Towards Assessing Quality of Open Courseware

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Subject

- an evaluation and a comparison between two open courseware on data structures and algorithms
- two major open courseware providers
- two different open courseware paradigms
- set of quality criteria that serve as general guidelines for development, use, modification, evaluation, and comparison
- *social and constructivist perspective*

Open Courseware

- MIT OpenCourseWare program (2100+ courses)
- OpenCourseWare Consortium (6000+ courses)
- Open Education Resources Commons (38000+)
- The Saylor Foundation's Free Education Initiative (200+/241 courses – 13 majors)
- Rice University's Connexions -20000 resources
- Coursera (121), Carnegie Mellon Open Learning Initiative, Harvard Medical School's MyCourses, Webcast.Berkeley etc.

Quality criteria

- categories*: content, instructional design, technology* and *courseware evaluation*
- *quality in use*, *internal and external product quality* according to ISO/IEC 25000 SQuaRE
- covered user needs: effectiveness, efficiency, satisfaction, reliability, security, context coverage, learnability, and accessibility
- quality assessment of either small learning units or an entire courseware

Content related (1)

- *Criteria that reveal to what degree an educational resource allows learners to have engaging learning experiences that provide for mastery of the content*
- readability
- uniformity of language, terminology, and notations
- availability of the course syllabus
- comprehensiveness of the lecture notes

Content related (2)

- possibility to select the most suitable learning unit
- opportunity to choose the most appropriate learning path
- top-down, bottom-up or combined approach
- availability of assignments (with or without solutions)

Content related (3)

- *resource related*: accuracy, reasonableness, self-containedness, context, relevance, availability of multimedia inserts, and correlation with the entire course

Instructional design (1)

- *Criteria that address the instructional design, and other pedagogical aspects of teaching and learning for that resource*
- goal and learning objectives
- appropriate instructional activities
- learning outcomes
- availability of the evaluation and auto-evaluation means

Instructional design **(2)**

- learning theory
- instructional design model
- *reflective learning opportunities* in which the desired outcome of education becomes the construction of coherent functional knowledge structures adaptable to further lifelong learning

Technology related **(1)**

- *both open educational resources and open courseware are expected to benefit fully from ICT technologies, to have user-friendly interfaces, and to comply with various standards*
- conformity with standards for interoperability
- compliance with standards for accessibility
- extensibility (both instructors and learners)

Technology related **(2)**

- user interface's navigational consistency and easiness, its multimedia appearance
- supporting technology requirements at user's end
- the prerequisite skills to use the supporting technology
- multi-platform capability
- supporting tools
- security of users' confidential information

Courseware evaluation **(1)**

- *Despite of the original claim of just offering high quality educational materials, all major open courseware initiatives have recently become more involved with their learners*
- *Hence, regular assessment of effectiveness of open courseware becomes essential, along with using the results for further improvements*

Courseware evaluation (2)

- *courseware overview*: content scope and sequence, intended audience, grade level, periodicity of updating the content, author's credentials, source credibility, multiple-languages, instructor facilitation or semi-automated support, suitableness for self-study and/or classroom-based study and/or peer collaborative study, time requirements, grading policy, instructions on using the courseware

Courseware evaluation **(3)**

- availability of prerequisite knowledge
- availability of required competencies
- matching the course schedule with learner's own pace
- availability of repository or institutional policies
- bias and advertising freeness
- providing a formal degree or a certificate of completion

Courseware evaluation (4)

- appropriate user interface
- suitable design and presentation of educational content
- *participatory culture and Web 2.0 facets*: contribution to the content, collection of users' feedback, collaboration with fellows, sharing the development/using experience

The candidates ☺

- University of Washington's Open Courseware on Data Structures and Algorithms
- The Saylor Foundation's Elementary Data Structures

UW OCW on Data Structures and Algorithms

- covers the fundamental data structures and algorithms
- for graduate students
- lecture notes, homework assignments, some solved problems and exams, along with the grading policy for the enrolled students

UW OCW on DS&A vs. QC (1)

- **Content-related**
- the lectures (.pdf and .ppt) are easy *readable* and very *uniform* in terms of language, terminology and notations, as they have a unique author
- learners have access to java programs and animations in javascript that are useful when learning about data structures and algorithms
- the offered materials are characterized by uniformity, except for the animations, which come from various online sources

UW OCW on DS&A vs. QC (2)

- **Instructional design related**
- general *instructional goal* and *learning objectives* of the entire course are presented both in the course description and in the *course syllabus*
- most of the available instructional materials provide only for *basic instructional activities*
- for *auto-evaluation* or *evaluation*, learners may use practice problems and exams – with solutions - both for midterm and final exams; the actual midterm and exam of Spring 2012 are available with solutions
- no *reflective learning*, no *learning theory*, nor *instructional design* aspects are available

UW OCW on DS&A vs. QC (3)

- **Technology related**
- the courseware complies with *interoperability* standards
- no *web accessibility* issues are considered yet
- only the instructors may *extend the instructional resources*
- the user interface is basic
- no interaction of external users with the courseware is allowed, and therefore no approaching of issues regarding *privacy and security of confidential information* is necessary

UW OCW on DS&A vs. QC (4)

- **Courseware evaluation**
- the *content scope and sequence* may be deduced from the Lectures' page
- no *support for learners* have been provided; no *instructions on "how to"* use the courseware and its components are available
- *grading policy* is presented, but it refers only to University of Washington's students
- no *repository policies* are presented
- the *user interface, design and presentation of the instructional content* are basic.

Elementary Data Structures/ Saylor.org – general info (1)

- one of the 200 courses freely available at The Saylor Foundation site / Computer Science program
- courseware overview includes the learning outcomes, the course requirements, and the learning units
- syllabus, readings, web media lectures, automated assessments, and the final exam are also available from the course home page

Elementary Data Structures/ Saylor.org – general info (2)

- the *course information*:
  - the course designer
  - the primary resources
  - the necessary requirements for completion
  - the needed time commitment
  - tips and suggestions on how to navigate through the course materials, on how to proceed when a learner struggles with a concept, and on the usefulness of taking notes while covering the available instructional resources

Saylor – Elem. Data Structures vs. QC

- **Content-related**. The *readability and uniformity* of the course materials is quite different as the learning units have different authors (in-house too)
- the course content is a mix of HTML readings, web media lectures, and assignments (quizzes), along with the final exam
- detailed *course syllabus* is available
- courseware is *modular* and very *comprehensive*
- selection of the *most suitable learning unit and learning path* can be done easily as the courseware is very intuitively built

Saylor - Elem. Data Structures vs. QC

- **Instructional design related**
- *learning objectives and outcomes* are available at two levels: course-wide and learning unit-wide
- the existing *instructional activities* are very limited in offering meaningful learning experiences, while *reflective learning* is not taken in consideration yet
- as for *auto-evaluation or evaluation* means, only *quizzes with solutions* (the assignments) or *without solutions* (the exam) are available for now
- each time the final exam is taken, learners are offered different questions

Saylor - Elem. Data Structures vs. QC

- **Technology related**
- accessibility is approached only in its larger sense rather than as *web accessibility*
- only the instructors may *extend the instructional resources*
- the *user interface* is advanced and suitable
- the supporting *technical requirements*, the *supporting tools,* and the *prerequisite skills* of using the technology are presented in The Saylor Student Handbook. Both the Terms of Use page and the Handbook show the saylor.org policy regarding *privacy and security of confidential information*

Saylor - Elem. Data Structures vs. QC

- **Courseware evaluation** (1) - *content scope and sequence* are presented in the course syllabus and course home page. Course *audience* and *grade level* is explicitly approached, but on saylor.org home page. For some learning units *author's credentials* are obvious, as they are professors at prestigious universities, while for others learners have to rely on *source credibility*
- the courseware may be used for the time being for *self-study* and *classroom based study*, but, taking into consideration the latest developments (forums, e-portfolios etc.), it seems that *peer collaborative study* is envisaged as well

Saylor - Elem. Data Structures vs. QC

- **Courseware evaluation** (2) - both syllabus and home page provide a *time advisory*, which show the needed time to complete each instructional resource. Student handbook details the *grading policy* and *instructions on "how to"* use the courseware and its components
- Student Handbook includes also the community standards, i. e. the repository policies, along with the statement regarding the *freeness of bias*

Saylor - Elem. Data Structures vs. QC

- **Courseware evaluation** (3) - *a certificate of completion* having a unique identification code is provided to each learner after she has passed the exam with a score of more than 70%
- learners may submit materials that might get chosen to be published on the saylor.org
- forums are starting to grow
- *feedback* from users is collected via a user survey
- the *development journey* and the *experience* of using saylor.org are presented in the student hndbk
- *user interface, design* and *presentation of the instructional content:* well elaborated and user-friendly

Comparison of the two O CW (1)

- each of the two evaluated open courseware has strong points and weak points, so we cannot state which one is the most beneficial for users, being them learners, teachers or developers
- the main merit of UW-DSA is, in our opinion, the broadness of the covered topics, the large range of instructional materials, and the source's credibility
- what it misses the most it is its engagement with prospective external users, and the participatory culture aspects

Comparison of the two O CW (2)

- the user interface and supporting framework looks best in SaylorDS due, in our view, to the fact that Saylor.org is thought to become an open online university, where independent learners are ought to return with pleasure and confidence that the courseware materials are connected to them in a *meaningful, unique, transformative way*
- SaylorDS covers a suitable variety of topics in the field, offering high-quality OERs, many of them coming from top universities and educational organizations worldwide

Comparison of the two O CW (3)

- neither of the two open courseware provides for true engaging, reflective learning, but it seems that saylor.org starts to address this issue, even though for the time being this is true only for some other courses, and not for SaylorDS
- Saylor.org provides some sort of certificate of completion for each of their courses. Related to that, cheating issues are acknowledged as well
- both courseware build up on other OERs and OCW, which increases the expectations, the benefits, and the confidence of users worldwide with respect to the OCW movement

Conclusions (1)

- put into practice the quality criteria, and to learn from this experience how to develop them further
- for the time being the evaluation is subjective, being based on more than 20 years of author's experience in Higher Education, particularly here, in teaching Data Structures and Algorithms
- there is no preoccupation yet for considering explicitly learning theories or instructional design models

Conclusions (2)

- new quality criteria: support for learners coming from other learners, opportunity for peer collaborative learning, availability of quick guides of relevant software, and providing links to related relevant resources
- extended quality criteria: accessibility needs to be seen at a higher level, not only as web accessibility, but as concerning access to as many people as possible to the open educational content

Conclusions (3)

- security of confidential information included in *terms of use,* along with copyright and licensing issues, anonymity, age restrictions, netiquette, updating or deleting personally identifiable information, security for *primary, secondary* and *indirect users* in terms of ISO/IEC 25000 SQuaRE

Future work

- compliance with existing quality standards, educational theories and best practice in the field
- each measurable criterion has to be evaluated in a quantifiable way, by devising an appropriate scoring or rubric system that will help users and other evaluators to “measure” open courseware
- the inspection procedure for quality evaluation and comparison needs to be taken to the next, more formal, level, aiming at providing a quality evaluation framework

Final conclusion (1)

- having many open courseware available, the struggle for quality will be encouraged for users' benefit, being them learners, instructors, faculty, developers, and educational institutions

Final conclusion (2)

- opening the courseware to people worldwide, and therefore providing for *the dissemination of knowledge for the public good*, will create promising opportunities for boosting creativity, because no creativity may appear in absence of knowledge, as creativity may be seen as *the mastery of information and skills in the service of dreams*

Thank you! ☺