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मसौदा भारतीय मानक

ऑनलाइन पाठ्यक्रम सामग्री को डिजाइन करने और पाठ्यक्रम सामग्री एवं वितरण प्लेटफ़ॉर्म की गुणता मूल्यांकन हेतु रीति संहिता भाग2 : ऑनलाइन पाठ्यक्रम सामग्री गुणवत्ता मॉडल और मूल्यांकन पद्धति

Draft Indian Standard

Code of Practice for Designing Online Course Contents and Quality Assessment of Course Content & Delivery Platform
Part 2: Online Course Contents Quality Model and Assessment Methodology

ICS 35.240.90

E-Learning Sectional Committee, LITD 19	Last Date for Comments: 09 February 2024

FOREWORD

[formal clauses will be added later]

This Draft Indian Standard (Part 2) will be adopted by the Bureau of Indian Standards, after the draft finalized by the E-Learning Sectional Committee LITD 19, will be approved by the Electronics and Information Technology Division Council.

Part 1 of this specification has defined the quality criterion to be followed in assessing online course contents quality. The criterion has several dimensions to identify a material as quality content. This part of the specification is meant to define a quality model and assessment methodology in accordance with the online course contents quality criterion defined in Clause 3.1 & Clause 3.2 (Part 1).

Other parts in this series are:

Part 1: Course Content Preparation, Current Practices and Compliance Verification Criteria
Part 3: Online course hosting platform quality model and assessment methodology

The aims of the Specification are as follows:

- Define online course contents quality model in accordance with the criterion defined in Part 1 of this specification.
- Define assessment methodology and conformance level in accordance with quality assessment model of this specification.

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INTRODUCTION

Different dimensions mentioned in the online course contents quality assessment criterion are based on the factors that are considered to be important from a particular stakeholder perspective. For example, a novice considers factors like publisher/author's reputation, table of contents, whether the material contains any illustrations and/or solved problems, vocabulary (ease of reading) etc., which influence his/her selection about course material. A quick glance on known topic will give better understanding of quality of content. However, the factors in determining content quality from subject matter expert perspective would be different from that of a novice user. Information coverage, relevance to the objectives of the topic and the content accuracy are the most important aspects of consideration from subject matter expert's perception.

At the same time it is also important to look at the standards or best practices which are most relevant to the digital technologies using which the course contents are being developed. Clause 5.0 (Part 1) of this specification, in content development approach, recommended the technologies to be used for content development.

From the above explanation it can be deduced that online course contents quality assessment model is mainly dependent on (a) factors which are of particular concern to a student and subject matter expert i.e., from pedagogical perspective and (b) factors which are to be considered from the technology perspective.

After defining the quality model for content assessment it is important to identify the methods and/or metrics to be used to assess these factors in quantitative manner. This specification describes the quality assessment methodology comprising evaluation planning, realization and analysis phases.

1. SCOPE

This draft specification will present the online course contents quality model and assessment methodology.

2. NORMATIVE REFERENCES

a) ISO/IEC TR 29163-2: 2009 Information Technology -- Sharable Content Object Reference Model 2004 3rd Edition – Part 2: Content Aggregation Model Version 1.1
b) Web Content Accessibility Guidelines version 2.0, W3C Recommendation. Retrieved September 1, 2012 from http://www.w3.org/TR/2012/NOTE-WCAG20-TECHS-20120103/G18#G18-related-techs
c) "A framework for multimedia educational content development and assessment of publication quality", CSI Transactions on ICT: Volume 3, Issue 1 (2015), Page 31-43
d) ISO/IEC TS 30135-1:2014 Information technology — Digital publishing — EPUB3 — Part 1: EPUB3 Overview
e) EPUB Accessibility 1.0 (idpf.org) retrieved from https://idpf.org/epub/a11y/accessibility.html

3. ONLINE COURSE CONTENTS QUALITY MODEL

The Online course contents quality model comprises quality parameters to be assessed based on the online contents quality assessment criteria defined in Clause 3.1 (Part 1). These parameters can be considered from technological and pedagogical aspects. From the technological perspective, international standards such as SCORM 2004 3rd edition, Web Content Accessibility Guidelines v 2.0 and best practices corresponding to determining multimedia quality are recommended as relevant standards that are applicable to the technologies identified in Clause 5.0 for online course development.

Sharable content object reference model (SCORM 2004 3rd Edition -ISO/IEC TR 29163-2:2009 & ISO/IEC TR 29163-3:2009) for content aggregation and runtime environment. The events generated within the content due to user's action such as clicking a button, drag and drop etc., can be communicated to course delivery platform through SCORM's runtime environment. Thus SCORM's runtime environment will act as a bridge between course content and tracking & analysis module of course delivery platform. This is useful in understanding student's motivation level. Measuring student motivation level is beyond the scope of this specification. This specification recommends SCORM conformance as one of the required quality parameters as it is useful in identifying that there is a provision to communicate student's action with the course delivery platform for further analysis.

Web Content Accessibility Guidelines (WCAG) 2.0 covers a wide range of recommendations for making Web content more accessible. Following these guidelines will make content accessible to a wider range of people with disabilities, including blindness and low vision, deafness and hearing loss, learning disabilities, cognitive limitations, limited movement, speech disabilities, photosensitivity and combinations of these.

Multimedia quality also plays important role in comprehending subject matter. Low legibility, impaired images create hindrance in grasping the topic being taught through video and/or audio presentations. Assessment of these technical impairments is also an important aspect required to be considered.

From the pedagogical perspective, composition of individual content blocks in accordance with the recommended course organization principles of this specification, readability of individual content blocks and adherence to instructional design principles of Part 1 are essential as per the quality assessment model of this specification.

3.1 Online Course Contents Quality Assessment Model

The following figure depicts the online course contents quality assessment model which is in accordance with the Clause 3.1 (Part 1).

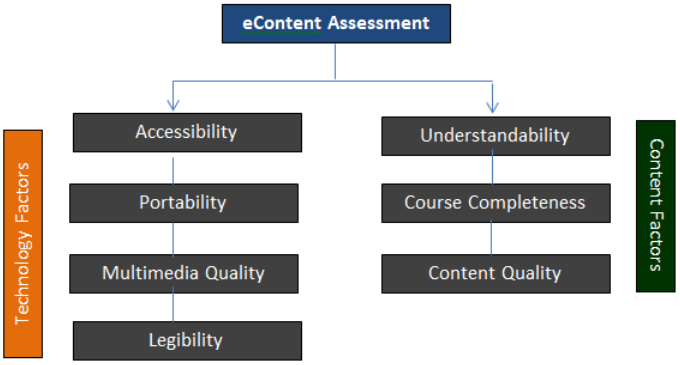

Figure 1: Content Quality Assessment Model

4. ONLINE COURSE CONTENTS ASSESSMENT METHODOLOGY

This item describes about evaluation planning, realization and analysis procedures of online course contents quality assessment based on the quality model proposed in clause 3.1 (Part 2).

4.1 Evaluation Planning

The evaluation planning comprises description of quality parameter and its conformance criteria in accordance with the quality model proposed in Clause 3.1 (Part 2).

4.1.1 *Accessibility:* Extent to which course contents developed in the form of web pages (HTML) and PDF is accessible to people irrespective of their physical abilities.
Standard: Web Content Accessibility Guidelines version 2.0 or ePub Accessibility
Criteria: Level 3 conformance criteria

4.1.2 *Quality of Audio/Video:* Extent to which audio/video based course content is clear enough so that users have no difficulty in listening or viewing the material.
Best Practice: Video Presentation Quality Guidelines
Criteria: Conformance to Video Presentation Quality guidelines

4.1.3 *Legibility:* Extent to which content is developed in consistent format and is legible.
Best Practice: Content Design Principles
Criteria: Conformance to content design principles

4.1.4 *Course Completeness:* Extent to which the course material is developed according to the recommended practices of course organization.
Best Practice: Principles of course organization of Part-A
Criteria: Conformance to principles of course organization

4.1.5 *Portability:* Extent to which course material can be reused on various learning management systems and e-readers.
Standard: SCORM 2004 3rd Edition or above OR ePUB3
Criteria: Conformance to SCORM 2004 3rd Edition or above Content Packaging and Runtime Specification Requirements OR ISO/IEC TS 30135-1:2014

Information technology — Digital publishing — EPUB3 — Part 1: EPUB3 Overview
xAPI Specification – ADL's Learning Record Store Test Suite
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4.1.6 *Understandability:* Extent to which the course content is comprehensible to the students of corresponding educational level.
Best Practice: Flesch Ease of Read
Criteria: Conformance to the grading mechanism recommended by this specification.

4.1.7 *Content Quality:* Extent to which the course material satisfies the instructional design guidelines.
Best Practice: Instructional Design Guidelines
Criteria: Conformance to Instructional Design Guidelines

4.2 Realization & Analysis:

This realization and analysis part consists of information about evaluation activities, the method used for obtaining the data during the evaluation process and its corresponding analysis.

4.2.1 *Accessibility:*
HTML, EPUB and PDF pages contained in course material will be subjected to accessibility conformance evaluation.

HTML: Two categories of deviations from the HTML 5.0 specification have to be handled, deviations which are irreparable and deviations which are ambiguous. Deviation in HTML element requires evaluators to determine whether it is indeed an error or not can be categorized as ambiguous. All the pages are not required to be evaluated instead a sample of available web pages can be subjected to evaluation.

EPUB: Deviations from ePUB accessibility guidelines have to be handled.

PDF: Deviations from the PDF accessibility guidelines have to be handled.

Selection of Test Material: From the course material HTML pages, ePUB and/or PDF files will be provided to the evaluator. The evaluator can choose which pages have to be selected for testing purpose. While selecting web pages different types of pages should be taken into consideration like pages having form submission, embedded objects, images, navigation related actions etc.

Result: Every problem that is detected on each HTML page or PDF file will be identified as either 'ERROR' or 'LIKELY PROBLEM'. Each 'LIKELY PROBLEM' will be assessed by the evaluator and will be identified as 'ERROR' or NOT.

Analysis: Result data will be analyzed to know how many errors have been found w.r.t each accessibility guideline

Actors: Software Tool, Accessibility Expert

Method: Combined Assessment (Subjective & Objective)

4.2.2 *Quality of Audio/Video:*

Video files in the course material will be subjected to video presentation quality guidelines conformance test.

Severity level of three major impairments (blur, blockiness, ringing) that affects the quality of video will be determined and compared against the recommended threshold values during the evaluation process.

For other video quality issues, the video files will be assessed based on subjective assessment after splitting each video in to separate files of 5 min duration each.

Selection of Test Material: From the course material video files developed in .MP4 (H.264, MPEG-4 encoded)/WebM/Ogg and audio filed developed in .MP3/WAV/Ogg Vorbis will be provided to the evaluator.

Result: Evaluator's response will be noted down on a 1-5 point scale with intermediate reference labels as Excellent, Good, Fair, Poor, Bad in case of subjective assessment and the severity value of impairments in the range of 0-1 in case of objective assessment.

Analysis: If more than 50% of video content exceeds the identified threshold values OR 50% of evaluators have rated the content as below 'Good' then the video file will be marked as FAIL.

Actors: Internal / External Evaluators (subjective assessment) and Software Tool (objective assessment)

Method: Combined Assessment (Subjective & Objective).

4.2.3 *Legibility:*

Non audio/video-based material i.e., course material developed using word processors and power point presentation will be analyzed for any deviations from content design principles especially focusing on color contrast, image quality, font & text consistency.

Selection of Test Material: From the course material Documents (PDF. ePUB), Power point presentations (PPT) and images (.jpeg, .png, .gif) will be provided to the evaluator.

Result: For each document/slide the contrast value, image quality value and the font consistency will be obtained.

Analysis: The minimum of contrast value, image quality value and text & color consistency is considered as the legibility value of corresponding file.

Actors: Software Tool

Method: Document Analysis (Objective Assessment)

4.2.4 *Course Completeness:*

Course material is considered as complete in all aspects when it contains information w.r.t all three essential components viz., explanation & demonstration, assessment and references in different styles suitable for both offline and online learning.

Selection of Test Material: Individual course contents (PDF, PPT, HTML, .epub, .MP4 (H.264 encoded), .mp3, webm, ogg, DOC files) compressed into .ZIP format.

Result: A value in the range [0 - 1] which quantifies the extent to which course contents are provided in different styles viz., book style and presentation style and contains all three essential elements.

Analysis: The result value represents course completeness value.

Actors: Software Tool

Method: Course Package Analysis (Objective assessment)

4.2.5 *Portability:*

Course material that is packaged as per the SCORM 2004 3rd Edition or above will be evaluated for its conformance to the standard.

Selection of Test Material: The course material exported as SCORM package in .ZIP format.

Result: Data about which guidelines of content aggregation have failed and the value of test as “PASS” or “FAIL”.

Analysis: The result will be analyzed to declare the final output as either PASS or FAIL.

Actors: Software Tool

Method: Course Package Analysis (Objective Assessment)

4.2.6 *Understandability:*

The course contents will be evaluated against Flesch ease of reading formula to obtain readability of the content.

Selection of Test Material: The test material will comprise contents in one of the forms of recommended ‘Book Style’ i.e., epub, pdf, ppt or html.

Result: A score reflecting the readability of the course content.

Analysis: The score obtained by applying the ease of reading formula should be greater than 80. Score below 80 is not acceptable.

Actors: Software Tool

Method: Flesch Ease of Reading score (Objective Assessment)

4.2.7 *Content Quality:*

The course material will be evaluated for its conformance to the instructional design principles.

Selection of Test Material and Test Session: The test session will comprise selection of a particular objective and presentation of corresponding course material to the subject matter expert. The evaluator has to specify his/her rating on a 5-point scale. The evaluators will be given a template as per Annex A to capture his/her evaluation particulars. Minimum five objectives of the course should be evaluated each at least by 5 subject matter experts.

Result: Users response will be noted down as one of Very Good, Good, Average, Poor, Not Appropriate Content.

Analysis: The result will be analyzed for conformance to Instructional Design Guidelines from evaluator's perspective by computing average score through 'mode' w.r.t each objective when the evaluator is 'Subject Matter Expert' and through 'mean' when the evaluator is 'Student'. The course completeness value will be adjusted based on these average values as per below formula.

$$CQI = \left[\left(\left[0.25 * \left(\frac{1}{n}\right) * \sum_{i=1}^{n}\left(\prod_{k=1}^{cb}\left(\frac{\#\text{ of styles}}{m}\right)\right) * \text{LM}\right] + \left[\left(\frac{1}{n} * \sum_{k=1}^{n} R\right) * \text{RM} * 0.33\right] + \left[\left(\frac{1}{n} * \sum_{k=1}^{n} A\right) * \text{AM} * 0.33\right]\right) * (\text{Normalized RI})\right] + \left[\left(\frac{1}{n} * \sum_{k=1}^{n} D\right) * \text{DM} * 0.09\right]$$

Note: n is the no of objectives. LM – Mean score of subjective assessment of individual content blocks, AM - Mean score of subjective assessment of individual assessment, RM - Mean score of subjective assessment of individual references, DM - Mean score of subjective assessment of individual demonstrations.

Where, LM, AM, RM, DM stands for average score computed from the ratings given by the domain reviewers against standard set of rubrics corresponding to each learning objective.

After the initial course content quality value is computed taking ratings from the subject matter experts, the value of the course quality will be updated subsequently taking ratings from the students.

Actors: Software Tool, Evaluators

Method: Content Analysis based on individual course objectives. (Subjective Assessment)

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ANNEXURE A
(Informative)

A.0 Introduction

This annexure provides a template for capturing details of evaluator's (Subject Matter Expert) feedback on online course content in line with the recommended Instructional Design Principles mentioned in section $5.2.4 of CoP-QAF-Part1 document.

This specification recommends evaluators to provide their feedback on online course on a 1-5 rating scale as mentioned in the A.2 template below.

A.1 Example Template for Abstract Tasks

Fields	Description
Role	Student/Online Tutor
Task ID	
Evaluator ID	
Course Grade Level	Graduate/Undergraduate/Post Graduate/Higher Education
Category*	Assessment/Collaboration/Profile/Contents/System
Sub Category	Clause XX (Part 1)
Software Module / Content Block Name**	
Objective ***	
Ref of Guidelines	Clause XX (Part 1)
Task Description****	
Accomplishment of Task (0 – 100%)	
Is the task relevant to the Role type?	☐
Contents and Content Delivery Platform Developer Approval	☐ Yes ☐ No

A.2 Example - Online Course Contents

This section provides an example of capturing details pertaining to quality assessment of a particular content block (not for the entire course or module).

Fields	Description
Role	Subject Matter Expert (Physics) or Student
Course ID	101
Evaluator ID	MOODLE-T-101
Course Grade Level	Graduate
Category*	Online Course
Sub category	Course Unit Name
Content Block ID or Name**	101-01 Or Thermodynamics
Objective***	Objective of content block
Ref of Guidelines	Clause 5.2.4.2 (Part 1)
Description****	• Access a particular unit/lesson objective from the course material and verify whether information pertaining to the objective is relevant or not.
Evaluator Rating	5-Very Good, 4-Good, 3-Average, 2-Poor, 1-Not suitable for learning
Is the task relevant to the Role type?	☐
Reviewer Comments, if any	
Content /Hosting Platform Developer Approval	☐ Yes ☐ No

For any comments/revisions to be proposed on this specification please write to us at <email address>.

Note:

*Category to which the task belongs to.

**Course Module Name/s: Name/s of the pages in the online course corresponding to the topic being assessed.

*** Objective of the content being assessed

****Description of the guideline can be mentioned here.

ANNEXURE B

Brief Description about the Evaluation of Content Quality Index

ISO/IEC technical committee on Learning, education and training – Quality management, assurance and metrics – Part 3: Reference methods and metrics [21] have recognized Pedagogical effectiveness index as one of the methods under implementation models and guidelines category. However, this category is identified as one of the reference methods and is in no way related to a specific implementation approach.

The implied instructional method in the course suggests every lesson has to be decomposed in to a number of content blocks that can be put in to one of the four categories viz., lectures / demonstrations / references / assessment.

A lesson can have any number of objectives associated with it. Content block is defined as a self-contained unit of course material corresponding to an objective. Each content block is associated with one and only one objective of a lesson and can be designed using different technologies viz., HTML, PPT, Video and PDF. In a course, a lesson must have at least one content block under "lectures" category. When a course material is organized in this fashion its quality index can be computed using following formula.

$$CQI = \left[\left(\left[0.25 * \left(\frac{1}{n}\right) * \sum_{i=1}^{n}\left(\prod_{k=1}^{cb}\left(\frac{\#\text{ of styles}}{m}\right)\right) * \text{LM}\right] + \left[\left(\frac{1}{n} * \sum_{k=1}^{n} R\right) * \text{RM} * 0.33\right] + \left[\left(\frac{1}{n} * \sum_{k=1}^{n} A\right) * \text{AM} * 0.33\right]\right) * (\text{Normalized RI})\right] + \left[\left(\frac{1}{n} * \sum_{k=1}^{n} D\right) * \text{DM} * 0.09\right]$$

Where n is the number of objectives of all the lessons of a given course, Cb is the number of content blocks associated with a particular objective, m is the maximum number of different delivery styles (book and/or presentation) in which content is made available, R represents '1' or '0' to depict whether a particular objective has a reference material associated with it, A represents '1' or '0' to depict whether a particular objective has a reference material associated with it and RI is readability index.

Please be noted that equal weightage is given to all the components of the course material viz. explanation & demonstration, assessment and references. But we cannot conclude that if more number of assessments or references or demonstrations is associated with a given course then the course would be more effective. Hence, the presence of assessment/references/demonstrations is considered but not the number of assessments/references/demonstrations associated with a given course content. If a course contains no assessment, references, demonstrations then the corresponding factors in the above formula will become zero. Otherwise, it will be count of '1's representing number of objectives with which these categories are associated.

Also, please be aware that, the value of $\prod_{Cb}^{k=1}$ (# of styles / m) will be high when the content is developed to be suitable for more than one delivery style (for e.g., book style - a.pdf, presentation style - a.ppt etc.) than when the content is developed in a single delivery style corresponding to an objective. Designing content in different file formats corresponding to a particular delivery style however will not increase the value of the fraction. Convenience of

sticking to a particular file format corresponding to a delivery style is implicit in this model. For example, assume that a particular objective is covered in a single content block which has been designed suitable for single delivery style. Then the above fraction would result in the value of (1/1)[1/2] = 0.5. Even if the content block is designed in two different file formats but is related to a particular delivery style then the value would remain same as the value of Cb will be considered as 1 only. When the same content block is designed suitable for both the delivery styles then the value would be (1/1)[2/2] = 1.

Another important characteristic that can be associated with this formula is readability index (R.I) value of content which can be used to measure understand-ability of the text. The readability index value can be computed using following Flesch reading ease test (Flesch, 1948). R.I = 206.835 – 1.015 (total words / total sentences) – 84.6 (total syllables/total words).

The CQI value considers two independent variables viz., readability and completeness of the content which can be measured in objective manner as shown above. The CQI value can further be adjusted by considering peer review scores on accuracy, relevance of content to the objective and depth of knowledge dimensions as per $5.4.2 section of Part 1.

Where, LM, AM, RM, DM stands for average score computed from the ratings given by the domain reviewers against standard set of rubrics corresponding to each objective. The advantage of this mechanism is we can invite scores from subject matter experts by posing questions to collect scores against parameters such as accuracy and depth of knowledge which cannot be evaluated in objective manner while rendering content on screen thus relieving the domain reviewer from focusing on other aspects concerned with technical factors.

The overall course quality can be assigned Level A or Level AA after completion of assessment of all the quality characteristics. When all the parameters are assessed in objective manner this result can be given as Level A conformance. In other case, where expert intervention is required for judging the conformance level the result can be given as Level AA conformance.

Note: For a detailed technical work done w.r.t above description please refer [3] of Normative references section in this specification.