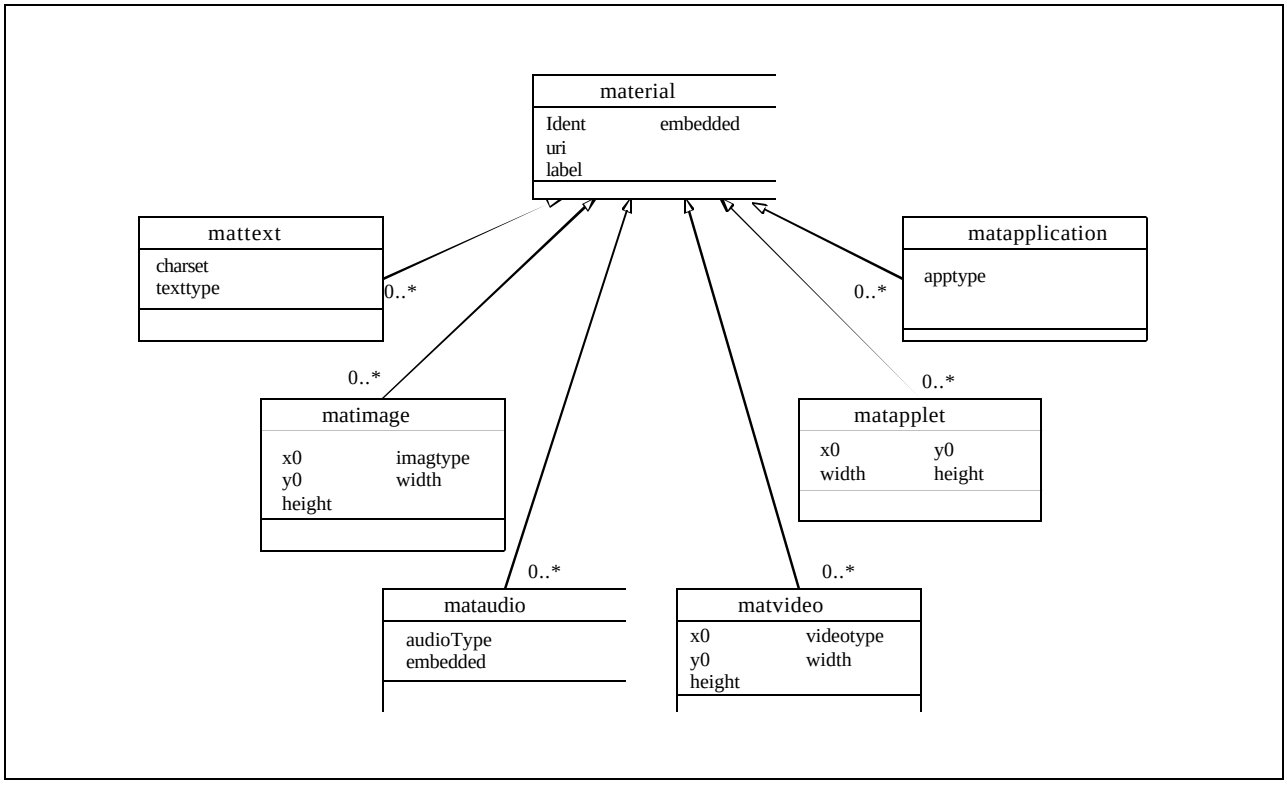


Figure A1.3 Material class representation.

The sub-elements table describes:

- Sub-element – the name of the sub-element;
- Cardinality – the number of possible associations between the class and the sub-element;
- Description – a brief description of the sub-element plus a reference to its defining source within this specification.

Table A1.4 Material class sub-elements.

Sub-element	Cardinality	Description
mattext	0..*	The presentation of text.
matimag	0..*	The presentation of images.
mataudio	0..*	The presentation of audio.
matvideo	0..*	The presentation of video.
matapplet	0..*	The running of a Java applet.
matapplication	0..*	The running of an application.

Table A1.5 Material class and sub-element attributes.

Attribute Name	Data Type	Description	Req'd
ident	String	String uniquely identifying the material; Length: 1-32 chars.	M
label	String	A label used to describe the style of the material. Length: 1-256 chars.	O
uri	String	As per RFC1630. Length: 1-256 chars.	O
embedded	String	Indicator for the embedded inclusion of the material itself. Range: Yes/No.	O
texttype	String	The type of text to be displayed. Length: 1-256 chars.	O
imagtype	String	The type of image to be displayed. Length: 1-256 chars.	O
videotype	String	The type of video to be played. Length: 1-256 chars.	O
audiotype	String	The type of sound file to be played. Length: 1-256 chars.	O
apptype	String	The type of application to be invoked. Length: 1-256 chars.	O
charset	String	The character set to be used, as per RFC1521. Length: 1-256 chars.	O
x0	Integer	The top left-hand X co-ordinate of the image. Range: 0-9999.	O
y0	Integer	The top left-hand Y co-ordinate of the image. Range: 0-9999.	O
height	Integer	The height (y-axis length) of the image/video. Range: 0-9999.	O
width	Integer	The width (x-axis length) of the image/video. Range: 0-9999.	O

The objects that are derived from the Material class are listed in Table A1.6.

Table A1.6 Material class objects.

Object Name	Source Object	Description
altmaterial	material	Alternative content presentation.
objectives	assessment, section, item	Objectives for the Assessment, Section and Item data structures.
assessfeedback	assessmentprocessing	Scoring feedback content.
itemrubric	item	The rubric description for the Item.
presentation	item	Response container for the Item.
response_lid	presentation	LID response type content presentation.
response_xy	presentation	XY response type content presentation.
response_str	presentation	STR response type content presentation.
response_num	presentation	NUM response type content presentation.
response_grp	presentation	GRP response type content presentation.
render_choice	presentation	Choice rendering presentation content.
render_hotspot	presentation	Image rendering presentation content.
render_slider	presentation	Slider rendering presentation content.
render_fib	presentation	Fill-in-blank rendering presentation content.
response_label	presentation	Available responses content.
solutionmaterial	solution	The available solutions.
hintmaterial	hint	The available hints.

A1.5 Control Class Definition

The Control class is responsible for the setting of the various switches which determine the capabilities to be displayed to the user e.g. the display, or not, of solutions. Figure A1.4 shows the structure of the Control class and the associated attributes are listed in Table A1.7.

Table A1.7 Control class attributes.

Attribute Name	Data Type	Description	Req'd
feedbackswitch	Enumerated	Determines whether or not the users have access to any feedback information. Range: Yes/No.	O
solutionswitch	Enumerated	Determines whether or not the users have access to any solutions. Range: Yes/No.	O
hintswitch	Enumerated	Determines whether or not the users have access to hints. Range: Yes/No.	O

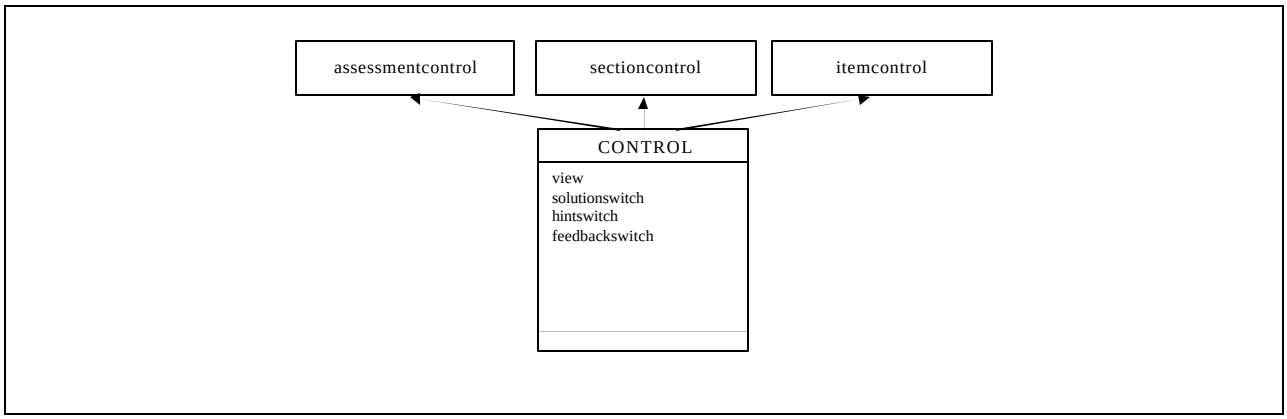


Figure A1.4 Control class representation.

The objects based upon the Control class are listed in Table A1.8. The order of precedence for these switches is:

- Item level switches take precedence over everything else;
- Section switches take precedence over Assessment switches;
- Assessment switches define the default state if no switches are defined within either the Section or Item;
- The meta-data elements are used to inform about the availability of control over the switches.

Table A1.8 Control class objects.

Object Name	Source Object	Description
assessmentcontrol	assessment	Switch control for an Assessment.
sectioncontrol	section	Switch control for a Section.
itemcontrol	item	Switch control for an Item.

A1.6 Variable Class Definition

The Variable class is the representation of the data variables and the methods used to support the different response processing operations at the Item, Section and Assessment levels. The Variable class is shown in Figure A1.5 and the corresponding attributes are listed in Table A1.9. The methods for the class are listed in Table A1.10.

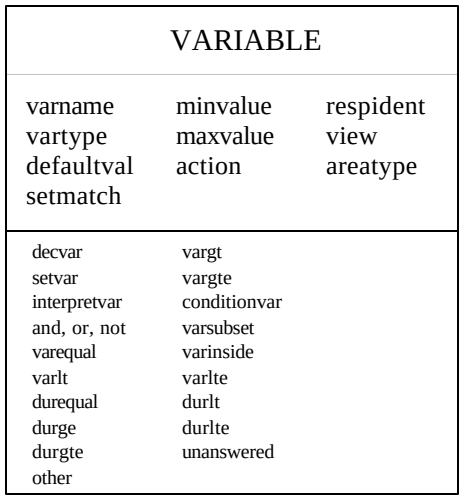


Figure A1.5 Variable class representation.

Table A1.9 Variable class attributes.

Attribute Name	Data Type	Description	Req'd
varname	String	The name of the variable to be declared or used.	O
vartype	Enumerated	The type of variable to be created: • String • Integer • Decimal • Scientific • Boolean • Enumerated • Set	O
defaultval	String/numeric	The initial value to which the created variable is set.	O
minvalue	Numeric	The minimum value to which the numeric variable can be set.	O
maxvalue	Numeric	The maximum value to which the numeric variable can be set.	O
action	Enumerated	The action to be applied to the variable: • Set • Add • Subtract • Multiply • Divide	O
respident	String	The 'Response Identity' to which the processing is to be applied.	O
setmatch	Enumerated	The type of set comparison to be made. The options are: • Exact - the default value • Partial	O
areatype	Enumerated	The type of area to be used for the comparison: • Ellipse • Rectangle • Bounded	O
view	Enumerated	As per Table A1.2.	O

It is the responsibility of the presentation system to support the storage and manipulation of the variables. How this storage and manipulation is supported is outside of the scope of this specification. Support for this capability is part of the conformance requirement and any error handling capabilities are implementation dependent.

Table A1.10 Variable class methods.

Method	Description
decvar	Declaration of the variable: string, integer, real, float, scientific, Boolean.
setvar	Setting the value of the variable.
interpretvar	Comments about the variable e.g. mean, standard deviation, etc.

Method	Description
conditionvar	The application of a conditions to variables to determine their value.
varequal	Variable condition comparison of equality.
varlt	Variable condition comparison of less than.
varlte	Variable condition comparison of less than or equal.
vargt	Variable condition comparison of greater than.
vargte	Variable condition comparison of greater than or equal.
varsubset	Determine if the variable is contained within the given set (exact or partial).
varinside	To determine if the XY co-ordinate within the defined area.
durequal	Duration condition comparison of equality.
durlt	Duration condition comparison of less than.
durlte	Duration condition comparison of less than or equal.
durgt	Duration condition comparison of greater than.
durgte	Duration condition comparison of greater than or equal.
not	The logical NOT used to invert the comparison result.
and	The logical AND operator.
or	The logical OR operator.
other	The undefined condition operator.
unanswered	Condition for Item responses that have not been attempted.

The condition processing is based upon the requirements listed in Table A1.11.

Table A1.11 The condition processing to be applied to variables.

Response-type	Single Response	Multiple Responses	Ordered Responses
LID	Equal, Not equal, Subset, Not subset	The set of responses is applied to the set of var*** tests. The order the tests are applied is not significant as each test must be applied to all of the responses.	The order of the tests is applied sequentially. The order of the sequence of responses is applied to the order of the sequence of the var*** elements. Each response is used for only one var*** test per conditionvar element.
XY	Equal, Not equal, Inside, Not inside		
STR	Equal, Not equal, Substring, Not substring		
NUM	Greater than, Less than, Greater than or equal, Less than or equal		
GRP	Equal, Not equal, Subset, Not subset		

A1.7 DecVar Class

The DecVar class supports the evaluation of the responses by enabling different scoring variables to be declared. The list of DecVar attributes are listed in Table A1.12.

Table A1.12 DecVar class attributes.

Attribute Name	Data Type	Description	Req'd
varname	String	Name of the variable declared. Range: 1-32 characters. Default='SCORE'.	M
vartype	Enumerated	The type of variable that is being declared. The options are: • Integer – an integer variable; • Decimal – a real number variable; • Scientific - exponential notation number; • String – string of characters; • Boolean – true/false value; • Enumerated – predefined options; • Set – a set (this may be empty) Default = 'integer'.	M
defaultval	Number or string or True/False or enumerated type value.	The start value assigned to the variable.	O
members	String	String that lists the possible enumerated entries.	O
minvalue	Real Number	The minimum value to be assigned to the variable. Range = -999 to 999.	O
maxvalue	Real Number	The start value to be assigned to the variable. Range = -999 to 999.	O

Each and every scoring variable MUST be declared through its own DecVar statement. 'SCORE" is defined as a default integer variable.

A1.8 SetVar Class

The SetVar class defines the operations permitted on a scoring variable (as defined by DecVar). It is this series of operations that determine the final score made available through the score variables. The attributes for the SetVar class are listed in Table A1.13.

Table A1.13 SetVar class attributes.

Attribute Name	Data Type	Description	Req'd
action	Enumerated	The mathematical actions that can be applied to the variable. The options are: • Set – set the variable to the defined value; • Add – add the value to the named variable; • Subtract – subtract the value from the named variable; • Multiply – multiply the variable with the defined value; • Divide – divide the variable with the defined value.	M
varname	String	The variable name to which the processing is to be applied. Range: 1-32 characters.	O

A1.9 InterpretVar Class

The InterpretVar class supports description of the declared variables. The attributes for the InterpretVar class are listed in Table A1.14.

Table A1.14 InterpretVar class attributes.

Attribute Name	Data Type	Description	Req'd
varname	String	The variable name to which the processing is to be applied. Range: 1-32 characters.	O
view	Enumerated	As per Table A1.2	O

A1.10 Condition Classes

The Condition class is the collection of condition methods that are applied to variables to determine subsequent actions. The available condition methods and their attributes are listed in Table A1.15. Each condition returns a 'True' if the comparison is 'True' otherwise 'False' is returned.

Table A1.15 Condition methods and attributes.

Method - Attribute	Description
varequal	Variable condition comparison of equality.
respident	Refers to the 'Response ident' containing the ResponseId.
case	Defines if the check is case sensitive or not.
varlt	Variable condition comparison of less than.
respident	Refers to the 'Response ident' containing the ResponseId.
varlte	Variable condition comparison of less than or equal.
respident	Refers to the 'Response ident' containing the ResponseId.
vargt	Variable condition comparison of greater than.
respident	Refers to the 'Response ident' containing the ResponseId.
vargte	Variable condition comparison of greater than or equal.
respident	Refers to the 'Response ident' containing the ResponseId.
varsubset	Is the variable a member of the defined set.
respident	Refers to the 'Response ident' containing the ResponseId.
case	Defines if the check is case sensitive or not.
setmatch	Defines if the set comparison is to be exact or partial.
varinside	Is the XY co-ordinate within the defined area.
respident	Refers to the 'Response ident' containing the ResponseId.
areatype	Enumerated choice of area to contain the value: • Ellipse • Rectangle • Bounded
durequal	Duration condition comparison of equality. Used for determining if a response has occurred within some period.

Method - Attribute	Description
respident	Refers to the 'Response ident' containing the ResponseId.
durlt	Duration condition comparison of less than. Used for determining if a response has occurred within some period.
respident	Refers to the 'Response ident' containing the ResponseId.
durlte	Duration condition comparison of less than or equal. Used for determining if a response has occurred within some period.
respident	Refers to the 'Response ident' containing the ResponseId.
durgt	Duration condition comparison of greater than. Used for determining if a response has occurred within some period.
respident	Refers to the 'Response ident' containing the ResponseId.
durgte	Duration condition comparison of greater than or equal. Used for determining if a response has occurred within some period.
respident	Refers to the 'Response ident' containing the ResponseId.
not	Inverts the status code of the enclosed method.
and	Returns the AND condition of the status codes of the enclosed methods.
or	Returns the OR condition of the status codes of the enclosed methods.
other	Explicit undefined condition processing.
unanswered	If the response has not been attempted hen this test returns 'True'.
respident	Refers to the 'Response ident' for unanswered processing.

The *not* method can be used to negate the status of any of the methods (except the *unanswered*) listed in Table A1.15. The *and* and *or* methods are used to collect together the methods listed in Table A1.15.

A1.11 Duration Class

The Duration class is the representation of the period for the activity. The Duration is defined as per the ISO8601 standard. The duration class objects are defined in table A1.16. The content of the class is the text string that contains the date/time using the format:- YYYY:MM:DDTHH:MM:SS.

Table A1.16 Duration class objects.

Object Name	Source Object	Description
duration	assessment	Duration for Assessments.
	item	Duration for Items.
	section	Duration for Sections.

A1.12 DisplayFeedback Class

The DisplayFeedback class is the representation of the link between processing and the feedback that is to be triggered. The attributes for this class are listed in Table A.17 and the DisplayFeedback objects are listed in Table A1.18.

Table A1.17 DisplayFeedback class attributes.

Attribute Name	Data Type	Description	Req'd
feedbacktype	Enumerated	The type of feedback possible. The possible options are: • Response • Solution • Hint	M
linkrefid	String	The identity of the feedback which is to be triggered. Range: 1-32 chars.	M

Table A1.18 DisplayFeedback class objects.

Object Name	Source Object	Description
displayfeedback	scorecondition	Feedback trigger for Assessments and Sections.
	respcondition	Feedback trigger for Items.

A1.13 Scores Class

The Scores class represents the variables to be used for the processing of the assessment accumulated information. The sub-elements for the Scores class are listed in Table A1.19.

Table A1.19 Scores class sub-elements.

Sub-element	Cardinality	Description
decvar	1..*	Declaration of the variables to be used for the assessment accumulated processing (see Section A1.6 in this document).
interpretvar	0..*	Comments about the variable e.g. mean, standard deviation, etc. (see Section A1.6 in this document).

A1.14 ScoreCondition Class

The ScoreCondition class represents the variables to be used for the processing of the assessment accumulated information. The sub-elements for the ScoreCondition class are listed in Table A1.20.

Table A1.20 Scores class sub-elements.

Sub-element	Cardinality	Description
conditionvar	1..*	The conditions that are to be applied to the variables to determine the feedback (see Section A1.6 in this document).
setvar	0..*	The values to be assigned to the declared variables (see Section A1.6 in this document).
displayfeedback	0..*	The feedback to be displayed as a result of the evaluation processing.

A2. Assessment Representation

A2.1 Assessment Class

The Assessment class representation is shown in Figure A2.1. Each Assessment must contain at least one Section and may consist of a meta-data description (Meta-data), at least on objective (Objectives), switch control (Control) and assessment processing (assessprocessing) and feedback (assessfeedback). The attributes are listed in Table A2.1.

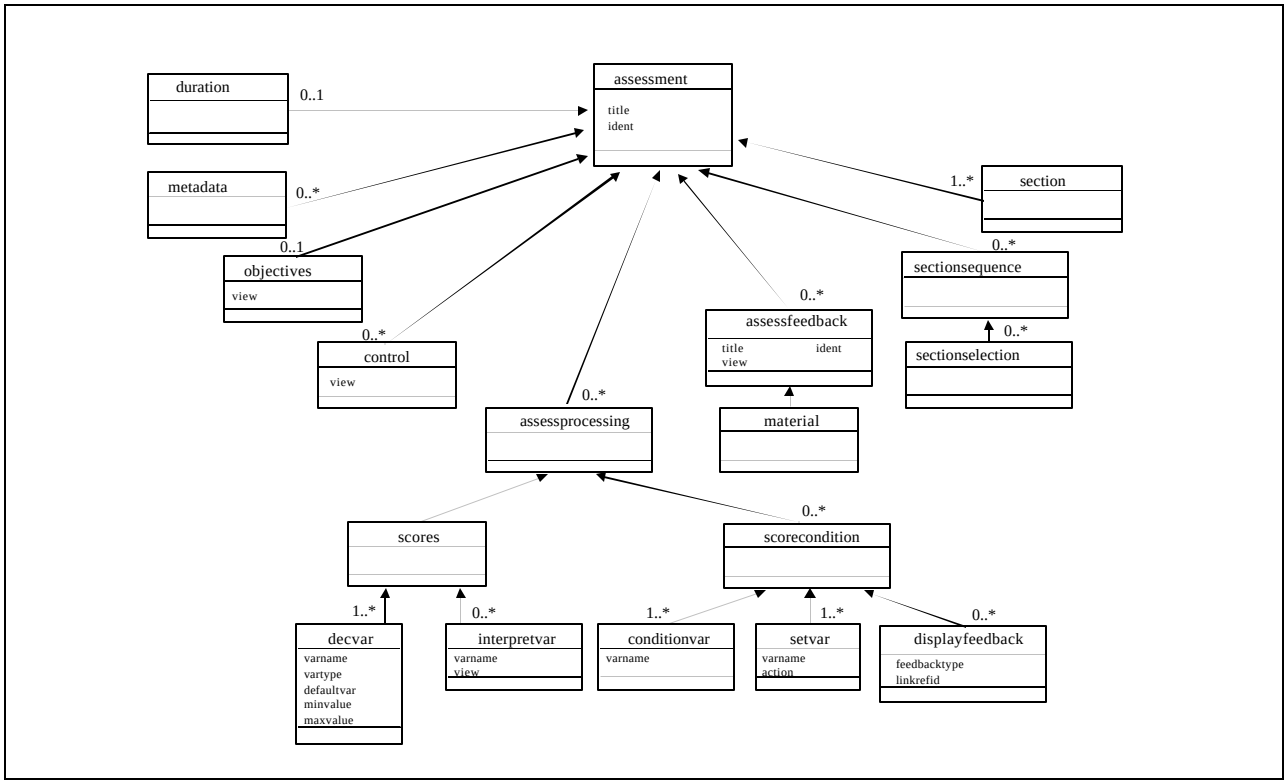


Figure A2.1 Assessment class representation.

Table A2.1 Assessment class attributes.

Attribute Name	Data Type	Description	Req'd
title	String	Title or name of the assessment. Range = 1-256 characters.	O
ident	String	The unique identifier of the Assessment. Range: 1-32 characters.	M

The Sub-elements for the Assessment class are listed in Table A2.2.

Table A2.2 Assessment class sub-elements.

Sub-element	Cardinality	Description
meta-data	0..1	Meta-data description of the assessment.
objectives	0..*	Objectives of the assessment.
control	0..*	Assessment control switches.
assessprocessing	0..1	Assessment accumulated processing.

Sub-element	Cardinality	Description
		For further study in V2.0.
assessfeedback	0..*	Feedback for the assessment accumulated processing.
sectionselection	0..*	The selection of Sections to be used. **For further study in V2.0.**
sectionsequence	0..*	The sequencing of the Sections used. **For further study in V2.0.**
section	1..*	Primary container for the Items. Each assessment must contain at least one section.

A2.2 AssessProcessing Class

The AssessProcessing class represents the Assessment Accumulated Processing activity (as defined in the system model in Figure 4.1). The sub-elements are listed in Table A2.3.

Table A2.3 AssessProcessing class sub-elements.

Sub-element	Cardinality	Description
scores	1	Declaration of the variables to be used for the assessment accumulated processing.
scorecondition	0..*	The conditional evaluation to be placed on the assessment accumulated processing variables.

A2.3 AssessFeedback Class

The AssessFeedback class defines the material for feedback, as shown in Figure A2.1. The attributes for the AssessFeedback class are listed in Table A2.4 and the sub-elements are defined in Table A2.5.

Table A2.4 AssessFeedback class attributes.

Attribute Name	Data Type	Description	Req'd
title	String	Title or name of the score. Range = 1-256 characters.	M
ident	String	Unique identity of the feedback. Range = 1-32 characters.	O
view	Enumerated	As per Table A1.3.	O

Table A2.5 AssessFeedback class sub-elements.

Sub-element	Cardinality	Description
material	1	The content to be presented as a result of the score.

For further study in V2.0.

A2.4 SectionSelection & SectionSequence Classes

For further study in V2.0.

A3. Section Representation

A3.1 Section Class

The Section class representation is shown in Figure A3.1. Each Section may contain other selected sections (Selection) and may consist of a meta-data description (Meta-data), the objectives (Objectives), switch control (Control), pre/postconditions (Predicates), Section evaluation (SectionProcessing) and feedback (SectionFeedback) and selected and sequenced Sections (SectionSelection/SectionSequence) and Items (ItemSection/ItemSequence).

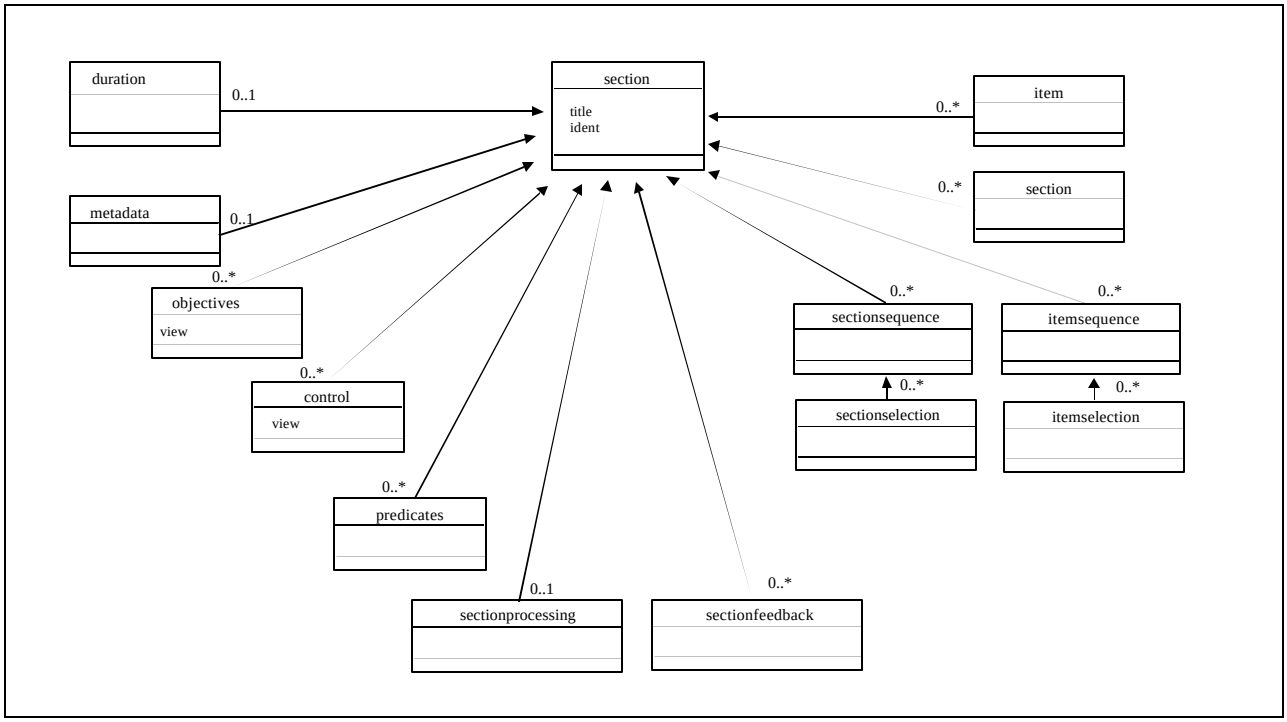


Figure A3.1 Section class model representation.

The attributes for the Section class are listed in Table A3.1:

Table A3.1 Section class attributes.

Attribute Name	Data Type	Description	Req'd
title	String	Title or name of the Section. Range = 1-256 characters.	M
ident	String	Name uniquely identifying the Section. Range = 1-32 characters.	M

The Sub-elements for the Section class are listed in Table A3.2:

Table A3.2 Section class sub-elements.

Sub-element	Cardinality	Description
meta-data	0..1	Meta-data description of the Section.
objectives	0..*	Objectives of the Section.
control	0..*	Section control switches.
predicates	0..*	Pre/post condition predicates applied to the Sections to

Sub-element	Cardinality	Description
		decide which is to be invoked.
sectionprocessing	0..1	Assessment accumulated processing and feedback. **For further study in V2.0.**
sectionfeedback	0..*	Feedback of the results of the section level processing. **For further study in V2.0.**
sectionselection	0..*	The selection of Sections to be used. **For further study in V2.0.**
sectionsequence	0..*	The sequencing of the Sections used. **For further study in V2.0.**
section	0..*	Primary container for the Items. Each Section may contain other Sections.
itemselection	0..*	The selection of Items to be used. **For further study in V2.0.**
itemsequence	0..*	The sequencing of the Items used. **For further study in V2.0.**
item	0..*	The Items to be used.

A3.2 ItemSelection & ItemSequence Classes

For further study in V2.0.

A3.3 SectionProcessing Class

The SectionProcessing class represents part of the Assessment Accumulated Processing activity (as defined in the system model in Figure 4.1). The sub-elements are listed in Table A3.3.

Table A3.3 SectionProcessing class sub-elements.

Sub-element	Cardinality	Description
scores	1	Declaration of the variables to be used for the assessment accumulated processing.
scorecondition	0..*	The conditional evaluation to be placed on the assessment accumulated processing variables.

For further study in V2.0.

A3.4 SectionFeedback Class

For further study in V2.0.

A4. Item Representation

A4.1 Item Class

The Item class representation is shown in Figure A4.1. Each Item may consist of a meta-data description (Description), the view dependent rubric (ItemRubric), the selection predicates (Predicates), the available responses (Presentation), the corresponding response evaluation (RespProcessing), the associated feedback (RespFeedback). The attributes for the Item class are listed in Table A4.1 and the Item class sub-elements in Table A4.2.

Table A4.1 Item class attributes.

Attribute Name	Data Type	Description	Req'd
ident	String	Name uniquely identifying the Item. Range = 1-32 characters.	M
title	String	Title or name of the Item. Range = 1-256 characters.	M
label	String	Label identifying the Item. Range = 1-256 characters.	O
maxattempts	Integer	The maximum number of attempts permitted. Range = 1-99.	O

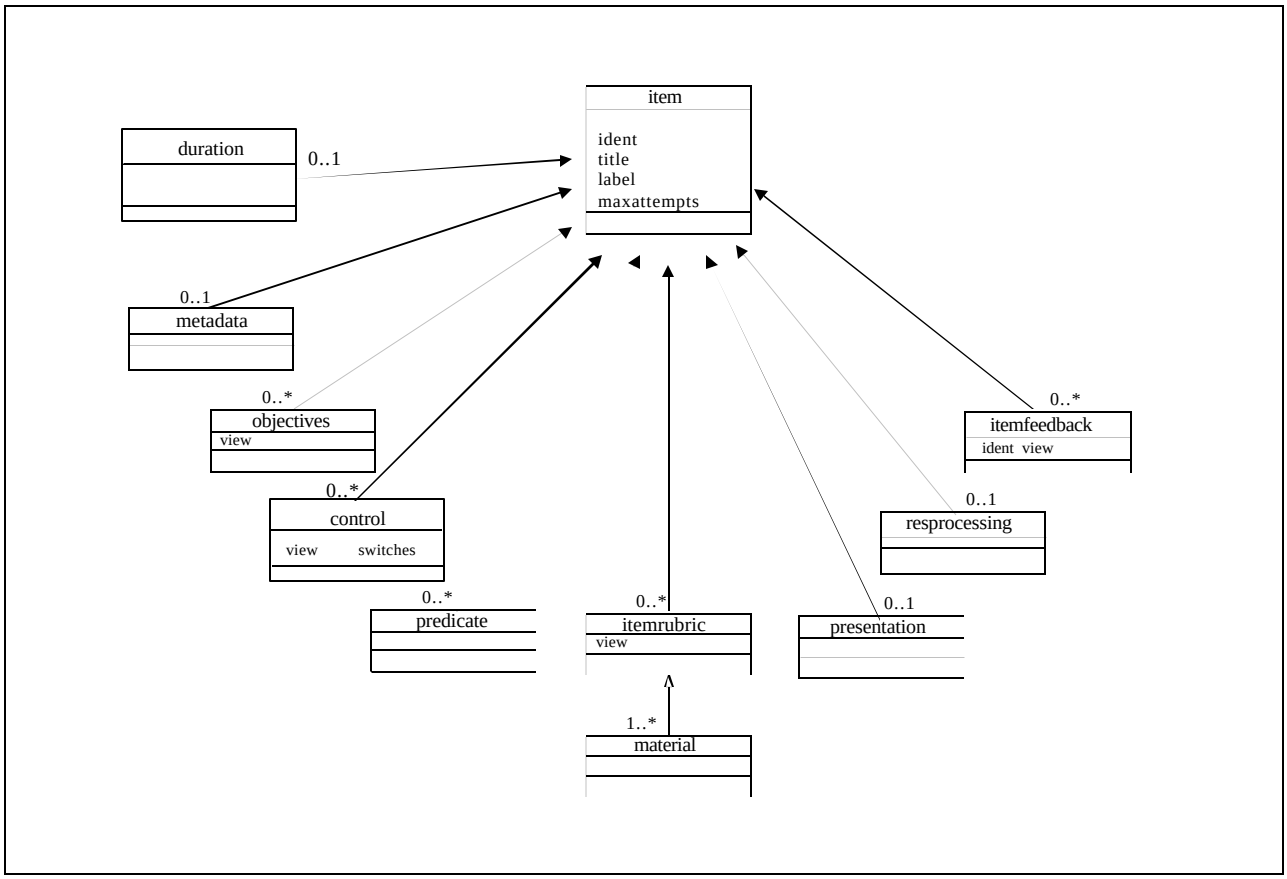


Figure A4.1 Item class representation.

Table A4.2 Item class sub-elements.

Sub-element	Cardinality	Description
meta-data	0..1	Meta-data description of the Item.
objectives	0..*	The view specific objectives.
predicate	0..*	The pre/postcondition predicates applied to the Item selection.
control	0..*	Item control switches.
itemrubric	0..1	The content describing the context of the Item.
presentation	0..1	The range of responses to be offered to the user.
resprocessing	0..1	Processing of the users responses.
itemfeedback	0..*	Feedback in terms of responses, solutions and hints..

A4.2 ItemRubric Class

The ItemRubric class defines the manner in which content is presented that describes the context of the Item about to be presented. The content is defined by the view adopted. The attributes are listed in Table A4.3 and the associated sub-elements are listed in Table A4.4.

Table A4.3 ItemRubric class attributes.

Attribute Name	Data Type	Description	Req'd
view	Enumerated	As per Table 1.2.	O

Table A4.4 ItemRubric class sub-elements.

Sub-element	Cardinality	Description
material	0..*	The content to be presented as the rubric.

A4.3 Presentation Class

The Presentation class representation is shown in Figure A4.2. Each Response may consist of a response content (Material), the available response types (Response), the corresponding rendering of the response type (Rendering) and the available responses (ResponseLabel). The attributes for the Response class are listed in Table A4.5:

Table A4.5 Presentation class attributes.

Attribute Name	Data Type	Description	Req'd
ident	String	Name uniquely identifying the Item. Range = 1-32 characters.	M

The Sub-elements for the Responses class are listed in Table A4.6:

Table A4.6 Response class sub-elements.

Sub-element	Cardinality	Description
material	0..1	The content to be presented for setting the scene to the response.
response	1..*	The response types container. Multiple response types means the response is a composite question.

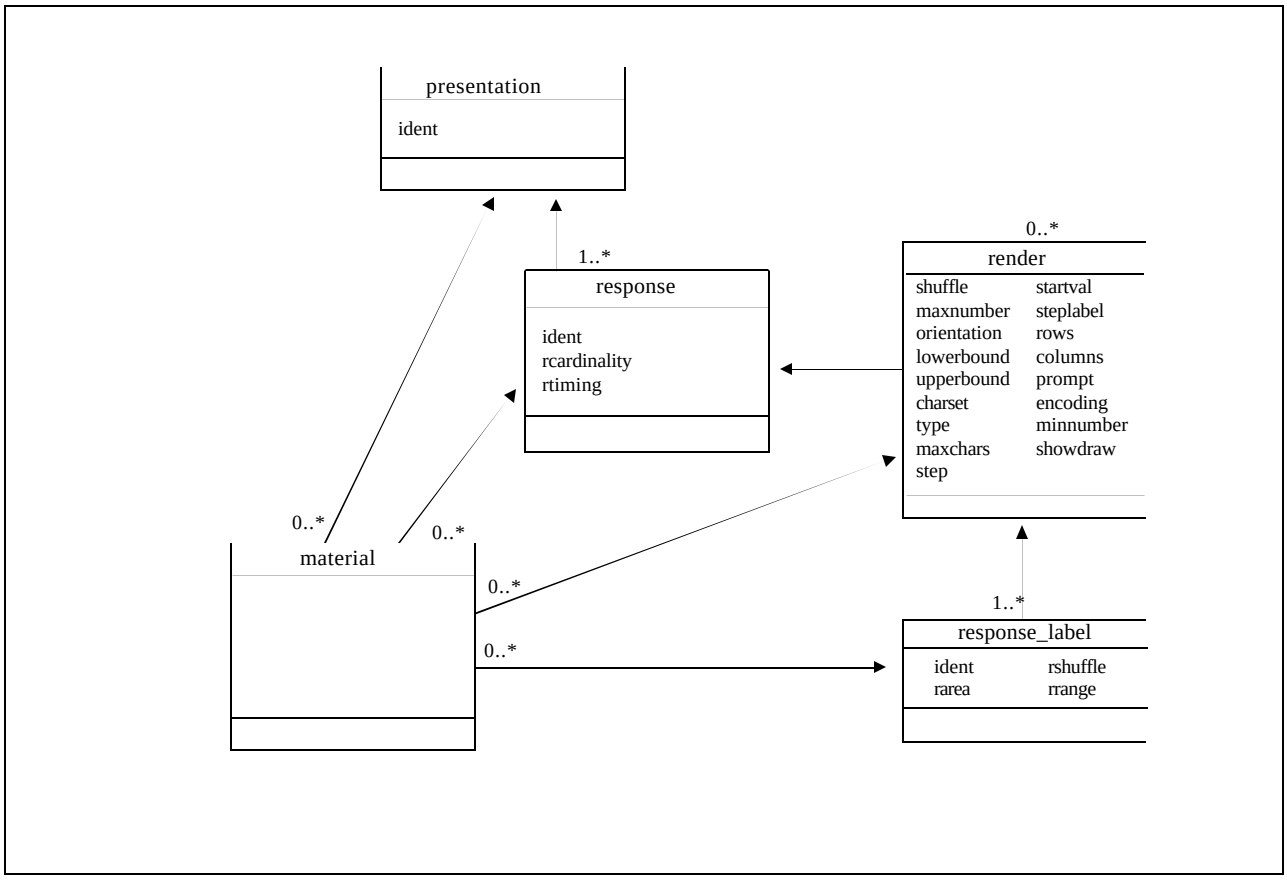


Figure A4.2 Responses class representation.

A4.4 Response Class

The Response class defines the range of different types of response that can be provided. The Response attributes are listed in Table A4.7 and the list of sub-elements is listed in Table A4.8.

Table A4.7 Response class attributes.

Attribute Name	Data Type	Description	Req'd
ident	String	Name uniquely identifying the Item. Range = 1-32 characters.	M
rcardinality	Enumerated	The classification of the number of responses to be expected. The possible values are: • Single – one response only; • Multiple – more than one response; • Ordered – multiple responses where the order is significant.	O
rtiming	Enumerated	Determination that the time taken to make a response is significant and needs to be recorded. The options are: • Yes • No.	O

Table A4.8 Response class sub-elements.

Sub-element	Cardinality	Description
material	0..1	The content to be presented as part of the response itself.
render	1..*	The presentation format to be used to render the response type.

The objects based upon the Response class are listed in Table A4.9.

Table A4.9 RespType class objects.

Object Name	Source Object	Description
response_lid	presentation	The logical identifier response type.
response_xy	presentation	The XY co-ordinate response type.
response_str	presentation	The string response type.
response_num	presentation	The numeric response type.
response_grp	presentation	The logical group response type.

A4.5 Render Class

The Render class defines the range of presentation formats that it is possible to apply to the response types. The Render class attributes are listed in Table A4.10 and the associated sub-elements are listed in Table A4.11.

Table A4.10 Render class attributes.

Attribute Name	Data Type	Description	Req'd
shuffle	Enumerated.	Defines if the multiple choice options are to be shuffled each time the item is invoked. Range = Yes/No (default = No).	O
minnumber	Integer	The minimum number of responses to be recorded. Range = 1-99.	O
maxnumber	Integer	The maximum number of responses to be recorded. Range = 1-99.	O
showdraw		Setting the connect-the-points feature of the display. Range = Yes/No (default = No).	
orientation	Enumerated	The orientation of the slider graphic. Range = Horizontal/Vertical.	O
lowerbound	Real number	The lowest value to be permitted by the slider. Range = less than 17 characters wide.	M
upperbound	Real number	The highest value to be permitted by the slider. Range = less than 17 characters wide.	M
step	Real number	The increment steps to be permitted by the slider. Range = less than 17 characters wide.	O
startval	Real number	The initial value to be displayed by the slider. Range = less than 17 characters wide.	O
steplabel	Enumerated	Defines if the unit values on the slider are to be displayed (the value covered by the pointer must	O

Attribute Name	Data Type	Description	Req'd
		always be displayed). Range = Yes/No (default = Yes).	
charset	Enumerated	The character set to be used for the FIB. Range = as defined by RFC1521.	O
encoding	Enumerated	The encoding set to be used for the FIB. Range = as defined by RFC1521.	
rows	Integer	The number of rows for the FIB field. Range = 1-999	O
columns	Integer	The number of columns for the FIB field. Range = 1-999.	O
prompt	Enumerated	The type of visual prompt that will be supplied as part of the FIB rendering. The options are: • Box – a bordered area surrounding the text field; • Dashline – a dotted line representing the number of expected characters; • Asterisk – line of asterisks representing the number of expected characters; • Underline – single underline.	O
type	Enumerated	The type of information to be put in to the FIB field. The options are: • String – a string of characters; • Integer – an integer; • Decimal – a real number; • Scientific – exponential notation; • Boolean – Yes/No	O
maxchars	Integer	The maximum number of characters that can be entered. Range = 1-99999999	O

Table A4.11 Render class sub-elements.

Sub-element	Cardinality	Description
material	0..1	The content to be presented as part of the rendering.
response_label	0..*	Identification of the possible responses.

The objects based upon the Render class are listed in Table A4.12.

Table A4.12 Render class objects.

Object Name	Source Object	Description
render_choice	presentation	The basic multiple choice text presentation.
render_hotspot	presentation	The image hot spot presentation.
render_slider	presentation	The slider representation.
render_fib	presentation	The fill-in-blank presentation.

A4.6 Response_Label Class

The Response_Label is the set of responses that a user may select. Each Response_Label may consist of the presented response content (Content). The attributes for the Response class are listed in Table A4.13:

Table A4.13 ResponseId class attributes.

Attribute Name	Data Type	Description	Req'd
ident	String	Name uniquely identifying the Item. Range = 1-32 characters.	M
rshuffle	Enumerated	Determines if that particular response is subject to shuffling. Options: Yes/No. (default=No)	O
rarea	Enumerated	The type of area that are to be used as hot-spots. The options are: • Ellipse • Rectangle • Bounded	O
rrange	Enumerated	Sets the accuracy of the answer. The options are: • Absolute • Relative	O

The Sub-elements for the Responses class are listed in Table A4.14:

Table A4.14 Response_Label class sub-elements.

Sub-element	Cardinality	Description
material	0..1	The content to be presented for setting the scene to the response.

A4.7 ResProcessing Class

The ResProcessing class describes the evaluation processing that is applied to the responses supplied by the user. The structure of the ResProcessing class is shown in Figure A4.3. The Sub-elements for the ResProcessing class are listed in Table A4.15:

Table A4.15 ResProcessing class sub-elements.

Sub-element	Cardinality	Description
outcomes	1	Declaration of variables to be used to provide scoring.
respcondition	1..*	Evaluation of the responses.

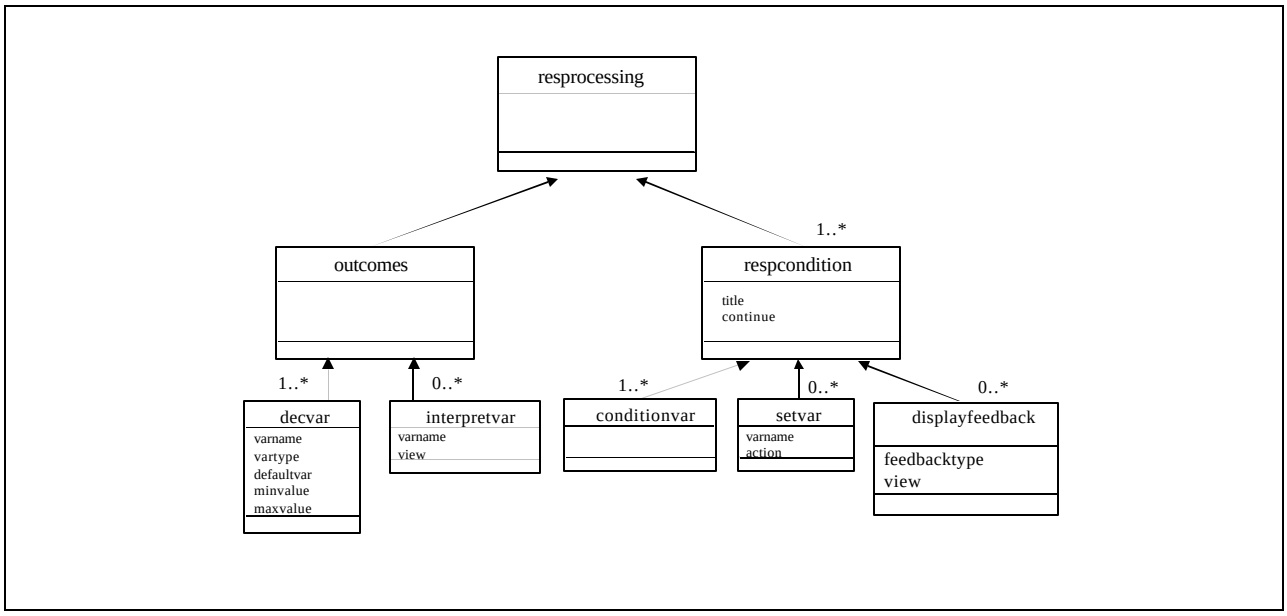


Figure A4.3 RespProcessing class representation.

A4.8 RespCondition Class

The RespCondition class defines the manner in which the response evaluation is actually processed. The attributes for the RespCondition class are listed in Table A4.16 and the associated sub-elements are listed in Table A4.17.

Table A4.16 RespCondition class attributes.

Attribute Name	Data Type	Description	Req'd
title	String	Title or name of the assessment. Range = 1-256 characters.	M
continue	Enumerated	The condition that defines if further processing should be applied. Options = Yes/No (default = No).	O

Table A4.17 RespCondition class sub-elements.

Sub-element	Cardinality	Description
conditionvar	1..*	Conditions applied to determine the associated Item score.
setvar	0..*	Assignment of a score to a scoring variable.
displayfeedback	0..*	Feedback of the response to the defined view.

A4.9 ItemFeedback Class

The ItemFeedback class, as shown in Figure A4.4 contains the feedback returned to the user (defined through the view) in response to the scoring achieved. The attributes for the ItemFeedback class are listed in Table A4.18 and the sub-elements are defined in Table A4.19.

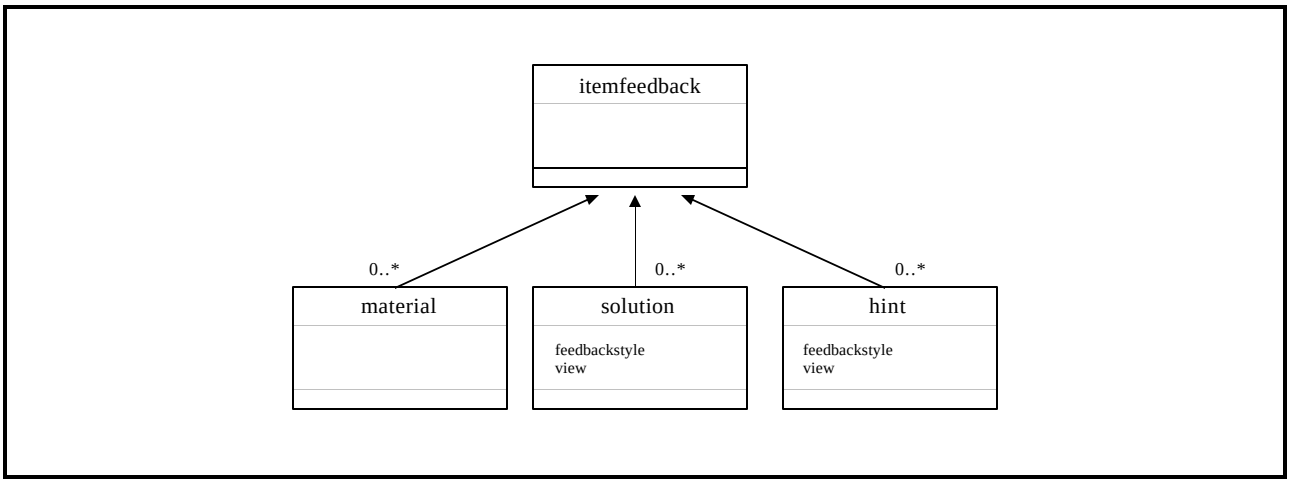


Figure A4.4 ItemFeedback class representation.

Table A4.18 ItemFeedback class attributes.

Attribute Name	Data Type	Description	Req'd
view	Enumerated	As per Table 1.2.	O

Table A4.19 ItemFeedback class sub-elements.

Sub-element	Cardinality	Description
material	1	The content to be presented as a result of the score.

For further study.

A4.10 Solution Class

The Solution class describes the series of steps that produce the resulting answers solicited from the user. The structure of the Solution class is shown in Figure A4.5 and the associated attributes are listed in Table A4.20.

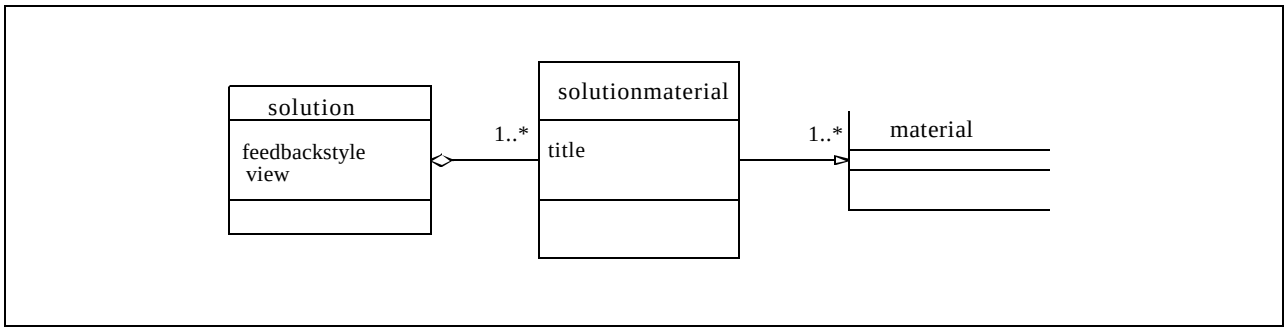


Figure A4.5 Solution class representation.

The attributes for the Solution class are listed in Table A4.20:

Table A4.20 Solution class attributes.

Attribute Name	Data Type	Description	Req'd
feedbackstyle	Enumerated	The type of solution that is available. The options are: • Complete – a single complete solution is available; • Incremental – a single solution is available that is revealed in portions; • Multilevel – several complete solutions are available; • Proprietary – proprietary feedback scheme. The default setting is "Complete".	O
view	Enumerated	As per Table A1.2.	O

The Sub-elements for the Solution class are listed in Table A4.21:

Table A4.21 Solution sub-elements.

Sub-element	Cardinality	Description
solutionmaterial	1..*	The container for the content for a solution which could be complete, multiple or incremental.

A4.11 SolutionMaterial Class

The SolutionMaterial class represented the flow of information to the user. Its attributes are listed in Table A4.22 and the associated sub-elements are listed in Table A4.23.

Table A4.22 SolutionMaterial class attributes.

Attribute Name	Data Type	Description	Req'd
title	String	Title or name of the assessment. Range = 1-256 characters.	O

Triggers for the solution are generated by the DisplayFeedback object (Table A1.12).

Table A4.23 SolutionMaterial class sub-elements.

Sub-element	Cardinality	Description
material	0..1	The content to be presented as part of the solution.

A4.12 Hint Class

The Hint class describes the series of hints that can be revealed to the user. The structure of the Hint class is shown in Figure A4.6 and the associated attributes are listed in Table A4.24.

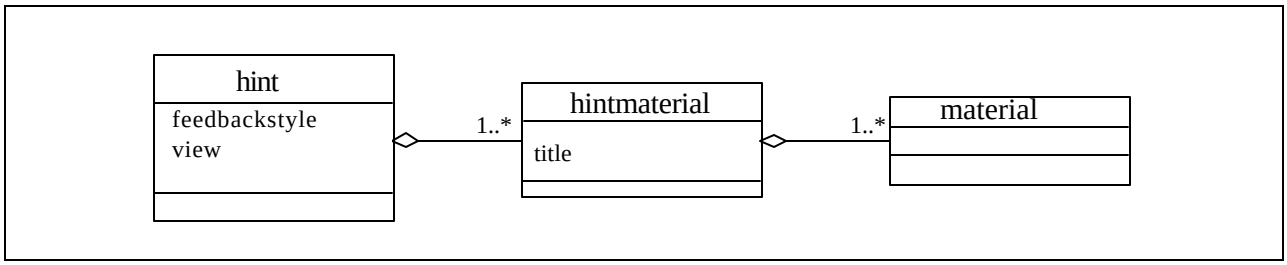


Figure A4.6 Hint class representation.

Table A4.24 Hint class attributes.

Attribute Name	Data Type	Description	Req'd
feedbackstyle	Enumerated	The type of Hint that is available. The options are: • Complete – a single complete hint is available; • Incremental – a single hint is available that is revealed in portions; • Multilevel – several complete hints are available; • Proprietary – proprietary feedback scheme. The default setting is "Complete".	O
view	Enumerated	As per Table A1.2	O

The Sub-elements for the Hint class are listed in Table A4.25. Triggers for the hints are generated by the DisplayFeedback object (Table A1.12).

Table A4.25 Hint class sub-elements.

Sub-element	Cardinality	Description
hintmaterial	1..*	The container for the content for a Hint which could be complete, multiple or incremental.

A4.13 HintContent Class

The HintContent class represents the flow of hints to the user. Its attributes are listed in Table A4.26 and the associated sub-elements are listed in Table A4.27

Table A4.26 HintContent class attributes.

Attribute Name	Data Type	Description	Req'd
title	String	Title or name of the assessment. Range = 1-256 characters.	O

Table A4.27 HintContent class sub-elements.

Sub-element	Cardinality	Description
material	0..*	The content to be presented as part of the solution.

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