A ontology for sharing open educational resources: the case of statistics teaching

Jean-Marc Meunier\textsuperscript{1}, Myriam Lamolle\textsuperscript{2}, Samuel Szoniecky\textsuperscript{1}

\textsuperscript{1}Laboratoire Paragraphe, Université Paris 8. imeunier@univ-paris8.fr ; samuel.szoniecky@univ-paris8.fr

\textsuperscript{2}Laboratoire LIASD, Université Paris 8. m.lamolle@iut.univ-paris8.fr
A difficult knowledge structuration

• Effect of surface characteristics on procedure choice (Quilici, 1996)
• A non-spontaneous knowledge structuration (Robert, 1999)
• Role of the explicitation of the knowledge structure (Quilici & Mayer, 2002)
• Teaching with conceptual maps (Chiou, Wang & Lee, 2014)
The OER use challenge in ODL

• Skills to search for information (Kinley, Tjondronegoro, & Partridge, 2010)

• hierarchical organization facilitates navigation and memorization (Amadieu & Salmerón, 2014)

• It is essential to align cognitive abilities and indexation principles. (Holman, 2011; (Schrader, 2015)
An ontology as a common language

ONTOSTATS (http://gapai.univ-paris8.fr/ontostats/)

678 concepts defined and labeled in English and French
http://bioportal.bioontology.org/ontologies/STATO


A multidisciplinary approach : Psychology, Statistics sciences, Documentaries sciences computer sciences

Stato (Rocca-Serra & Gonzales-Beltran, 2016)
A common language for different goals

• Knowledge sharing

• Design decision support systems (Guefack Donfack, 2013; Raby & Ravaut, 2011)

• Pedagogical resources indexation better than norms (Bouzeghoub, Defude, Duitama, & Lecocq, 2005).

• Construct support-learning devices for courses personalization (Castro & Alonso, 2011) and assessment (Romero, North, Gutiérrez, & Caliusco, 2015)
Thanks for your attention

See our project website: http://gapai.univ-paris8.fr/ontostats/

Or send me an email at jmeunier@univ-paris8.fr
Project partners
What’s an ontology?

- An ontology is a formal definition for describing a knowledge domain with a set of hierarchised concepts. Technically, an ontology is a "text-based piece of reference-knowledge, put somewhere on the Web for agents to consult it when necessary", Ghaleb et al. (2006)

Ontologies ...
- Allow us or software agents to share common understanding of the structure of information
- Enable reuse of domain knowledge
- Make domain assumptions explicit
- Separate domain knowledge from the operational knowledge
- Analyze domain knowledge

Different kinds of ontologies
- **Domain ontologies organise concepts**
- Method ontologies (i.e., medical diagnosis)
- Ontologies of application combine the both previous kinds
- Ontologies of representation organise the primitive of a theory
The Ontostats project

• Facilitate open and editorial educational resources access for students and teachers
  • Enrichment indexation for make it meaningful with an ontology
  • Facilitate educational resources search
  • Facilitate their reuse in teaching contexts
  • Facilitate collaborative enrichment of the database

• In the future, paving the way for other applications
  • Building an Expertise Database
  • Develop an inference engine
  • Query in natural language
  • Develop adaptative learning device
Documentary ressources indexation

- Ontology vs norms (Bouzeghoub, Defude, Duitama, & Lecocq, 2005)
- Ontology indexation facilitates resources access
- Semantically enriched indexation
- Interoperability
- Open data link possibilities

The multiple facets of OER (Hernandez, Mothe, Ralalason et Stolf, 2006)
Build decision support systems

Decision tree (Johnson & Karunakaran, 2014)

Ontology (Gonzalez-Beltran et al., 2014)

Which statistical tests may be used to test association between categorical variables?

STATO results

<table>
<thead>
<tr>
<th>Test</th>
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<tbody>
<tr>
<td>Barnard's test</td>
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<tr>
<td>Yates' corrected Chi-Squared test</td>
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<tr>
<td>Transmission disequilibrium test</td>
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<tr>
<td>Cochran-Mantel-Haenszel test for repeated tests of independence</td>
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<td>Pearson's chi square test of independence between categorical variables</td>
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<td>Fisher's exact test</td>
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<td>Cochran-Armitage test for trend</td>
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Yate's corrected Chi-Squared test

Yate's corrected Chi-Squared test is a statistical test which is used to test the association/dependence of 2 dichotomous variables while introducing a correction for using the continuous Chi squared distribution for the test. To reduce the error in approximation, Frank Yates, an English statistician, suggested a correction for continuity that adjusts the formula for Pearson's chi squared test by subtracting 0.5 from the difference between each observed value and its expected value in a 2 x 2 contingency table. This reduces the chi-squared value obtained and thus increases its p-value.

'Statistical hypothesis test' and achieves_planned_objective some 'association between categorical variables testing objective'

classes&concepts: http://purl.obolibrary.org/obo/STATO_0000070
Building learning supports

- Structuration of pedagogical sequences (Guo & Chen, 2007)
  - Courses documents; Exercices database; Bibliography; Dataset
- Recommendation systems (Shen & Schen, 2005)
  - For teachers and students
- Competency gap analysis & students assessment (Romero, North, Gutiérrez, & Caliusco, 2015)
  - Preconceptions, misconceptions
  - Categorisation errors
- Personalized & Adaptative learning (Castro & Alonso, 2011)
  - More or less formal teaching (Hendler, 2001)
  - Competency based learning (Paquette, 2007)
  - Just in time learning (Woelk, 2010)

https://elearning4109.wikispaces.com/The+Semantic+Web+&+Ontologies+in+e-learning