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eQNet
Quality Network for a European Learning Resource Exchange
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Public Report

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Project coordinator:	Elena Shulman
Project coordinator organisation:	EUN Partnership AISBL (European Schoolnet)
Project coordinator telephone number:	+32 2 790 7537
Project coordinator email address:	elena.shulman@eun.org

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Executive Summary

This updated annual report is primarily designed to inform the network of policy makers defining 'travel well' quality criteria but will be of value to repository owners and other content stakeholders outside the project. It reviews major projects and initiatives working on quality criteria for educational repositories/content (e.g. Achieve, Inc.) as well as how work from relevant standards and licensing bodies such as the Learning Resource Metadata Initiative (a project co-led by the Association of Educational Publishers and Creative Commons to build a common metadata vocabulary for educational resources) impact on eQNet quality criteria.

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1 Introduction

The European Schoolnet Learning Resource Exchange was set up to provide Ministries of Education (MoE) with access to a network of learning content repositories and associated tools that allow them to more easily exchange high quality learning resources that 'travel well' and can be used by teachers in different countries.

At the end of the eQNet project, the LRE development continues to be steered by MoE in a EUN Subcommittee. A recent redesign of the LRE portal includes a new user interface (involving carrousels) and functionalities (e.g., search by providers, explicit support for multiple formats). In March 2012 the portal is available in the following languages: Czech, Dutch, English, Finnish, French, German, Italian, Lithuanian, Norwegian, Portuguese and Spanish.

The quality criteria developed in the eQnet project have made it possible for European Schoolnet to identify a number of collections that will travel well and selected resources from these collections have been added to the LRE. These include learning resources from: FreeSound, GeoGebra, Khan Academy, The British Council's Learn English Kids, NASA PhotoJournal, Wolfram Demonstration Project, PhET, and many more.

The third version of this report, represents an important instrument for MoE in the LRE Subcommittee and will also be of value to new LRE Associate Partners (including regional educational authorities and ICT vendors) that will be invited to join the LRE Subcommittee in 2012-2013.

2 Previous projects and findings

Preliminary work related to the development of the “travel well” concept has been addressed in several previous projects: the European projects CALIBRATE[1] (2005-08) and MELT[2] (2006-09), and the Open Educational Resources Teacher Network[3] (OERTN) funded by the Hewlett Foundation (2008-10) described in deliverable 2.2.1.

[1] http://calibrate.eun.org
[2] http://info.melt-project.eu
[3] http://oertn.eun.org/

3 Quality Criteria for Educational Repositories

This section brings together and reproduces key parts of documents of direct relevance to the work on educational content quality standards/criteria carried out by the eQNet network.

3.1 EdReNe Initiative to Establish a European Curriculum Bank

eQNet has been following and contributing to the discussions and initiative spearheaded by the Educational Repositories Network (EdReNe) to develop detailed machine-readable curriculum descriptions as a basis for further improvement of student-centric learning, management and accountability. Teachers in Europe already have access to a wide variety of eLearning content portals. There has been major investment over the last 10 years from MoE's and the Commission in developing both national and European level portals (e.g., the LRE, Europeana) and in enriching a critical mass of content with K-12 specific metadata. Arguably, Europe has been 'competing' on very favourable terms with the USA in this respect and has even taken the lead in several areas, particularly with regard to the development and international adoption of the IMS LODE specification, the LRE metadata application profile and the LRE multilingual thesaurus for education.

Discussions about a joint pan-European effort to develop curriculum mapping tools among EdReNe members were inspired by the work of the U.S. based Achievement Standards Network which over the last 10 years has produced a framework for the description of curricula and a digitized, authoritative collection of curricula for all fifty US states in machine and human readable formats. EdReNe has pointed out that Europe does not have a comparable initiative, even though a number of European Ministries of Education at the forefront of content repository development increasingly recognize that at national level curriculum-based discovery is important to ensure that the majority of teachers begin to exploit digital learning resources and justify the existing investment in eLearning content portals.

In the case of Europe, EdReNE makes the argument that a collaborative effort to develop a technical solution is imperative at this time, lest Europe fall behind, and will be most cost effective. A common technical solution may of course be used nationally. While 'curriculum mapping' is slated for piecemeal development in European projects and project proposals (e.g. in the IST PSP programme on the use of ICT in learning), the EdReNe Network is seeking to launch a more comprehensive approach to meet the growing need recognized by multiple European countries for machine and human readable curriculum descriptions.

EdReNe's members resolved to elaborate their vision for this process in a statement to the European Commission proposing that the EC takes a lead in making research into curriculum mapping technologies and techniques a part of the European strategic and operational agenda for eLearning. The statement outlined the following processes and rationales:

"Objectives: Create a European Bank of Curricula in machine readable form that:

- Are based on the extensible ASN framework used in the US and Australia supporting interoperability and tailored to each nation's needs
- Are accurate digital representations of curriculum documents and their component statements (semantic units);
- Are consistent in form; and
- Are modelled in RDF and amenable to the emerging Semantic Web and Linked Data principles.
- Are designed in an extensible framework to support evolving uses.
- Provide open access.
- Support curriculum that is language independent.

Process:

- MoEs create machine-readable descriptions of their national curriculum. Each document and statement will be assigned URIs resolvable over the web by humans and machines. This task includes installing tools to automate this process and making it sustainable in the long term.
- Machine-readable curriculum documents and statements are stored as open data in a European bank that supports:
  - Efficient integration of data from disparate resource providers
  - Resource sharing and linking related resources
- Content providers relate their learning resources to the curriculum learning outcomes provided by the MoEs. Here too, this task will allow content providers to adapt their tagging tools to reach out to the machine-readable curriculums.
- As learning resources get tagged using different curriculum, it will be possible to infer cross-maps between these curriculums.

Immediate Benefits:

- An instrument for defining within both national teaching practices and across Europe:
  - Instruction (i.e., what is taught in the classroom)
  - Assessment (i.e., which skills are tested) and
  - Relating assessment to instruction
  - Relating curricula and assessment across Europe to support benchmark studies (i.e. PISA-report)

Long-term Benefits:

- In addition to greatly enhanced discoverability of relevant learning resources, engagement in a common framework to describe curricula for machine processing will position Europe to participate in mapping initiatives occurring globally. The cross linking of the curricula of nations and their relationships to resources will enable:
  - Better alignment of learning resources and strategies to student assessment based on national learning objectives
  - Development of data-driven decision making mechanisms based on learning objectives (both expected and achieved)
  - Personalization of student learning to meet particular needs through customized maps or trajectories through learning outcomes (and management of the data-intensive nature of such undertakings)

- Student mobility through e-portfolios representing student achievement aligned to learning outcome expectations and the international cross-mapping of those expectations
- Sharing/leveraging of eLearning content developed throughout the world based on semantically related learning outcomes
- Intensive data-driven research into the nature of learning processes as they relate to goals expressed in curricula.

This instrument would enable:

- Ministries of Education to better manage curricula
- Content providers to align their learning resources with the different European curricula
- Teachers and learners to perform curriculum-based search for learning resources (something that is simply impossible to do via Google)
- Policy makers to better monitor and compare curriculum and curriculum-related activities." (EdReNe, 2011)

eQNet continues to follow these discussions and possible developments with great interest and keeps its network members informed about any similar undertakings.

3.2 Achieve, Inc. Rubrics for Evaluating Open Education Resource (OER) Objects

eQNet has been following the work of the U.S. based Achieve, Inc. in its efforts to assist all users (teachers, schools districts and states) to determine aspects of quality of Open Educational Resources and the degree of alignment of OERs to the U.S. Common Core State Standards. Achieve[4] has developed eight rubrics in collaboration with leaders from the OER community that are of great interest to eQNet network members and to repository owners and other content stakeholders outside the project.

> "The following rubrics represent an evaluation system for objects found within Open Education Resources. An object could include images, applets, lessons, units, assessments and more. For the purpose of this evaluation, any component that can exist as a stand-alone qualifies as an object. The rubrics in this packet can be applied across content areas and object types.
>
> In general, the rubrics should be applied to the smallest meaningful unit. In some cases, this may be a single lesson or instructional support material, while in others it might be a complete unit of study or set of support materials. If multiple lessons are included in an OER, the reviewer needs to determine if all lessons will be examined, if only those lessons that deal with essential aspects of the curriculum are to be considered, or if it would be best to evaluate random lessons, looking at, for example, every third or fifth lesson.

[4] http://www.achieve.org/files/AchieveOERRubrics.pdf available under a Creative Commons Attribution 3.0 Unported License (http://creativecommons.org/licenses/by/3.0/)

These rubrics are typically used to rate the potential, not actual, effectiveness of a particular object in a learning environment. Each rubric should be scored independently of the others using the following five scores that describe levels of potential quality, usefulness, or alignment to standards:

3: Superior

2: Strong

1: Limited

0: Very Weak / None

N/A: Rubric Not Applicable

The not applicable (N/A) rating should be used any time a particular rubric does not apply to the object being rated. This is not a pejorative score; it simply means it would be inappropriate to apply this rubric to this object. For example, Rubric IV: Quality of Assessment would not be applicable to an object that does not have an assessment component.

The following rubrics are included:

Rubric I. Degree of Alignment to Standards

Rubric II. Quality of Explanation of the Subject Matter

Rubric III. Utility of Materials Designed to Support Teaching

Rubric IV. Quality of Assessment

Rubric V. Quality of Technological Interactivity

Rubric VI. Quality of Instructional and Practice Exercises

Rubric VII. Opportunities for Deeper Learning

Rubric VIII. Assurance of Accessibility

Rubric I: Degree of Alignment to Standards

This rubric is applied to learning objects that have suggested alignments to standards. It is used to rate the degree to which an individual object actually aligns to each proposed standard. The rubric was designed specifically for the Common Core State Standards, but can be used with any set of standards. Before the rubric can be applied, the assumption is that a user has proposed an alignment between the object and the selected standard(s).
There are two major aspects of standards that are vital to a meaningful alignment review: content and performance expectations. It is important that the content addressed in the object matches the content addressed in each proposed standard. Evaluating the alignment of the performances required in

both the object and the standard is equally essential and should be considered along with the content.

Rubric I Scoring Guide:
3: An object has superior alignment only if both of the following are true:

All of the content and performance expectations in the identified standard are completely addressed by the object.

The content and performance expectations of the identified standard are the focus of the object. While some objects may cover a range of standards that could potentially be aligned, for a superior alignment the content and performance expectations must not be a peripheral part of the object.

2: An object has strong alignment for either one of two reasons:

Minor elements of the standard are not addressed in the object.

The content and performance expectations of the standard align to a minor part of the object.

1: An object has limited alignment if a significant part of the content or performance expectations of the identified standard is not addressed in the object, as long as there is fidelity to the part it does cover. For example, an object that aligns to CCSS 2.NBT.2, “Count within 1000; skip-count by 5s, 10s, and 100s,” but only addresses counting numbers to 500, would be considered to have limited alignment. The object aligns very closely with a limited part of the standard.

0: An object has very weak alignment for either one of two reasons:

The object does not match the intended standards.

The object matches only to minimally important aspects of a standard. These objects will not typically be useful for instruction of core concepts and performances covered by the standard.

N/A: This rubric does not apply for an object that has no suggested standards for alignment.

For example, the rubric might not be applicable to a set of raw data.

Rubric II: Quality of Explanation of the Subject Matter

This rubric is applied to objects designed to explain subject matter. It is used to rate how thoroughly the subject matter is explained or otherwise revealed in the object. Teachers might use this object with a whole class, a small group, or an individual student. Students might use the object to self-tutor. For objects that are primarily intended for teacher use, the rubric is applied to the explanation of the subject matter not to the planning instructions for the teacher.

Rubric II Scoring Guide:
3: An object is rated superior for explanation of subject matter only if all of the following are true:

The object provides comprehensive information so effectively that the target audience should be able to understand the subject matter.

The object connects important associated concepts within the subject matter. For example, a lesson on multi-digit addition makes connections with place value, rather than simply showing how to add multi-digit numbers. Or a lesson designed to analyze how an author develops ideas across extended text would make connections among the various developmental steps and the various purposes the author has for the text.

The object does not need to be augmented with additional explanation or materials.

The main ideas of the subject matter addressed in the object are clearly identified for the learner.

2: An object is rated strong for explanation of subject matter if it explains the subject matter in a way that makes skills, procedures, concepts, and/or information understandable. It falls short of superior in that it does not make connections among important associated concepts within the subject matter. For example, a lesson on multi-digit addition may focus on the procedure and fail to connect it with place value.

1: An object is rated limited for explanation of subject matter if it explains the subject matter correctly but in a limited way. This cursory treatment of the content is not sufficiently developed for a first-time learner of the content. The explanations are not thorough and would likely serve as a review for most learners.

0: An object is rated very weak or no value for explanation of subject matter if its explanations are confusing or contain errors. There is little likelihood that this object will contribute to understanding.

N/A: This rubric is not applicable (N/A) for an object that is not designed to explain subject matter, for example, a sheet of mathematical formulae or a map. It may be possible to apply the object in some way that aids a learner's understanding, but that is beyond any obvious or described purpose of the object.

Rubric III: Utility of Materials Designed to Support Teaching

This rubric is applied to objects designed to support teachers in planning or presenting subject matter. The primary user would be a teacher. This rubric evaluates the potential utility of an object at the intended grade level for the majority of instructors.

Rubric III Scoring Guide:
3: An object is rated superior for the utility of materials designed to support teaching only if all of the following are true:

The object provides materials that are comprehensive and easy to understand and use.

The object includes suggestions for ways to use the materials with a variety of learners.

These suggestions include materials such as “common error analysis tips” and “precursor skills and knowledge” that go beyond the basic lesson or unit elements.

All objects and all components are provided and function as intended and described. For example, the time needed for lesson planning appears accurately estimated, materials lists are complete, and explanations make sense.

For larger objects like units, materials facilitate the use of a mix of instructional approaches (direct instruction, group work, investigations, etc.).

2: An object is rated strong for the utility of materials designed to support teaching if it offers materials that are comprehensive and easy to understand and use but falls short of “superior” for either one of two reasons:

The object does not include suggestions for ways to use the materials with a variety of learners (e.g., error analysis tips).

Some core components (e.g., directions) are underdeveloped in the object.

1: An object is rated limited for the utility of materials designed to support teaching if it includes a useful approach or idea to teach an important topic but falls short of “strong” for either one of two reasons:

The object is missing important elements (e.g. directions for some parts of a lesson are not included).

Important elements do not function as they are intended to (e.g. directions are unclear or practice exercises are missing or inadequate). Teachers would need to supplement this object to use it effectively.

0: An object is rated very weak or no value for the utility of materials designed to support teaching if it is confusing, contains errors, is missing important elements, or is for some other reason simply not useful, in spite of an intention to be used as a support for teachers in planning or preparation.

N/A: This rubric is not applicable (N/A) for an object that is not designed to support teachers in planning and/or presenting subject matter. It may be

possible that an educator could find an application for such an object during a lesson, but that would not be the intended use.

Rubric IV: Quality of Assessments

This rubric is applied to those objects designed to determine what a student knows before, during, or after a topic is taught. When many assessment items are included in one object, as is often the case, the rubric is applied to the entire set.

Rubric IV Scoring Guide:
3: An object is rated superior for the quality of its assessments only if all of the following are true:

All of the skills and knowledge assessed align clearly to the content and performance expectations intended, as stated or implied in the object.

Nothing is assessed that is not included in the scope of intended material unless it is differentiated as extension material.

The most important aspects of the expectations are targeted and are given appropriate weight/attention in the assessment.

The assessment modes used in the object, such as selected response, long and short constructed response, or group work require the student to demonstrate proficiency in the intended concept/skill.

The level of difficulty is a result of the complexity of the subject-area content and performance expectations and of the degree of cognitive demand, rather than a result of unrelated issues (e.g. overly complex vocabulary used in math word problems).

2: An object is rated strong for the quality of its assessments if it assesses all of the content and performance expectations intended, but the assessment modes used do not consistently offer the student opportunities to demonstrate proficiency in the intended concept/skill.

1: An object is rated limited for the quality of its assessments if it assesses some of the content or performance expectations intended, as stated or implicit in the object, but omits some important content or performance expectations and/or fails to offer the student opportunities to demonstrate proficiency in the intended content/skills.

0: An object is rated very weak or no value for the quality of its assessments if its assessments contain significant errors, do not assess important content/skills, are written in a way that is confusing to students, or are unsound for other reasons.

N/A: This rubric is not applicable (N/A) for an object that is not designed to have an assessment component. Even if one might imagine ways an object

could be used for assessment purposes, if it is not the intended purpose, not applicable is the appropriate score.

Rubric V: Quality of Technological Interactivity

This rubric is applied to objects designed with a technology-based interactive component. It is used to rate the degree and quality of the interactivity of that component. Interactivity" is used broadly to mean that the object responds to the user, in other words, it behaves differently based on what the user does. This is not a rating for technology in general, but for technological interactivity. The rubric does not apply to interaction between students, but rather to how the technology responds to the individual user.

Rubric V Scoring Guide:
3: An object, or interactive component of an object, is rated superior for the quality of its technological interactivity only if all of the following are true:

The object is responsive to student input in a way that creates an individualized learning experience. This means the object adapts to the user based on what s/he does, or the object allows the user some flexibility or individual control during the learning experience.

The interactive element is purposeful and directly related to learning.

The object is well-designed and easy to use, encouraging learner use.

The object appears to function flawlessly on the intended platform.

2: An object, or interactive component of an object, is rated strong for the quality of its technological interactivity if it has an interactive feature that is purposeful and directly related to learning, but does not provide an individualized learning experience. Similarly to the superior objects, strong interactive objects must be well designed, easy-to-use, and function flawlessly on the intended platform. Some technological elements may not be directly related to the content but for a strong rating they must not detract from the learning experience. These kinds of interactive elements, including earning points or achieving levels for correct answers, might be designed to increase student motivation and to build content understanding by rewarding or entertaining the learner, and may extend the time the user engages with the content.

1: An object, or interactive component of an object, is rated limited for the quality of its technological interactivity if its interactive element does not relate to the subject matter and may detract from the learning experience. These kinds of interactive elements may slightly increase motivation but do not provide strong support for understanding the subject matter addressed in the object. It is unlikely that this interactive feature will increase understanding or extend the time a user engages with the content.

0: An object, or interactive component of an object, is rated very weak or no value for the quality of its technological interactivity if it has interactive features that are poorly conceived and/or executed. The interactive features might fail to operate as intended, distract the user, or unnecessarily take up user time.

N/A: This rubric is not applicable (N/A) for an object that does not have an interactive technological element. For example, the rubric does not apply if interaction with the object is limited to, for example, opening a user-selected PDF.

Rubric VI: Quality of Instructional and Practice Exercises

This rubric is applied to objects that contain exercises designed to provide an opportunity to practice and strengthen specific skills and knowledge. The purpose of these exercises is to deepen understanding of subject matter and to routinize foundational skills and procedures.

When concepts and skills are introduced, providing a sufficient number of exercises to support skill acquisition is critical. However, when integrating skills in complex tasks, the number of exercise problems is less important than their richness. These types of practice opportunities may include as few as one or two instructional exercises designed to provide practice applying specific concepts and/or skills. Sets of practice exercises are treated as a single object, with the rubric applied to an entire group.

Rubric VI Scoring Guide:
3: An object is rated superior for the quality of its instructional and practice exercises only if all of the following are true:

The object offers more exercises than needed for the average student to facilitate mastery of the targeted skills, as stated or implied in the object. For complex tasks, one or two rich practice exercises may be considered more than enough.

The exercises are clearly written and supported by accurate answer keys or scoring guidelines as applicable.

There are a variety of exercise types and/or the exercises are available in a variety of formats, as appropriate to the targeted concepts and skills. For more complex practice exercises the formats used provide an opportunity for the learner to integrate a variety of skills.

2: An object is rated strong for the quality of its instructional and practice exercises if it offers only a sufficient number of well-written exercises to facilitate mastery of targeted skills, which are supported by accurate answer keys or scoring guidelines, but there is little variety of exercise types or formats.

1: An object is rated limited for the quality of its instructional and practice exercises if it has some, but too few exercises to facilitate mastery of the

targeted skills, is without answer keys, and provides no variation in type or format.

0: An object is rated very weak or no value for the quality of its instructional and practice exercises if the exercises provided do not facilitate mastery of the targeted skills, contain errors, or are unsound for other reasons.

N/A: This rubric is not applicable (N/A) to an object that does not include opportunities to practice targeted skills.

Rubric VII: Opportunities for Deeper Learning

This rubric is applied to objects designed to engage learners in at least one of the following deeper learning skills, which can be applied across all content areas:

Think critically and solve complex problems.

Work collaboratively.

Communicate effectively.

Learn how to learn.

Reason abstractly.

Construct viable arguments and critique the reasoning of others.

Apply discrete knowledge and skills to real-world situations.

Construct, use, or analyze models.

Rubric VII Scoring Guide:
3: An object is rated superior for its opportunities for deeper learning only if all of the following are true:

At least three of the deeper learning skills from the list identified in this rubric are required in the object.

The object offers a range of cognitive demand that is appropriate and supportive of the material.

Appropriate scaffolding and direction are provided.

2: An object is rated strong for its opportunities for deeper learning if it includes one or two deeper learning skills identified in this rubric. For example, the object might involve a complex problem that requires abstract reasoning skills to reach a solution.

1: An object is rated limited for its opportunities for deeper learning if it includes one deeper learning skill identified in the rubric but is missing clear guidance on how to tap into the various aspects of deeper learning. For example, an object might include a provision for learners to collaborate, but the process and product are unclear.

0: An object is rated very weak for its opportunities for deeper learning if it appears to be designed to provide some of the deeper learning opportunities identified in this rubric, but it is not useful as it is presented. For example, the object might be based on poorly formulated problems and/or unclear directions, making it unlikely that this lesson or activity will lead to skills like critical thinking, abstract reasoning, constructing arguments, or modeling.

N/A: This rubric is not applicable (N/A) to an object that does not appear to be designed to provide the opportunity for deeper learning, even though one might imagine how it could be used to do so.

Rubric VIII: Assurance of Accessibility Standards

This rubric is used to assure materials are accessible to all students, including students identified as blind, visually impaired or print disabled, and those students who may qualify under the Chafee Amendment to the U.S. 1931 Act to Provide Books to the Adult Blind as Amended. It was developed to assess compliance with U.S. standards and requirements, but could be adapted to accommodate differences in other sets of requirements internationally.

Accessibility is critically important for all learners and should be considered in the design of all online materials. Identification of certain characteristics will assist in determining if materials will be fully accessible for all students. Assurance that materials are compliant with the standards, recommendations, and guidelines specified assists educators in the selection and use of accessible versions of materials that can be used with all students, including those with different kinds of challenges and assistive devices.

The Assurance of Accessibility Standards Rubric does not ask reviewers to make a judgment on the degree of object quality. Instead, it requests that a determination (yes/no) of characteristics be made that, together with assurance of specific Standards, may determine the degree to which the materials are accessible. Only those who feel qualified to make judgments about an object's accessibility should use this rubric.

Rubric VIII Scoring Guide (see table p. 11
http://www.achieve.org/files/AchieveOERRubrics.pdf

Yes: The object displays the characteristic or complies with the standards, recommendations or guidelines.

No: The object does NOT display the characteristic or comply with the standards, recommendations or guidelines.

Comment: Comments on Rubric 8 Object determination may include notes that describe the reason materials do not comply with the standard, recommendations or guidelines or further description that may clarify the characteristics of the object.” (Achieve, 2011)

3.3 NEEDS Premier Award for Excellence in Engineering Education Courseware Criteria

Of Interest to eQNet is the work of NEEDS[5] — The National Engineering Education Delivery System, a digital library of learning resources for engineering education.

"NEEDS supports a multi-tier evaluation system that includes a set of criteria used in Premier Award for Excellence in Engineering Education Courseware yearly competition. The Premier Award competition is open to a wide range of submissions of high-quality, engaging, non-commercial learning innovations designed to enhance engineering education. The criteria described below reflect the values associated with good teaching practices and pedagogy and that are used by NEEDS to promote and guide the selection of the Premier Award for Excellence in Engineering Courseware. The criteria are divided into three categories: instructional design, software design, and engineering content. Each category is described by a set of components and sub-components. The entire learning experience of using the software, as well as the materials in the submission packet, should demonstrate that the submission meets (and hopefully exceeds) the criteria by addressing each component and sub-component. (NEEDS, 2012)

> "Scoring for Instructional Design and Software Design
>
> • Scoring is done on a seven point scale from 1 = poor to 7 = excellent.
>
> • To earn four (4) points for a given category, the software must address most, if not all, applicable subcomponents in Part 1.
>
> • To earn six (6) points, the software must address most applicable sub-components of Parts 1 and 2.
>
> • To earn seven (7) points, the software must address all applicable sub-components of Parts 1 and 2.
>
> • If none of the sub-components in Part 2 have been addressed, that category cannot receive a score higher than a four.
>
> Scoring for Engineering Content
>
> • Engineering Content is not scored the same way as the other categories, it is scored to reflect its accuracy and appropriateness for the Premier Award. Engineering content is evaluated by the judges' agreement with the statements listed: Strongly Disagree, Disagree, Agree and Strongly Agree.

[5] http://www.needs.org/needs/ Premier Award for Excellence in Engineering Education Courseware Copyright © NEEDS

• If any judge evaluates the statements as Strongly Disagree or Disagree the software cannot be considered for the Premier Award or as a finalist candidate.

The sub-components relate to the scale in such a way as to ensure the excellence of the winners. Winning software need not address all sub-components specifically, since not all components are appropriate for each type of courseware. For example, a piece of software may not include a simulation; as a result, not all components dealing with user feedback are appropriate. We expect the software selected for the Premier Award will address most, if not all, of the applicable components in an exemplary manner.

Selection Criteria

1.0 INSTRUCTIONAL DESIGN

1.1 Learning Objectives: Learning objectives and goals are clearly stated and supported by the software and learning experience.

Part 1:

• Learning objectives and goals are appropriate and clearly stated, in the software (preferred) in an instructor's guide or the submission packet.

• The presentation and organization of content, as well as related activities, supports the learning objectives and goals.

Part 2: Support for Learning Objectives is enhanced if:

• Learners are aware of learning objectives as they are using the software and participating in the learning experience.

• A clear method of measuring achievement of learning objectives and goals is provided within the software or by the learning experience.

• Learning objectives and goals can be correlated to ABET accreditation criteria.

1.2 Interactivity: The learner is actively involved in the learning process—the interaction enhances learning.

Part 1:

• The software responds appropriately to learner actions.

• Communication is 2-way.

• Learners control their own pace and are informed of their progress so they can make appropriate decisions about how to proceed.

• Choices that learners make are meaningful and not “just for the sake of making choices”.

Part 2: Interactivity is enhanced if:

• Learners decide: what they want to learn; in what order; and how deeply they want to concentrate on specific topics.

• The learner can select the type of media that she wants to use (e.g., audio, transcript, etc.).

• There are questions and challenges to help the learner monitor his or her progress.

• Learners are presented with relevant problems to solve; exemplary solutions are included.

• There is an analysis of learner input and useful, appropriate feedback.

• The system adapts its delivery style or content based on learner actions.

1.3 Cognition/Conceptual Change: Learning appears to be significant and long lasting—strong and useful cognitive models can be built.

Part 1:

• It appears that learners will be able to demonstrate or apply the concepts introduced by the software in meaningful ways.

• It appears that learners will be able to transfer what they’ve learned to areas beyond what is specifically covered in the software.

• The software encourages and supports reflection, deep thinking, knowledge integration, and making connections.

Part 2: Cognition/Conceptual Change is enhanced if:

• The software has been tested with real learners and there is evidence that it enhances learning.

• Learners are encouraged to make predictions; provide self-explanations; or to analyze, synthesize or reorganize the information.

• Mechanisms are provided so learners can monitor their own understanding and correct their misconceptions or poorly developed mental models.

1.4 Content: The content is well chosen and structured.

Part 1:

• The scope of the content is appropriate for the intended learning objectives and intended audience.

• There is a default sequencing of material that makes sense for learning (i.e., concepts build upon each other and are presented in a clear, logical manner).

• The structure of the knowledge to be learned is clearly conveyed.

• The content builds on prior knowledge that learners can be expected to have; the required background knowledge is clearly stated or understood.

Part 2: Choice and Structure of Content is enhanced if:

• There are useful links between content areas.

• The organization facilitates the user's exploration of the area of knowledge both inside and outside the learning experience.

1.5 Multimedia use: Multimedia is used effectively and promotes the learning objectives and goals.

Part 1:

• None of the multimedia representations used are ambiguous, lead to serious misconceptions, or are likely to be misinterpreted by learners.

• Media is used appropriately and not gratuitously.

• Multiple representations are used to help learners construct inter-related knowledge.

• Media elements are of high visual and aural quality.

Part 2: Multimedia use is enhanced if:

• Multiple media types support each other. For example, text transcripts are available for audio data, or audio data narrates animation(s).

• Multimedia elements are clearly labeled, so the learner doesn't have to struggle to figure out what they are looking at, or why the element is there. The software has multimedia elements that in themselves are interactive (e.g., learner can interact with animation of a system, by pressing buttons or moving levers, etc.).

1.6 Instructional Use/Adaptability: The software can be used in a variety of settings.

Part 1:

• Instructions or an instructor's guide clearly explains how this software should be used to be effective, and who is expected to use the software.

• The intended use is not so narrowly defined that only a select few could use this software.

• There are suggestions in the instructors' guide or mechanisms in the software to assess learning.

Part 2: Instructional Use/Adaptability is enhanced if:

• The software provides different use levels (beginner, intermediate, expert).

• Help functions and guides are provided.

• There are instructor configurable software settings.

• There are clear suggestions for alternate uses in the instructors' guide, or easily identifiable alternate uses.

• This software has potential to improve the way instructors spend their time.

2.0 SOFTWARE DESIGN

2.1 Engagement: The software holds the interest of a diversity of learners.

Part 1:

• The software is stimulating and challenging.

• The software does not contain stereotypes (racial, gender, ethnic, age).

• Speed of software is satisfactory.

• The software is visually appealing and attractive in the design of its screens.

Part 2: Engagement is enhanced if:

• The learner would use it more than once.

• There are learner-tailorable interface settings.

• There is consideration for learners with physical impairments.

• The software promotes diversity and gender equity.

2.2 Learner Interface and Navigation: The software is easy to use.

Part 1:

• The software is consistent in its design and response to learner actions.

• The learner will not get confused about how to proceed.

• The learner can form a mental map of where they are and how to get around in the software (e.g., through an explicit map or because the software is simple enough).

Part 2: Learner Interface and Navigation is enhanced if:

• Icons and graphical symbols are clear and unambiguous.

• There are multiple forms of navigation (e.g., table of contents, next/previous, index, and search).

• Screens can be viewed without scrolling.

• Text on screens is appropriately scaled and cannot be erased.

2.3 Technical Reliability: The software is free from technical problems.

Part 1:

• There are no obvious software bugs.

• There are no interface problems (e.g., all buttons function, screen graphics are displayed and updated appropriately, text on screens cannot be erased and/or are not cut off, etc.)

• Software crashes occur very rarely, if at all.

Part 2: Technical Reliability is enhanced if:

• Screens can be viewed without scrolling.

• Text on screens is appropriately scaled and cannot be erased.

3.0 ENGINEERING CONTENT

3.1 Accuracy: The content is accurate and error free.

3.2 Appropriateness: The content is appropriate for the scope of the Premier Award" (NEEDS, 2012)

3.4 The Open Educational Quality Initiative (OPAL)

eQNet continues to closely follow the evolution and activities of the "Open Educational Quality Initiative,"[6] an international network "to promote innovation and better quality in education and training through the use of open educational resources." The OPAL Initiative is a pan-EU partnership between seven organizations including the ICDE, UNESCO, European Foundation for Quality, the Open University UK, Aalto University and the Catholic University Portugal. It is led by

[6] http://oer-quality.org/

the University of Duisburg-Essen, Germany and partly funded by the European Commission."

Since eQNet last discussed the initiative, OPAL has published a report on: best practices detailing the process of collecting examples of open educational practice through the OEP Best Practice Clearing House; and the OEP Maturity Self-Assessments which are stored in the OEP Register. This can downloaded from the OPAL website.

The Open Educational Quality Initiative is now providing guidelines for open educational practice as an interactive "metromap". The OEP Guidelines enable learners, educational practitioners, leaders of organisations, and policy makers to assess their current position and develop strategies for open educational practices.
"Users can use different stations on the metromap according to their situations: Learners, education practitioners, leaders of organization and policy makers. The main considerations are listed within each of the stages shown on the metromap with links to examples of best practice which have been submitted through the OEP Best Practice Clearing House." (OPAL, 2012)

3.5 Standards for Digital Learning Content in British Columbia

eQNet Network members and educational content repository owners will benefit from reviewing Standards for Digital Learning Content v3[7] published by the BC Ministry of Education. The Standards delineate expected standards of quality in online course material and are an accountability mechanism constituting the BC Ministry of Education's vision for Distributed Learning (DL) which takes place when: a student is primarily at a distance from the teacher, whether he/she is at home; or connected to teachers from another learning facility.

The vision for Distributed Learning is to "create a quality, dynamic and engaging learning environment that all students in the province can access." The standards in v. 3 were intended to support educators in achieving these visions and ideals for students taking some, or all, of their learning online. Key sections of this document are reproduced below as standards of interest for European educational policy makers and the eQNet Network because it is intended to guide educators in the development, selection, and evaluation of quality digital learning content for the online, e-learning environment.

> "The Digital learning content standards are organized into four categories:
> 1. Technical
> 2. Layout (Visual Design)
> 3. Instructional Design & Pedagogy
> 4. Assessment

[7] © Royalty-Free/Corbis

1. Technical Standards
The technical standards below represent the technical considerations for the digital learning object to function reliably, effectively and transparently to the users.

1.1 Third party software used within the learning object is common and easily accessible to all users.
1.2 The learning object is formatted so that it is accessible to learners from home or school at both low and high bandwidths.
1.3 The learning object can be used on both PC and Mac operating systems with common operating platforms.
1.4 The learning object is designed to be used in a variety of learning management systems as applicable.
1.5 Learning object multimedia has been optimized for size and use with standard computer graphics and systems (i.e. compressed files; MP3 files, JPEG or TIFF for photos, and GIF or PNG for computer graphics).
1.6 Video animation and sound file formats can be played on freely available and commonly used plug-ins or players.
1.7 If video or sound files are larger than 8MB, alternate low-bandwidth versions are provided.
1.8 Text material is provided in standard formats accessible to learners.
1.9 Text based material is embedded within the content and can be presented to learners on local computers so that the content may be printed or saved for future reference should licensing permit (HTML, XHTML, RTF, and/or PDF format).
1.10 The learning object provides learner control of audio (i.e. learner can turn on/off audio files) and alternate tags or script of the audio is provided.
1.11 The learning object provides learner control of video (i.e. learner can start, stop, and pause video clips) and alternate tags or script of the video is provided.
1.12 Metadata tagging standards and specifications are used in labeling so that content is searchable from learning management systems, learning object repositories, and learning content management systems.
1.13 Content is tested to W3C accessibility as required.
1.14 Content licensing details are stated in easily understood wording, including a description of when the license expires, where it may be used and by whom.
1.15 Content includes complete information about the rights that the copyright owner has assigned in regards to the content, and the content contains complete information on the author(s) of the content, respecting the right of authors to use a pseudonym or remain anonymous.
1.16 Content includes information about the location and nature of source code required to modify it.
1.17 Licensing uses appropriate structures such as Creative Commons, BCcampus, BC Commons, or other licensing models.
1.18 Users have the right to modify the content to meet individual learner and educator needs, except where third party agreements restrict this.

1.19 BC educators and students have the right to use the content in the classroom or at home.
1.20 Users have the right to make one copy of the content in any medium such as print or CD for the purposes of research or private study.
1.21 A User License to explain how the content may be used and any restrictions that might apply in its use is provided

2. Layout (Visual Design) Standards
The learning object layout standards below represent the layout and navigation considerations required to ensure a consistent look and feel.

2.1 The learning object uses consistent navigational menus, icons or cues (i.e. readings icon, audio file, video, etc.) and is consistent in style and function.
2.2 The learning object explains each icon function (i.e. mouse over tag appears describing button), and graphics are relevant, consistently identified, labeled and described.
2.3 All clickable objects in the content are identified through the use of labels, borders, or instruction in text as appropriate.
2.4 The learning object appears to use a standard web viewable font for the material (i.e. Arial, Times New Roman, Verdana).
2.5 A simple, consistent and accessible structure for the navigation of learning object materials is provided.
2.6 A “back” button is provided.
2.7 The beginning or start of the learning object is accessible from all areas within the learning object.
2.8 Spelling and terminology used is accurate and consistent throughout the learning object and abbreviations are defined in full.
2.9 The learning object uses numbers in a consistent manner to identify steps in a process.
2.10 Key terms are highlighted on screen and are in the glossary.
2.11 Format is uncluttered, includes white space, effective use of color, and graphics where appropriate, and text colors are clearly legible over background colors.
2.12 Text is organized into readable paragraphs for presenting on a computer screen.
2.13 The learning object provides learners the opportunity to proceed at their own pace and revisit sections as required.
2.14 The learning object has a consistent tone, readability, look and feel.
2.15 An efficient and comfortable learning interface that provides a minimum of fatigue is employed (i.e. is visually appealing without being over stimulating).

3. Instructional Design and Pedagogy Standards
The instructional design and pedagogical standards below represent design considerations for the learning object to be interactive, motivating, and effective at fostering and supporting learning.

3.1 The learning object meets universal design principles.

3.2 Ongoing interaction between learner(s) and content is fostered.
3.3 Learning object activities require students to manipulate information and ideas to comprehend, apply, analyze, synthesize and evaluate new knowledge, and provide opportunity for practice and transfer of learning in a variety of ways.
3.4 A wide range of learner choice is accommodated (for example: multiple methods of completing assignments or progressing through the content).
3.5 A wide range of learning styles is supported (i.e. visual, auditory, kinaesthetic).
3.6 The learning object provides examples of activities, assignments and reflections.
3.7 Different modes (pictorial, verbal) for presentation of essential information are incorporated.
3.8 Facts and ideas are applicable to the real world and are authentic for students.
3.9 Information presented in the learning object is accurate.
3.10 High level questioning strategies are evident in the interactions set up in the learning object.
3.11 Students are given opportunities to apply knowledge to meaningful and authentic problems.
3.12 The learning object clearly identifies the relevant learning outcomes
3.13 Content is presented in a logical sequence based on the learning outcomes. s
3.14 The learning object provides summaries of key information as learners navigate content.
3.15 The learning object organizes and sequences content in a way that is appropriate for the subject matter and age of the intended audience, and uses age/grade appropriate language.
3.16 The learning object indicates suggested time required to complete it and clear and accurate directions for all activities and/or assignments are provided.
3.17 The learning object is socially, culturally, and age appropriate for the intended audience (i.e. is representative of a range of gender, age, cultural, ethnicity and religious diversity as well as family situations and socio-economic status in its examples, activities and multimedia elements).
3.18 Design elements contribute to efficient learning without unnecessary or redundant content.

4. Assessment Standards
The assessment standards below represent evaluation considerations for measuring progress and achievement in a manner consistent with the British Columbia Provincial K – 12 curriculum.

4.1 The learning object specifies pre-requisite knowledge required by the learner for successful completion.
4.2 Learner assessment is linked to learning outcomes, associated content, and learning object activities.
4.3 Content activates prior knowledge of the learner (using advance organizers).

4.4 Assessment methods are constructed to measure learning on a variety of levels (i.e. fact, concept, process, critical thinking, problem solving).
4.5 The learning object incorporates a variety of methods of learner assessment (i.e. quizzes, matching activities, reflection, discussion questions, on-the-job activities, etc.) that can be both formative and summative.
4.6 The learning object provides opportunities for learner practice and transfer.
4.7 Meaningful, useful and relevant feedback is provided to the learner if electronic quizzes or tests are used (i.e. not just saying “incorrect”).
4.8 The learning object includes grading rubrics and models for partially to fully completed assignments.” (BC DL, 2010)

4 Impact of content standards on eQNet quality criteria

For eQNet it is also important to take into account the work of relevant standards and licensing bodies, e.g. Learning Registry (U.S.) and Learning Resource Metadata Initiative a project led by Creative Commons (CC) and the Association of Educational Publishers (AEP).

4.1 Learning Registry

As reported in D2.2.2, eQNet is closely following the work of the Learning Registry project, “an informal collaboration among several United States federal agencies committed to making learning resources created by U.S. federal agencies discoverable and accessible to enable all stakeholders in the education domain to build and access better more interconnected and personalized learning solutions needed for a 21st-century education.”

The key members of the Learning Registry are The Advanced Distributed Learning Initiative (ADL) from Office of the Under Secretary of Defense for Personnel and Readiness (OUSD P&R) and The Office of Educational Technology at the US Department of Education. This work is built upon a collaborative framework that includes U.S. based institutions such as the National Science Foundation and the White House Office of Science and Technology, as well as international collaborators, including European Schoolnet and Education Services Australia, and the UK Joint Information Systems Committee (JISC) among others.

The Learning Registry launched in a beta version in November 2011. Learning resource data—metadata, usage data—is now being shared through the registry by a number of organizations. The Learning Registry is not a website or repository and it is not a search engine and not a replacement for the excellent sources of online learning content that already exist. The Learning Registry is an open source technical system designed to facilitate the exchange of data behind the scenes, and an open community of resource creators, publishers, curators, and consumers who are collaborating to broadly share resources, as well as information about how those resources are used by educators in diverse learning environments across the Web.

European Schoolnet is an early and by far the largest contributor of metadata and usage data to the Learning Registry sharing more than 200,000 records from the Learning Resource Exchange (LRE), including metadata for resources identified and tagged with Travel Well criteria by eQNet network members and teachers.

“To realize the full vision and value of the Learning Registry, next steps are:

- Publishers will share information about their education content in the registry,
- Application developers will design tools for displaying and reporting on usage and social metadata,

- Recommendation and search engines will leverage Learning Registry data for surfacing relevant learning resources, and
- LMS vendors, content aggregators, portals, and other platforms will create links to the Learning Registry to share data about content used within their environments: how it has been used and how widely used it is, and so on." (Learning Registry, 2012)

4.2 Learning Resource Metadata Initiative (LRMI)

Throughout 2011 and 2012, eQNet has monitored the developments the Learning Resource Metadata Initiative (LRMI), a project led by Creative Commons (CC) and the Association of Educational Publishers (AEP) to establish a common vocabulary for describing learning resources. "The vocabulary will be the first independently developed industry-specific framework designed to work with schema.org, the web metadata framework launched June 2, 2011 by Google, Bing, and Yahoo!, thereby improving the practical search and discovery of learning resources online. A common framework for tagging and organizing learning resources can enable further applications; thus, in order to maximize buy-in and the realization of future benefits for all learners, interoperability and transparency will be key criteria for the vocabulary and LRMI's development process.
Goals and activities:

- Document an abstract vocabulary representing the most common descriptions of learning resources used by existing educational metadata standards (e.g., Learning Object Metadata), by online publishers of learning resources (whether a machine-readable vocabulary is used or not), and addressing the contemporary desire to link learning resources to learning outcomes (e.g., Achievement Standards Network).
- Create a concrete expression of the abstract vocabulary for use within the schema.org hierarchy. Given this deployment target and the motivation to increase discoverability, utility for enhancing search queries and results will be a desired property for each term in the abstract vocabulary.
- Create a concrete expression of the abstract vocabulary as RDF, for interoperability with other applications and existing vocabularies. This drives another desired property for abstract vocabulary terms — to mirror the semantics of existing education metadata vocabularies to the extent possible, so that explicit equivalences and refinements may be established, protecting existing investments in educational metadata made by publishers and curators of learning resources and by institutions to date.
- Liaise with search engines, learning resource publishers, communities, and repositories, and other potential distributors and consumers of education metadata (e.g., Learning Management Systems vendors, National Learning Registry) to promote adoption and impact of the vocabulary.
- Explain the impact, value, and use cases of a common education metadata vocabulary to the general public, decision-, and policy-makers.

LRMI aims to establish a common metadata schema to identify learning resources that will complement learning standards, for example those encoded in the

Achievement Standards Network, including Common Core State Standards for K12 (US), as well as all other online learning vehicles. Interoperability is a key precept of LRMI. While simplicity is necessary for mass adoption and search engine implementation, mixing with and mapping to other vocabularies will be possible -- for example by mirroring the semantics of existing education metadata vocabularies (e.g., Learning Object Metadata) to the extent possible, so that explicit equivalences and refinements may be established, protecting existing investments in educational metadata made by publishers and curators of learning resources and by institutions to date.

After several rounds of public comments on the proposed LRMI specification, a final version open for public comment was published in January 2012 http://wiki.creativecommons.org/LRMI/Properties/Version_0.7. The LRMI Technical Working Group continues to develop the schema in response to public input as of the writing of this deliverable. eQNet will continue to follow the development of this schema and inform network members of relevant developments in this process and how they may benefit from this initiative." (LRMI, 2012)

5 References

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