From Taxonomies to Folksonomies: a roadmap from formal to informal modeling of medical concepts / objects

P.D. Bamidis, E. Kaldoudi, C. Pattichis

ARISTOTLE UNIVERSITY OF THESSALONIKI
DEMOCRITUS UNIVERSITY OF THRACE
GREECE

UNIVERSITY OF CYPRUS
CYPRUS

mEducator Best Practice Network co-funded by the European Commission eContentplus programme

http://www.meducator.net
Summary

- A brief note on mEducator
- The notion of content sharing...
- Formal modelling in medicine
- From taxonomies ... to Web2.0 folksonomies
Setting the Scene

Academic Institution

has/creates

autonomous specialized educational modules

uses

co-funded by the European Commission eContentplus programme

Web 2.0

LCMS

uses
Setting the Scene

Inter-Institution Communication cannot always be effective.
Setting the Scene

- Need of virtual distributed pools of autonomous specialized educational modules

- mechanisms for
  - Searching
  - Retrieving
  - Evaluating
  - Rating
  - Adapting
  - Revising

educational content in Medicine and Life sciences
mEducator

project title: mEducator: Multi-type Content Repurposing and Sharing in Medical Education

project type: Best Practice Network

programme: eContentplus Information Society & Media Directorate General, European Commission

contract: ECP 2008 EDU 418006

duration: 2009-2012

consortium: 14 partners from 10 EU countries, lead by AUTH (GR)

budget: ~4.500.000 €

website: http://www.meducator.net/
mEducator central idea

- discover, retrieve, use, rate, re-use and **re-purpose** educational content *irrespectively* of any Learning Management System use

- providers and users of such content may be
  - expert instructors (academics / health professionals)
  - students / learners
mEducator “content”

refers to educational material with a registered history of creation and evolution

● Is linked with
  – specific educational goals and objectives
  – learning outcomes
  – educational contexts/settings

● comes recommended with
  – certain teaching methods, strategies types, assessment methods
mEducator “content” …

content can be anything,

as long as it is properly accompanied by a clear description of

- what objectives it meets
- what learning outcomes it envisages
- how is it supposed to be taught
- how is can be assessed…
Learning content in medical education

- produced by a variety of sources:
  - basic research outcome
  - accepted scientific knowledge
  - clinical practice

- addresses a variety of learning/teaching approaches
  - conventional teaching material
  - content for active learning experiences: case/problem/role/inquiry/… based learning
Medical learning content types

- **conventional content**
  - lecture notes, books, exam questions, practicals, scientific papers, graphs, images, videos, …

- **content types unique in medical education**
  - teaching files, virtual patients, evidence based medicine forms, objective standard clinical examinations, anatomical atlases, …

- **alternative educational content types**
  - reflecting active learning techniques and new technologies: didactic problems, wikis, forums, web traces, …

- **user generated content**
  - reflecting user interaction with learning content
Content re-purposing & re-use

considering the state of the art nature of medical educational content, it is imperative that such content is

- repurposed
- enriched
- re-used

so as to be embedded effectively in medical curricula, continuing medical education and public awareness
Openness

mEducator project aims at Openness and Open Educational Resources
Formal Modelling Of Medical Data (I)

- Long lasting history…
- Since de Lacroix (1706-1777) - conceived the idea of classification of diseases and published it under the title Nosologia methodical.
- Cullen (1710-1790) - simplified the system for general use
- Farr (1807-1883) - first medical statistician who set principles that should govern a statistical classification of disease & urged the adoption of a uniform classification internationally.
- ICD: since 1900, through 1948 when WHO responsible for the International List of Causes of Death;
  - the new era of ICD
  - “internationalisation” of codification/classification of medical concepts like diseases
Formal Modelling Of Medical Data (II)

- **Taxonomy** - theoretical study of classification, including its basic principles, procedures, and rules, (the science of classification)

- **Classification** - a method of grouping of items scientifically according to purpose and codifying them with numerical (or alpha-numerical) identification according to certain principles.

- **coding** - the process of assigning a single item to a category or to a set of categories, which are denoted by codes, which in turn take various forms/formats.
Formal Modelling Of Medical Data (III)

- **Nomenclature** - the assignment of codes to medical concepts
- **Thesauri** - a list of terms is made that is used for a certain application area or domain
- **Terminology** the set of designations used in the special language of a subject field, such as the terminology of medicine
- Medical Terminologies and Classification Standards are: SNOMED, Read Clinical Terms, UMLS, GALEN, MEDCIN, CPT-4, LOINC, ICPC-2, ICD-10.
Ontologies and Terminologies

- In biomedical sciences the majority of concept/terminology-based systems are attempting to make implicit knowledge explicit.

- **Ontologies** aim to push explicitness further by harvesting the reasoning by machines, facilitating classification, enabling prediction, and allowing the triggering of alerts.

- But … concept-based terminologies and standardisations are mechanisms to improve communication of messages by humans.

- … probably not the right device to explain why reality is what it is, or to reason about reality, or to make machines understand what is real, or to integrate across different views, languages, and conceptualisations…
Standards ... (in medical education)
Web 2.0 developments...

Folksonomy

- ... a user created taxonomy where users provide short keywords (tags) about their uploaded content which are however generated by them rather selecting them from pre-fixed/pre-defined categories.

- As users can assign such decentralised keywords to their content, it is imperative that the semantics of the various IS are self-evolved (no restrictions to what information one can submit).

- Users have absolute control re the organisation of the information resources (self maintenance, super flexibility).
## Comparing classification/coding & folksonomies

<table>
<thead>
<tr>
<th>Requirements for a classification</th>
<th>Requirements for computer-assisted coding systems</th>
<th>Web 2.0 characteristics of user networks &amp; communities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domain completeness</td>
<td>Allow for the use of synonyms</td>
<td>social networking</td>
</tr>
<tr>
<td>Nonoverlapping classes (mutual exclusiveness)</td>
<td>Allow for the use of lexical variations</td>
<td>participation</td>
</tr>
<tr>
<td>Homogeneous ordering (one principle per level)</td>
<td>Insensitive to spelling errors</td>
<td>personalisation</td>
</tr>
<tr>
<td>Clear criteria for class boundaries</td>
<td>Reliability</td>
<td>Openness and agility</td>
</tr>
<tr>
<td>Appropriate level of detail</td>
<td>consistent operation (insensitive to ordering of terms)</td>
<td>Collaboration and sharing</td>
</tr>
<tr>
<td>Unambiguous and complete guidelines for application</td>
<td>correct</td>
<td>Reuse and apomediation</td>
</tr>
</tbody>
</table>
A note about …Medical Education…

“Half of what you are taught as medical students will in ten years have been shown to be wrong. And the trouble is, none of your teachers know which half”

Sydney Burwell, Dean, Harvard Medical School - 1956

“Knowing more and more about less and less until one has known everything about nothing”

Developing a community medical ontology

Merging centralized expert generated medical ontology with local naive patient and health provider user generated common sense experiential ontology.

Conclusions

- … traditional medical taxonomies have not been as widely accepted as originally hoped
- … haven’t resolved some of the major medical problems either (at least not as they ought to).
- folksonomies encompass a “self-organization” aspect
- …it is imperative to hope that the allowed user relationship building and the formation of personal cognitive conceptual and operational models as a part of social cognitive interactions [recently labeled social cognitive ontological constructs (SCOCs)]
- … may find key applications in the area of medical education and content sharing
P. Bamidis, E. Kaldoudi, and C. Pattichis. “From Taxonomies to Folksonomies in Medical Education”, ITAB2009: 9th International Conference on Information Technology and Applications in Biomedicine, Larnaca, Cyprus, November 5-7, 2009