

# Griffith E-Learning Fellowship Report (for Semester 2, 2006)

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**Project title:** Cooperatively updated knowledge bases for e-learning and research.

**Goals of the project:** (i) refining my knowledge server ([WebKB-2](#)) to support an efficient and precision-oriented sharing, organisation, annotation and retrieval of teaching-related information by lecturers and students, (ii) semantically organising and indexing the content of teaching materials to help students find, compare and memorise information scattered in these materials (e.g., the sub-process relationships between all the processes introduced in a course), and (iii) evaluating this approach and the support provided by WebKB-2.

Summary of the tasks planned in the proposal:

- refining the interface and functionalities of WebKB-2;
- representing (some of) the semantic content of three different courses into WebKB-2;
- evaluating the usability and help of the tool and approach (for the students) via surveys, test questions and, when possible, structured discussions via WebKB-2;
- representing 50 knowledge representation and management tools on about 250 features (this was marked as a "low priority task");
- dissemination of the project outcomes.

## Outcomes

### Refinement of WebKB-2

The most part of August was dedicated to making some interface-related code of WebKB-2 more generic to permit the user to easily access the many proposed functions and presentation options, and easily change and combine these options. This framework is necessary for the tool to be used by beginners as well as advanced users. (This phase was initially planned to be mostly completed in July, that is, before the official beginning of the GEL project period, but the implementation was delayed and took longer than expected). This phase was done first in order to ease further developments and avoid delaying FLAS graphic designers in their evaluation of the interface of WebKB-2. These designers provided me with a nice "lightweight graphic banner" for WebKB-2 and some answers to several questions (e.g., "what is the problem with my Javascript code detecting that a pop-up window has been blocked?"). Finally, since September, I am supervising a Masters student working for 6 months on the import-export procedures of WebKB-2, mainly the parsing and generation of knowledge representations in the RDF notation.

As of November 2006, the other planned refinements (i.e., the "possibility for a user to vote on the originality and usefulness of a statement", the "knowledge evaluation method based on the votes and argumentation relations" and the "improvements of the querying mechanisms") have not yet been implemented because other tasks became more urgent. These refinements turned out not to be needed during this project because (unfortunately) the students only used very simple features of WebKB-2 and the evaluation had to be more superficial than initially planned. However, these refinements are important and will be completed as soon as time permits.

### Representation of three courses

This project was planned to be tested on three different courses in order to tackle various kinds of information and situations. Thankfully, three convenors had accepted their courses to be used as described in my proposal. These courses were: 1017INT/GC (Introduction to Multimedia Development; referred to below as the "Multimedia course"), 7007INT/GC (System Analysis and Design; referred to below as the "SA course") and 3116CIT/NA (Knowledge Representation; referred to below as the "KR course"). However, the KR course soon turned out to be difficult to use: (i) the lecturer could not give me the teaching materials sooner than to the students (the materials were put on-line week by week) and hence I could not create a consistent representation for the whole course, (ii) those materials were general and diverse (a lot of extra knowledge would have had to be represented to making the represented knowledge useful), (iii) the lecturer allowed no exercise outside those he initially planned for the course. Hence, instead of the KR course, I decided to refine and put into WebKB-2 my old representation of the lecture 3403INT online course (Workflow Management Systems; referred to below as the "WF course"). (I created this old representation last year when I taught this course but, since WebKB-2 was not yet ready to store and check some of the information, I used a wiki to store the representations and allow the students to update them). However, no additional exercise or questions could be asked to the students of this course either.

Below are the hyperlinks to the HTML files that contain the representations of the courses and some explanations for the notations and their rationales. (The representation of Lingo-related material was an addition asked by Dr Jo, the convenor of the WF course). I completed and published these representations on-line in September, for direct reading and/or exploration via WebKB-2 by the students. Each file includes a "conceptual query" field and has hyperlinks to ease the access by the students to some important subtaskOf or subtypeOf hierarchies on concepts of the course. At the beginning of the first, second and fourth files, a survey specific to the file is referred to. Each survey had to be answered by the students within 40 days.

- [Multimedia Resources](#)
- [Lingo](#) (script language of the 3D animation tool Macromedia Director)
- [Layout Guidelines](#)
- [Systems Analysis & Design](#)
- [Workflow Management](#)

Given the amount of information in these courses and the immediate purpose of the representations (i.e., helping information retrieval and comparison by the students), their level of detail is comparable to the one of good lexical ontologies (an example is given below). That is, my representations are less precise than "foundational ontologies" (e.g., ontologies logically defining properties of spatial or temporal relations) but more precise than the metadata used for indexing [Learning Objects](#) (LOs) in current LOs related [standards](#) (e.g., AICC, SCORM, ISM, [IEEE WG12](#)) or international projects (e.g., [CANDLE](#), GEODE, MERLOT, VLORN). My representations have some similarities with [concept maps](#) (or their ISO version, [topic maps](#)) which have often been used to represent various topics for teaching purposes (starting with Novak & Gowin (1984); a more recent example in biology is provided by [Leung \(2005\)](#)). However, these maps are small, informal and isolated semantic networks of generally 10 to 30 nominal expressions related by 10 to 30 verbal expressions) while my representations create a semantic network where each of the many dozens of objects introduced by a course is categorised inside a lexical ontology of English of 100,000 categories as well as being connected to other objects, properties and formal/informal statements via *formal* relations (i.e., relations defined in an ontology). Here is an example from the Multimedia course ("`/"` prefixes a comment for this report only):

```
is#flowchart      //an "information science" category with identifier "is#flowchart" ...
supertype: wn#chart,      //... defined as having Wordnet's "wn#chart" as generalisation
subtype: is#storyboard__content_flowchart, //... and "is#storyboard" as specialization
definition: "an organised sequence of possibilities/events",      //... one definition
use: "recounting past events in a time sequence"      //... one use
      "focusing on movement through a system";      //... another use
```

For each slide of the Multimedia and SA courses, I represented all the important objects and most of the sentences of the slide in the way illustrated above. For the SA course, I represented the content of about 350 of the 437 slides of the course (I have not represented the content of examples via figures and tables, and I eliminated the redundancies as well as the references to tutorials and examinations). For the WF course, I represented all the concepts and relations defined or illustrated in the textbook and some additional teaching materials; in each case I also represented the source (e.g., book and page number) and the interpreters for the relations (essentially myself, "pm") as in the following example where the default source is the book (hence, it is not mentioned) and the default domain/creator is "wfm" (hence, the categories are not prefixed by "wfm"):

```
process_management      //"{x y z}" means that x, y and z are mutually exclusive
subtype: {real-time_management operational_management
          tactical_management strategic_management}('p19' pm)
          solving_a_decision_problem ('p22' pm),
part: planning ('p19' pm) control ('p19' pm) solving_decision_problems ('p19' pm),
method: planning_and_control_cycle ('p19' pm),
tool: WFMS ('p19' pm);

planning_and_control_cycle
example: "using reports to revise objectives, preconditions and decisions"('p19' pm);
```

Within each of the files containing the representations, I categorised the various objects (with their associated relations) according to their conceptual nature into various informal sections with titles such as "Domains", "Properties, Measures, Models and Laws", "Processes, Tasks, Techniques and Methodologies", "Process agents", "Data structures and Formats", "Interfaces and Languages" and "Tools" (with the subsections "Softwares" and "Hardware"). Although I have not seen this approach used elsewhere, categorising objects into "concept-based sections" (informal sections, each dedicated to one type of object) organised into a specialization hierarchy has several important advantages:

- this makes it relatively easy for the reader to manually find objects, compare related objects, or understand the nature of the objects,

- this provides a unique place to put related objects next to each other and thus helps the person that models a course to progressively understand how the objects are related and hence refine the representations, remove the redundancies and solve the inconsistencies or misinterpretations,
- this is a systematic and scalable scheme: unlike sections or subsections in articles, the concept-based sections can be divided/specialized as many times as needed to accommodate all the information that the file author(s) want(s) to be in that file and the sections remain as helpful for information retrieval as a decision tree (I followed some important conceptual distinctions from the specialization hierarchy of WebKB-2 and this hierarchy, which organises at least 100,000 categories, could be followed at any level of detail),
- this provides a view on the information that is roughly similar to some results of queries provided in WebKB-2 but is richer and more flexible (indeed, automatically generated query results can only show direct relations from an object and, possibly, to those accessible from this object via a selected transitive relation, whereas with a section a person can mix different transitive relationships, using indentation to make things clear to the human reader; this is what I did in my files),
- this provides a view on the information that complements the view provided by the source teaching materials.

I did not require many different relation types for representing the three courses. The ones I used were essentially: subtype, instance, specialization, part (physical part or subtask), technique, tool, definition, annotation, descr, use, purpose, rationale, role, origin, example, advantage, disadvantage, argument, objection, requirement, agent, object, input, output, parameter, attribute, characteristic, support and url. Although the use of a knowledge-base server such as WebKB-2 is unavoidable to allow the representation, querying and cooperative updating of a large semantic network, the use of a structured document editor (SDE; e.g., the [Amaya Web browser](#) or any other XML editor) can be seen as a useful intermediary or complementary tool:

- the creation of the representations would have been much easier if the source documents had been organised via a SDE instead of Word or Powerpoint,
- the manual exploitation of my files is simpler if a SDE is re-used since for example some sections could be temporarily hidden by a user,
- despite its predefined schemas and semantic un-awareness, a SDE could also guide beginners in the creation of files and representations similar to mine.

[FL](#), the notation I use, is the most adequate formal notation that can be used for representing a realistic number of simple statements between objects (statements that do not require much more expressivity than RDF+OWL has). Indeed, its syntactic sugar is intuitive, reduced to the absolute minimum, and permits to avoid introducing repetitions. Controlled languages are more immediately understood by anyone but are verbose, force repetitions and hence are not adequate for presenting many statements. Formalised English (FE), a notation that I designed too, is a formal controlled language. As an illustration, compare the following statements in English (En) and their representations in FE and FL.

```
En: Any human_body is a body and has at most 2 arms and 1 head.
    Any arm, leg and head belongs to at most 1 human body.
    Male_body and female_body are exclusive subtypes of human_body
    and so are juvenile_body and adult_body.
FE: Any human_body is a body and has for part AND{at most 2 arms, 1 head}.
    Any OR{arm, head} is part of at most 1 human body.
    Human_body has for subtype AND{male_body, female_body, juvenile_body, adult_body}.
    Male_body has for exclusion female_body. Juvenile_body has for exclusion adult_body.
FL: human_body supertype: body,
    part: arm [0..1,0..2] head [1,1],
    subtype: {male_body female_body} {juvenile_body adult_body};
```

In an extension of this project, the representations could be presented in various formats and filtered or shown in a certain order according to the wishes of the lecturer or the students, and possibly according to student users' models (specifying which concepts they need not be displayed anymore) or pedagogical strategy. At Bond Uni (Gold Coast), some courses of information technology have been represented using concept maps (using a coarser granularity than the one I used and without an underlying lexical ontology) by A.Pr. Barta and some of his colleagues. Via filtering and assembling commands, these lecturers use this body of structured information to create [various on-line courses where each page correspond to one object and shows the direct relations from this object in a simple informal way \(bullet points are used\)](#). Thus, some conceptual relations are made explicit and the semantic network is shown, which I think is a very good point compared to traditional courses. However, I found the object-by-object presentation (as well as the lack of conceptual querying mechanisms and lack of an overall/systematic conceptual organisation) a problem for information retrieval/gathering and understanding. Some cooperation with A.Pr. Robert Barta is planned and should lead to interesting developments. Giving the students a choice to see the course in various generated structural and notational formats (FL, FE, ...) is important but I believe that allowing the access to the input file (as I did in this project) is necessary too, especially given the large number of relations I represented and level of granularity I used.

WebKB-2 is intended to permit lecturers and researchers to share and combine their academic outputs and incrementally refine the granularity of the shared representations. Students are also permitted to contribute or to annotate the knowledge

to indicate which points they think needs refinements or more explanations. Their contributions may also used as a way to evaluate them. The advantages of achieving all this, and the need to use formal notations to achieve all this, are clear. However, the unwillingness of most people to learn new notations (including musical notations, mathematical notations and programming languages), or more generally, doing something in a new way, is also well known. This is the reason why many authors of information retrieval systems, argumentation systems or mark-up languages have voluntarily restricted their approach. However, many of these authors also found that the expressivity limitations of their systems forced their users to make premature and arbitrary choices and hence led people not to use these systems or led them to enter biased and hard to re-use knowledge representations/indexations (Shipman & Marshall, 1999). An incremental adoption of the technical features and an incremental refinement of the knowledge should be permitted by the availability of various notations and by allowing users to mix formal and informal statements. Nevertheless, the question of how much the different actors (lecturers, researchers and students) are willing to participate remains a key problem (Tipton & Ingram, 2006). In the long term, knowledge extraction from natural language will reduce the problem but will not solve it: the semantic network will still need to be seen and updated by people.

## Evaluation

Although this was planned in the proposal for the Multimedia and KR courses, no "marked" question or exercise directly related to this project was given (nor could be given) to the students of the three courses. One reason was that none of the convenors of the three initially planned courses actually updated their course outlines to permit this, and none of them was comfortable with giving "extra marks" to encourage participation. Furthermore, as explained above, I used the WF course instead of the KR course.

For the SA course, the evaluation could only consist of a simple survey. At the beginning of a lecture on October 2nd, I introduced my work to the (dozen or so) students that were present, showed them why these representations would be helpful for them to prepare for their assessments, and asked them to fill a questionnaire by October 25th. Despite a reminder by the convenor soon before the deadline and one after it, only one student answered. Because of the uniqueness of this answer I directly quote it here.

Age: **27**, Gender: **F**, Background: **Iran**, Background language: **Persian**  
How many hours and minutes have you spent on the above cited System Analysis and Design summary? **3h**  
How many times did you get back to this above cited document? **4**  
Did you feel that the above cited help was a useful complement to the course:  
1) did it help you better understand relations between System Analysis and Design concepts? **yes**  
2) did it help you better memorise these relations? **so\_so**  
3) did it help you find some of these relations in a quicker way? **no**  
4) did you find querying a concept (or navigating from a concept) helpful? **i did not try them yet**  
5) which characteristics of the document (and WebKB-2) did you find (most) helpful?  
**good summarising the course material**  
6) which characteristics of the document (and WebKB-2) did you find (most) unhelpful?  
**it is not user friendly and take time to learn how should work with it**  
7) would any of your previous answers be different if the document (and WebKB-2) used a notation that was "your ideal notation"? (if so, please add the differences in your answers to the previous questions)  
**the language that used in summary is such programming language, i wodn't write it in this way**  
8) if the document (and WebKB-2) used a notation that was "your ideal notation", how would you consider this semantic network based approach for indexing and complementing the content of course materials?  
9) do you have other comments or suggestions? (please write them here)  
**Thanks it is a good help for me .**  
10) do you wish you had this document sooner? **yes.**

The rest of this section is related to the Multimedia course. After I completed my representation of this course, the convenor asked me for a representation of an additional module (the "Lingo script language") that was going to be assessed. After I completed it, I presented it for half an hour during one tutorial on September 14th, and thus to only 27 students out of the 63 students of the course. At the mid-term exam, the average mark of this test group was 24.73 while the average mark for the class was 24.59. These numbers do not show that my representation of the Lingo module helped the students of the group who was given this representation.

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The tutorials of October 4th and 5th were the last time I could see each of the two groups of the Multimedia students face-to-face, and the first and last time I could make the students actually have more than a cursory look at the representations since it soon appeared that most of them had not yet even gone to the Web site by themselves and in some cases had not checked their emails for at least two weeks. I made the students find layout guidelines on the Web and insert/represent them into a wiki-based version of my draft. (Given the little time that could be dedicated to this exercise, I could not hope to have them enter representations via the interface of WebKB-2, that is, representations satisfying the semantic checking procedures). I also asked them to fill the survey during the tutorial and thus got 15 more surveys (not all students come to the tutorials even though they gain some attendance points if they do). After the tutorial of October 4th (that is, after the tutorial with a first group), I cleaned up and organised the wiki-based version of the draft updated by the students of this group, and hence updated my draft.

This [cleaned version](#) is the one accessible from the hyperlink provided above. This second version was more organised than the first and this permitted the students of the second group to insert their representations at better places than the first group did. Another reason was that I advised the first group to focus on argumentation and specialisation relations between layout guidelines because I wanted the students to engage in "structured discussions" (since this was an exercise planned in my project proposal) but it turned out that the advices they found on the Web were often "how-to-do" advices and hence, instead of representing them via statements related by argumentation relations, they could be represented and organised in a much more adequate and scalable way via tasks related by "subtask" relations and with occasional "purpose" relations attached to them. The result of the work of the second group is accessible via the hyperlink titled "[this wiki](#)" in the above cited cleaned version. The student referred to as "R" in the survey summary below made the following comment: "The time I spent researching the web for design principles proved to be very useful to me. I now have a clearer knowledge of the principles after sorting them into the format required. The process was time consuming but did help me to remember the concepts and organized them in a fashion. This process could be used in other subjects to help study for exams or just to process information.". Here is an extract from the above cited cleaned version (the student numbers show which students added which relations):

```
using_an_attractive_presentation
  subtask: designing_so_as_not_to_shock_the_user (s2603457)
           capturing_and_retaining_attention_on_a_document (pm);

designing_so_as_not_to_shock_the_user
  subtask: "using backgrounds that don't clash/conflict with font colours" (s2603457);

capturing_and_retaining_attention_on_a_document
  subtask: creating_focus_on_the_relevant_document_elements (pm)
           creating_balance_on_a_document (pm)
           "using contrast to stimulate attention on the page"
           "using heading in larger fonts to gain attention" (s2603678)
           "using contrasting colors and graphics" (s2603678)
           "using graphics to focus attention" (s2603678),
  purpose: "good contrast draws the eye to different sections of the piece" (s2603678);
```

Since only 18 of the 63 registered students took the time to fill their surveys, it is possible and interesting to present all the answers here by indexing them with alphabetic letters (e.g., "a" for the answers of one student, "b" for the answers of a second student, etc.). See below. Uppercase letters are used for the students who claimed to have spent at least half an hour on the first set of representations they were given (that is, the "Lingo representations" for the first group) and lowercase letters for the other students. Some lowercase letters are prefixed by an underscore to highlight the fact that the students represented by those letters spent very little time on the representations ("0 minute" according to c and \_i) and, at least in the case of \_m and \_o, considered their answers irrelevant given how little they understood the representations and how little time they spent trying to understand them. The students referred to via lowercase letters (with or without underscore before) apparently spent little time in completing their surveys too; for example, many questions are left unanswered and a "yes" answer has been given by \_c d and f to questions such as "which characteristics did you find (most) helpful?". It is interesting, encouraging and a bit surprising that apparently *only very few* students do not have a positive attitude toward the proposed approach, and that all of these very few students are referred to via a lowercase letter and often prefixed by an underscore. I use a question mark below when the answer was "I don't know" or "not sure". For the questions beginning by "How many hours and minutes", the numbers are in minutes.

Age: A:24,B:18,\_c:18,d:21,e:27,f:18,G:18,H:18,\_i:17,J:18,k:18,l:23,\_m:22,N:21,\_o:18,p:31,q:41,R:18  
Sex: A:M, B:M, \_c:M, d:M, e:M, f:M, G:M, H:M, \_i:M, J:M, k:M, l:M, \_m:F, N:F, \_o:M, p:M, q:F, R:M  
Background (default: Australia): B:Croatia,\_c:Turkey,d:Singapore,\_m:USA,N:NZ,\_o:Turkey,q:Canada  
If you have a job, how many hours do you work per week?  
A:20-30,B:25,\_c:15,d:20,e:15,f:20-30,G:25+,H:18,\_i:14,J:25,k:12-20,l:25,\_m:20,N:10,\_o:15,p:12,q:10,R:

How many hours and minutes have you spent on the above cited document (the ["Lingo representations document"](#) for the surveys A to N, the ["Multimedia course representations" document](#) for the last 4 surveys)?

A:180,B:, \_c:0,d:20,e:15,f:,G:60?,H:180,\_i:0,J:30,k:5,l:,\_m:10,N:180,\_o:2,p:20,q:120,R:60-120

How many times did you get back to this above cited document?

A:5-6,B:3,\_c:0,d:0, e:1, f:,G:1, H:2, \_i:0,J:0, k:1,l:,\_m:0, N:3, \_o:0,p:, q:2, R:0

Did you feel that the above cited help was a useful complement to the course:

1) did it help you better understand relations between the objects?

A:yes,B:yes,\_c:d:yes,e:no,f:yes,G:no,H:yes,\_i:no,J:yes,k:yes,l:yes,\_m:no,N:yes,\_o:no,p:no,q:yes,R:yes

2) did it help you better memorise the relations between the objects?

A:yes,B:no, \_c:d:yes,e:no,f:yes,G:no,H:yes,\_i:no,J:yes,k:yes,l:yes,\_m:no,N:yes,\_o:no,p:no,q:yes,R:yes

3) did it help you find some relations in a quicker way?

A:yes,B:yes,\_c:d:yes,e:no,f:yes,G:?,H:yes,\_i:no,J:no, k:yes,l:yes,\_m:no,N:yes,\_o:yes,p:?,q:yes,R:yes

4) did you find querying an object (or navigating from an object) helpful?

A:yes,B:yes,\_c:d:yes,e:no,f:yes,G:no,H:yes,\_i:, J:, k:, l:yes,\_m:no,N:yes,\_o:yes,p:, q:?, R:yes

5) which characteristics did you find (most) helpful?

A:"relationships and examples of use", B:"comments placed throughout", \_c:, d:yes, e:none, f:yes, G:?,

H:"easy navigation and good descriptions of scripts and objects", \_i:, J:,

k:"query boxes, links", l:notes, \_m:none, N:yes, \_o:"hierarchy system", p:, q:?, R:"simple lists"

6) which characteristics did you find (most) unhelpful?

A:"confusing layout", B:"lack of spacing", \_c:yes, d:, e:all, f:yes, G:?, H:none, \_i:, J:,

k:"sometimes too many relations", l:"can be confusing at times", \_m:, N:none,

\_o:"plain website", p:, q:"editing freely in the wiki", R:"information was a little scattered"

7) do you have other comments or suggestions?

A:"More verbose instructions and explanations for use", B:"more color and comments would have helped",

\_c:d:, e:, f:, G:, H:, \_i:, J:, k:"I also did pretty good without this", l:,

\_m:"I feel that my answers to this questionnaire are rather irrelevant because I didnt use it as a

tool to help me study as I did not understand the document at all", N:"i know what they are now",

\_o:"i havent really used the site and im still passing",

p:"I didn't understand much,so it helped me little. It was like trying to learn a new language",

q:"most of the notations were intuitive or well known",

R:"it is a very good tool to have for future use"

8) do you wish you had this document sooner?

A:yes, B:"no, It did come in handy", \_c:, d:yes, e:, f:?, G:yes, H:yes, \_i:no, J:yes, k:yes,

l:"no i found it useful to have before the test", \_m:yes, N:yes, \_o:no, p:, q:yes, R:no

Given there was not a great number of relations in the above cited document, the last set of questions (and especially the third one) may be difficult to answer. Hence, please access the [document representing relations between objects of this whole multimedia course](#). Have a careful look at

this document and, if you think the number of relations is still not too low to be useful, imagine

an even more detailed representation of the course. With this ideally detailed representation in

mind and given your current understanding of the approach, please answer the following questions:

1) would the approach (as a complement to the course) help you better understand the relations

between the objects presented in this course?

A:yes,B:yes,\_c:?,d:yes,e:no?,f:yes,G:?,H:yes,\_i:no,J:?, k:,l:yes,\_m:yes,N:yes,\_o:no,p:,q:,R:yes

2) would the approach help you better memorise the relations?

A:yes,B:no, \_c:?,d:yes,e:no?,f:yes,G:?,H:yes,\_i:no,J:yes,k:,l:yes,\_m:no?,N:yes,\_o:no,p:,q:,R:yes

3) would the approach help you find a certain relation in a quicker way?

A:yes,B:yes,\_c:?,d:yes,e:no?,f:yes,G:?,H:yes,\_i:no,J:yes,k:,l:yes,\_m:no, N:yes,\_o:no,p:,q:,R:yes

4) would you find querying/navigating from an object helpful?

A:yes,B:yes,\_c:, d:yes,e:no, f:yes,G:yes,H:, \_i:, J:yes,k:,l:yes,\_m:yes,N:, \_o:no,p:,q:,R:yes

5) which characteristics would you find helpful (or most helpful)?

A:"query function, annotation and examples",B:"see above",\_c:d:yes,e:none,f:information,G:?,

H:"easy navigation",\_i:,J:,k:,l:"the fact that it is well ordered with notes",\_m:,N:,\_o:,p:,q:,R:

6) which characteristics would you find unhelpful (or most unhelpful)?

A:"layout+syntax",B:"see above",\_c:d:yes,e:,f:complexity,G:?,H:none,\_i:,J:,k:,l:,\_m:,N:,\_o:,p:,q:,R:

7) other comments or suggestions?

A:no, B:no, \_c:, d:, e:, f:no, G:, H:, \_i:, J:, k:, l:,

\_m:"I dont understand programming terminology easily so having it merely listed does nothing for me",

N:,\_o:"make is more artactive",p:,q:,R:

8) do you wish you had this second document sooner?

A:"with colour coding it would definitely be a good resource", B:yes, \_c:, d:no, e:no, f:?, G:yes,

H:yes, \_i:?, J:yes, k:, l:?, \_m:, N:yes, \_o:, p:, q:, R:

How many hours and minutes have you spent on this second document?

A:60, B:0, \_c:0, d:10, e:, f:5, G:, H:10, \_i:0, J:, k:, l:25, \_m:10, N:20, \_o:, p:, q:, R:

How many times did you get back to this second document?

A:2, B:0, \_c:0, d:0, e:, f:1, G:0, H:1, \_i:0, J:, k:, l:2, \_m:0, N:2, \_o:, p:, q:, R:

My interpretation of this survey synthesis is that all the students who did their homework found the approach useful (even if they did not like the syntax/layout) and that many of those who did not do their homework also understood the general advantages of the approach even if they did not fully understand the approach itself. As expected, the syntax is a big issue even if the student above referred to as "q" thought that "most of the notations were intuitive or well known". As explained in the previous section, this issue is rather unsolvable. HTML and colour coding are insufficient, and controlled languages are not adequate. However startling or aesthetically displeasing their use may be, notations are

necessary for compact and structured presentation of information, and hence to support knowledge comparison and understanding. In a sense, this is illustrated by the above survey synthesis itself since (i) a large table would have been unpractical to display, and (ii) a list of tables (or worse, individual surveys) would not permit an efficient comparison and understanding of the information. In most domains, students have to learn notations and, due to their ubiquitous application, more and more notations related to information management, for example, programming languages, workflow notations and information modelling notations. It is therefore likely that at some stage in the future, most students will have to learn principles and notations to structure information (graphic notations as well as textual notations since in many cases graphic notations are not practical). It is also unlikely that these principles and textual notations will be very different from the ones I advocate (or any other currently existing concise textual notation) because of the strong constraints they have to satisfy.

A more elaborate evaluation was planned in my project proposal: it relied on having the students add to the semantic network and engage in structured discussions via the semantic network (thus, also cross-evaluating themselves). This would have permitted to test [the method I designed to valuate the originality and "usefulness" of each statement \(and thereby each statement author\) based on its argument tree and votes from users](#) (Martin & al., 2005). It is now clear that this *deep learning* method could unfortunately only be tested or applied via marked exercises in the context of an "advanced knowledge representation" course (in order to justify these marked exercises).

## References

Leung, J. (2005). Concept Maps On Various Topics.

[http://www.fed.cuhk.edu.hk/~johnson/misconceptions/concept\\_map/concept\\_maps.html](http://www.fed.cuhk.edu.hk/~johnson/misconceptions/concept_map/concept_maps.html)

[Martin, Ph., Blumenstein, M. & Deer, P. \(2005\). \*Toward cooperatively-built knowledge repositories\*](#). Proceedings of [ICCS 2005](#), 13th International Conference on Conceptual Structures, (Springer Verlag, LNAI 3596, pp. 411-424), Kassel, Germany, July 18-22, 2005.

Novak, J.D. & Gowin, D.B. (1984). *Learning How to Learn*. New York, Cambridge University Press.

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## Dissemination of the outcomes

As planned in my project proposal, I submitted an article to the [Ascilite 2006](#) conference (Australasian Society for Computers in Learning in Tertiary Education) in Sydney. I also submitted an article to the [E-Learn 2006](#) conference in Hawai'i (the E-Learn conference is an annual [AAACE Conference](#) on E-learning in Corporate, Government, Healthcare, & Higher Education; it is a successor of the WebNet World Conferences that occurred between 1996 and 2001). The Ascilite article was judged "too technical for the intended readers and more adapted to a Semantic Web conference" but the E-Learn article was accepted. I was kindly allowed to upgrade my budget to match the increased travel costs and I presented my article at this conference. I also went to present this article (and more generally my works) at the [Hawai'i Pacific University](#), at the [College of Business](#) of the University of Hawai'i and at the [Information and Computer Sciences](#) of the University of Hawai'i. Some collaborations (regarding the application and refinement of WebKB-2 and/or its ontology) will hopefully rise from these presentations and meetings (so far, at least one collaboration seems secured). Thanks to my meetings at E-Learn 2006, some collaboration with the [RMIT Computer Science Department](#) may also begin, at least as part of an [Agent-based Web Service Composition project for NineSigma Pty Ltd](#).

On the subject of collaborations initiated during this project I must mention the help and guidance I received from Dr Jun Jo (with whom I have now applied for an ARC Linkage grant) and my meetings with A.Pr. Robert Barta and Pr. Ian Morisson of Bond University which will very probably lead to a common submission to an ARC Discovery grant. Finally, my collaboration with A.Pr Michel Eboueya of the [L3I Laboratory of the French University of La Rochelle](#) (collaboration initiated two months before the beginning of this GEL project) is going on well. We have published tree conference articles together (including the E-Learn 2006; Dr Jo is co-author of two of them), submitted an extension of one of these articles to the [IJWET](#) journal (International Journal of Web Engineering; the article will go for a second round of review, once revised in December), and we have applied to grants for my coming to his laboratory as invited researcher for three months in 2007: one Australian grant (the ["Scientific visits to Europe" grant](#)) and one French grant

([from the Poitou-Charentes region](#)). The theme of this research visit will be "Application of precision-oriented knowledge modelling approaches to cooperation and e-learning via semantic grids". I am co-supervising a new PhD student of A.Pr Eboueya (her PhD began on September 4th 2006 and its title is "Semi-automatic and collaborative knowledge-based indexation, structuring and sharing of textual or multimedia information for learning or information retrieval within a knowledge server or in a semantic grid"). Her PhD begins with the task marked as "low priority task" in this project proposal, that is, representing 50 knowledge representation and management tools on about 250 features.

Further journal articles will be submitted soon. One will be submitted in January to the "Handbook of Research on Learning Design and Learning Objects" which will be edited by the University of Wollongong. I found the call for papers related to this handbook (and met Pr. Barry Harper, one of his editors) at E-Learn 2006. My article titled "Toward a Cooperatively Built Ontology of Knowledge Engineering" has been accepted on December 2nd 2006 by the [CEA 2007](#) (Computer Engineering and Applications), a [WSEAS \(World Scientific and Engineering Academy and Society\) Conference](#) on Computer Engineering and Applications, and I'll present it mid-January at Surfers Paradise (Australia) According to the [Acceptation letter](#), this article is apparently also accepted to be extended and published in a [WSEAS journal](#).

At the very beginning of this GEL project, I played the role of "ontological adviser" in the [first pilot of the Text Outline Project](#) (which the co-founder of Wikipedia launched to organise ideas from philosophy books) and I [began an alternative pilot project](#). This too was permitted by the teaching relief provided by the GEL grant.

As noted in the project proposal, the *sharing* of the outcomes of this project will (continue to) take place in mainly three ways: (i) by inviting lecturers and researchers to complement the KB by representing or indexing their research outcomes or learning materials (thus, sharing or advertising them), (ii) by sending articles to a conference and to journals in each of the relevant fields (Learning, Knowledge Engineering, Semantic Web and CSCW/argumentation), and (iii) by presenting the results of this project to Griffith Uni seminars when invited to do so.

## Expenditure

### Personnel:

- 1) Teaching relief via the hiring of academic casuals for the 7018INT and 1005ICT courses: **\$21,861.79**
  - for 7018INT (Internet Programming II): \$6476.53
  - for 1005ICT (Programming II): \$15385.26
- 2) Advices for making the interface more user-friendly: **\$1650**
  - advices from FLAS Educational Designer (1 day): \$501
  - advices from FLAS Graphic Designer (3 days): 3 \* \$383 = \$1149

**Equipment:** no additional equipment required.

**Travel:** return air-plane ticket to Hawaii for [E-Learn 2006](#), \$1512 via Qantas.

Registration to E-Learn 2006: \$585 (450 USD).

Running expenses: none.

TOTAL: \$25608.79

## Future commitments

*December/January.* Extending my CEA 2007 article to submit an article to [WSEAS Transactions on Information Science and Application](#). Revising and re-submitting my article for [IJWET](#). Writing and submitting an article to the "Handbook of Research on Learning Design and Learning Objects". Writing and submitting an ARC Discovery grant proposal with A.Pr. Robert Barta and Pr. Ian Morisson of Bond University.

*February 2007.* The implementation of the knowledge evaluation method (based on argumentation relations and votes as described in [Martin & al., 2005]) is completed (thus, the users will be able to see originality and usefulness values associated to statements).

*March 2007.* The French PhD student (at the above cited L3I) that I am co-supervising is supposed to have completed the representation of 50 knowledge representation and management tools on about 250 features. She will require a lot of help from my part to achieve this. Depending on my employment status at the time, and the success of my above cited applications to "invited researcher" grants, I may or may not be invited researcher at the L3I from March to June 2007. At least one E-learning/Semantic-Web related articles will be written during those months.