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Don't Waste Student Work: Using Classroom Assignments to Contribute to Online Resources

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According to the US Bureau of Census, as of 2006 there were 20.5 million college and graduate students in the United States alone (2008). Every year, these students work on millions of assignments, and instructors and teaching assistants spend millions of hours grading them. The vast majority of these assignments help the students learn, but do no good for anybody else. My teaching philosophy is that student assignments should not only help students learn, but should also benefit the wider educational and research communities. Don't waste student work.

In this chapter I will describe a number of assignment types I have introduced over the past years I've that I believe 1) facilitate learning, 2) are particularly motivating, and 3) contribute to the greater educational and research communities.

Although this chapter will focus on my field, cognitive science and artificial intelligence, most of the methods will translate to other fields with a bit of imagination.

Cognitive Science Summaries

When I was studying for my depth exams in graduate school, the other students and I had a long list of papers we needed to read and understand. The test we had to take was open book and "open web," that is, we were allowed to go online for information during the test. I suggested that we split the papers among us and each be responsible for deeply understanding our assigned papers. In our weekly discussion meetings, we knew who to turn to with questions. I also talked them into writing summaries of these papers. With their permission I put these summaries the web. In 1999 the Cognitive Science Summaries website was online (Davies, 1999).

For a few years after, every time I read an important paper, I would summarize it and put it on the site. Gradually the size of the site grew. When I became an assistant professor at the Institute of Cognitive Science at Carleton University, I started requiring the students in my classes, through class assignments, to contribute to the site. They are required to find a cognitive science paper that has not yet been summarized on the site, read it, and summarize it so that someone who has not read the paper can understand its basic claims, and so that the summary author would never need to read it again to know what it contained.

I am very happy with the results.

Insert Figure 1 about here.

Each summary contains some similar bits of information. First is complete citation information, in two formats: the American Psychological Association and BibTeX (for users of LaTeX). This allows for effective indexing for web searches, and makes it easy for other researchers to copy and paste the reference into their own papers.

Next comes the name of the author of the summary, and his or her email address. I tell my students that their assignments will be put on the web, and if they don't want their names on it, I will just list the summary's author as Anonymous. I also include the year the summary was written, so that readers have the information they need to cite the summary itself.

I also require the students to include a list of specific things one could cite the paper for. For example, in the summary for Larry Barsalou's paper on Perceptual Symbol Systems (Davies, 2000), the statement "Amodal symbols are redundant if they just link to the percepts" is in the "cite this paper for" section. It is for claims, argument conclusions, original ideas, names of software systems reported, quotable wording, etc. The motivation for this is search: if you read a fact or claim but cannot remember where you read it, a web search for that fact might turn up the summary, allowing you to cite it the paper.

Finally, there is the summary itself, which I allow the students to structure any way they see fit, except that I ask them to associate page numbers with statements, so that readers of the summary can easily find what's being summarized in the original paper. The text of the actual assignment is in Appendix A.

All of the summaries I have collected in this manner have been of high enough quality to put on the site, mostly with only minor alterations—usually formatting.

Insert Figure 2 about here.

This kind of assignment has several educational advantages. First, since the student finds his or her own paper to summarize, they get experience looking through journals, giving them some idea of the state of the art. They read several abstracts, and finally choose a paper they are really interested in. Second, they get exposure to real research, reading non-textbook science and understanding an actual scientific paper, which many second-year undergraduates, for example, have never done. Finally, knowing that their work will be on the web is further

motivation to do a good job. Some of them ask me to put a note on their summary communicating that they wrote it as an undergraduate, in case they sound naive to more experienced researchers online readers.

Since all fields have scholarly papers, this method can apply to any discipline.

Artificial Intelligence Wikibook

The Wikimedia foundation, which manages the Wikipedia, also has a wiki called "Wikibooks," which are for the creation of free content textbooks and annotated texts that anyone can edit from a web browser. I require students in my artificial intelligence classes to write chapters or chapter sections for the Artificial Intelligence Wikibook (Wikimedia Foundation, 2009a). For the last year each student had to write a piece about a search strategy that had not already been covered in the wikibook. Perhaps, in ten years or so, the book will be sufficiently mature so that my AI students will not need to purchase a textbook at all.

Teachers of foreign languages can assign translations of Wikipedia articles into other languages. The English Wikipedia is huge, but the Spanish version is 12% of the its size (von Ahn, 2009).

Advantages of Electronic and Online Books

Wikibooks are designed for online use, which offer a number of advantages with electronic books (e-books) in general over printed books (Crowell, 2005). I will describe several of these advantages.

They are searchable based on user queries. Normal books rely on an index, which can be thought of as pre-run searches by all words and phrases the author believes anyone might use to search with. Indices fail when users wish to retrieve information the author did not see as important enough to put in the index, or when users use unusual search terms.

E-books are compact. In terms of physical space, thousands of e-books can be stored on laptop computers, flash drives, phones, personal digital assistants, or e-book readers. Online need not be stored in a local version at all-- any device with an internet connection can access it at any time.

Font can be adjusted according to preference, and font size to accomodate vision problems. E-Books can be automatically read aloud for the blind.

In terms of content, e-books can include multimedia, including animated images, video, sound, and hyperlinks.

Finally, e-books have a smaller environmental impact than print books.

Disadvantages of Electronic and Online Books

For the wikibooks project in particular, each individual page in the book can be rendered into a printer-friendly version, or turned into a PDF. Currently there is no function to print or generate a PDF for the book as a whole.

E-books cannot be read without some kind of computer, although that computer can take the form of a phone, PDA, e-reader, or a desktop machine.

It's more difficult to flip through pages rapidly, looking for a particular part of the book that might be spatially indexed in the user (e.g., remembering that a passage is near the end of the book).

As with the summaries, any field can use this method, contributing to (or starting) an online textbook.

See Figure 3 for an example of the first page (as printed) of a student-written article in the wikibook.

Insert Figure 3 about here.

For my cognitive science classes, I have started a cognitive science wikibook (Wikimedia Foundation, 2009b), but have not yet assigned anything for it. See Appendix B for the actual written assignment given to my students.

Cognitive Science Podcast

A podcast is a continually-updated series of audio or video files available on the web, rather like an audio blog. The word "podcast" is a portmanteau of "iPod" and "broadcast," meant to be a broadcast you listen to on your iPod or other portable digital music player. There are thousands of podcasts on an enormous number of topics, from people commenting on the life of their pets, to music news, to science education. I have assigned students to draft transcripts of podcast episodes on the subject of cognitive science. The idea is that after editing, I will have them recorded and put on a cognitive science podcast.

However, the first round of this assignment has not yielded excellent results. The writing had an enormous variance in both style and quality. I felt that most of them would need to be completely re-written to be good enough for a podcast.

To address this problem I will try to alter the assignment instructions to give the students more structure. See Appendix C for the assignment text.

Brain Areas Wiki

One of the most difficult parts of cognitive science education is the memorization of brain areas, in terms of location, name, and function. Most students learn these things through repetitive drilling of the information, rather than using mnemonics, which have proven to be very effective for memorization. Unfortunately, text books and teachers rarely give students mnemonics to use. Each student is left to his own devices. Since creating mnemonics requires both knowledge of their effectiveness and a good amount of effort, they are rarely used.

For each fact that needs to be memorized, however, the whole world only needs a single good mnemonic. The famous "Roy G. Biv" helps everyone remember the colors in the spectrum-- it is not that each person needs to create their own mnemonic for the colors.

This is the motivation behind the Brain Areas Mnemonics Wiki project (Davies, 2009). The wiki is a place where one can find mnemonics for remembering what brain areas are associated with what functions.

Insert Figure 4 about here.

Students are required to look at the wiki and see which brain areas have not been addressed, find three unaddressed brain areas, and create mnemonics for remembering the functions in which those areas are implicated. A class of 15 students will create 45 mnemonic devices in a single semester.

One student created a textual mnemonic for the association of the Basal Ganglia with motor control, cognition, emotions, and learning. The mnemonic was this: Imagine a person trying to **learn** to **dance**, unsuccessfully, next to a bee hive. The sudden **movements** make the **B**ee **G**ang (Basal Ganglia) **angry** and decide to attack.

Insert Figure 5 about here.

Anyone can start a wiki, free, with Peanut Butter Wiki[1]. See Appendix D for the assignment text.

[1] http://www.pbwiki.com/

SuperMemo Courses

SuperMemo is a member of a family of programs that implement spaced learning in an electronic flash card format. Online SuperMemo[2], which is what I use, is program that one is expected to use every day. The key point is that the software, rather than the user, decides which cards are to be reviewed each day. The software keeps track of which facts you got right and wrong to determine how long you should wait before reviewing that fact again. The idea is that the best time to review a fact is just before you're likely to forget it. So if you get a flash card correct, it might present it to you again in two days, and if you get it correct again it will present four days from then, then eight days, etc. The problem with traditional flash cards is that you waste a great deal of time reviewing flash cards you already know very well.

Certain domains require a good deal of memorization (e.g., medicine, biological sciences, foreign languages, law), and programs like this can be of enormous value. Online, SuperMemo users can create courses and share them with other users. Any time one wants to remember a fact, one can type it into the program in a question and answer format.

Like mnemonics, the flash cards only need to be created once for everyone to benefit. The flash cards are organized into courses, and once a course is published, anyone online can subscribe to the course and memorize the facts therein. After a few years of teaching this in a class, all the notes from lectures and the chapter will be in flash card form for future students to use. Since creating SuperMemo courses does not require any computer science-specific knowledge, this assignment can be used in any discipline.

A final benefit of this kind of assignment is that students are introduced to programs like SuperMemo, which can help them in their schoolwork in general. See Appendix E for the assignment text.

Insert Figure 6 about here.

Actual Research

Finally, students can be assigned to conduct actual scientific research as a class assignment. The feasibility of this method varies greatly from discipline to discipline. In high-energy physics, for example, being able to do new

[2] http://www.supermemo.net.pl/

scientific research requires years of graduate training and very expensive equipment. In contrast, for artificial intelligence it's relatively easy, since there are a great many problems that have never been addressed.

In my artificial intelligence class, I gave an assignment to write a function to detect a spatial relationship between two objects in a photograph. Each student did a different relation (as examples, one did "close-to," another "above-below," and another "occlusion.") The full assignment can be seen in Appendix F.

Programming Assignments

Any project that requires programming can be broken into assignment-sized chunks. This requires some software engineering and up-front planning by the course instructor, so that the assignment is well-defined in terms of the assigned code's input and output. But with careful planning, a large relatively large piece of software can be built gradually by students completing class assignments.

One downside to this is that since all of the students, or student groups, are doing different assignments (having them all do the same assignment wastes work), the grading is more challenging. On the other hand, the instructor can view such grading as doing research.

Not all fields require programming, nor are all students have programming knowledge. However, many fields have some kind of data collection that can be conducted with student assignments, and all fields can benefit from literature reviews, which I will describe next.

Writing Literature Reviews

Students can be assigned to write literature reviews for topics that need them. Writing literature reviews for certain topics can be too big a job for a class assignment. There are a few solutions to this.

First, papers can be written by groups of students. This will make some topics manageable.

Second, students can write first drafts of papers, at a high level of abstraction. For example, one can assign students to write a six page paper that gives a very general overview of a complicated topic. This forces them to synthesize information and to be concise. Then, the next time the course is taught, an instructor can assign students to expand the paper into a 20 page paper with more detail. This new batch of students will have experience reviewing and re-writing other students' texts, which is also a valuable learning experience.

A downside to writing programs and literature reviews is that it's sometimes difficult to know ahead of time whether all of the assignments are of equal difficulty. Some software ends up being very complicated, and others nearly trivial. An instructor might assign a literature review on a topic for which there is very little published. One

solution is to keep in touch with the student projects as they progress, and see if the work is too little. If it is, the instructor should step in and expand the assignment. I require my students to give an in-class oral proposal of their project before they do it, by which time they are usually clear about what it will take to complete it. After watching the presentation, the instructor can recommend that they do the original project, plus this or that extension.

For example, suppose a student is assigned to do a literature review of what it means for a computer player to "cheat" in a computer game, and the students find out, by proposal time, that there is next to nothing published on the subject. The instructor can recommend proposing and defending criteria by which a computer could be considered to be cheating. The students will want this, because they will be worried about fulfilling the page quota they've been given.

Conclusion

My teaching philosophy is to not waste student work. To this end I have devised a number of class projects that contribute not only to the education of the students who do them, but for the broader educational and scientific communities. My hope is that other instructors will use similar methods in their own classrooms to promote this kind of indirect collaboration. Before the world-wide web, there was no mechanism for sharing the products of student assignments. Now that anyone can publish online, there is no excuse for wasting the millions of hours our students spend working on class assignments.

References:

Crowell, B. (2005). All Systems Go: The Newly Emerging Infrastructure to Support Free Books. Published online. Retrieved May 25, 2009 from http://www.lightandmatter.com/article/infrastructure.html

Davies, J. (ed.) (1999). Cognitive Science Summaries. Internet Website. URL: http://www.jimdavies.org/summaries/. Retrieved May 17, 2009.

Davies, J. (2000). Summary of Barsalou 1999 Perceptual Symbol Systems. In J. Davies (ed.), 1999, *Cognitive Science Summaries.* Internet Web site. URL:http://www.jimdavies.org/summaries/. Retrieved May 19, 2009.

Davies, J. (Ed.) (2009). *Brain Areas Mnemonics Wiki*. Internet Website. URL: http://brainareas.pbworks.com/ Retrieved May 26, 2009.

Musca, J. (2009). Summary of Barnard & Johnson 2005 Word Sense Disambiguation with Pictures. In J. Davies (Ed.), 1999, *Cognitive Science Summaries* Internet Web site. URL:http://www.jimdavies.org/summaries/. Retrieved May 19, 2009.

U.S. Bureau of the Census. (2008). School Enrollment in the United States: 2006. *Population Characteristics*. Washington, DC: U.S. Government Printing Office. (Series P-20, No. 559). Retrieved May 17, 2009 http://www.wired.com/medtech/health/magazine/16-05/ff_wozniak

von Ahn, Luis, (2009). Human computation. Innovative Applications of Artificial Intelligence (IAAI) invited talk.

Wikimedia Foundation, (2009a) *Artificial Intelligence*. Internet Web site, retrieved May 18, 2009. URL: http://en.wikibooks.org/wiki/Artificial_Intelligence

Wikimedia Foundation, (2009b) *Cognitive Science: An Introduction*. Internet Web site, retrieved May 18, 2009. URL: http://en.wikibooks.org/wiki/Cognitive_Science:_An_Introduction

APPENDIX A: PROJECT ASSIGNMENT TEXT FOR PAPER SUMMARY

Cognitive Science Summary

Create a new summary for the Cognitive Science Summaries website. http://www.jimdavies.org/summaries/

Paper selection: 2% (of the overall 5%)

I can provide you with a paper to summarize, but if you wish to pick one yourself, the paper needs to be a journal article from one of the following journals:

- *Artificial Intelligence*
- *The Journal of Experimental and Theoretical Artificial Intelligence*
- *Journal of Artificial Intelligence Research*
- *Knowledge-Based Systems Journal*
- *AI Magazine*

Or a paper from the proceedings of one of the following conferences:

- *International Joint Conference on Artificial Intelligence (IJCAI)*
- *AAAI*

Formatting: 8%.

Since this needs to be put on a website by hand, you need to minimize the work done by the editor of the summaries page. Thus you will be penalized for not doing the formatting correctly. Read several summaries-- some are good, others worse. An excellent summary is Barsalou 1999, "Perceptual Symbol Systems," found on the website. Model it. Make sure the bibtex entry is there, there are things listed to cite the paper for, page numbers are given when points are made, the title of the page is correct, there is full citation, your authorship is correct, etc. **You're submitting an html document.** Edit this document with a text editor. Please do not use a word processor's html output. The html file should be fairly readable. Brush up on HTML if you don't know it. Try not to use images. If you need to graphically describe something, try to use ASCII art instead if possible. Add a hyperlink to the original paper if it's online. There are templates you can use linked from the main Summaries page.

Common mistakes people make with the summaries:

- Make sure the reference at the top is in APA (American Psychological Association) format. Surnames are complete, others initialed. Books and journals italisized.
- in the bibtex, put in the identifier, for example, instead of @Article{, there should be the authors' surnames followed by publication year, such as @Article{DaviesBrostow2005,
- Make sure the list of things in "Cite this paper for" are actual claims the paper makes. Don't put broad categories like "AI" or "case-based reasoning"
- Make sure you summarize the paper; don't fill the summary with quotes from the paper. Be sparing with quotes.
- At the end there is a place for the cognitive summaries webmaster. That's me, not you, so don't replace my name with yours there.
- In the "cite this paper for" section, prefix any computational system name with "SYSTEM:"
- In the bibtex entry, separate each author name with the word "and"
- In the bibtex entry, each author name should be Lastname, Firstname

Content: 90%.

The summary should give the reader a clear idea of the main points of the paper, that is, what points the paper is trying to establish, and the evidence supporting them. Also in the summary should be the new ideas introduced in the paper. The summary should be comprehensible to the reader without their having to read the source paper. It's worth a lot of points, but another reason to do well at this is that it will be on the web with your name on it. Forever.

Turning it in:

Email a copy of it to jim@jimdavies.org with "CGSC4001a: Cognitive Science Summaries Submission" in the subject line. Also turn in a printed copy in class, clipped to a photocopy or printout of the paper summarized.

APPENDIX B: PROJECT ASSIGNMENT TEXT FOR WIKIBOOK

Wikibook Chapter

In this assignment you will contribute to the wikibook on artificial intelligence, found at http://en.wikibooks.org/wiki/Artificial_Intelligence

The goal of wikibooks is to provide collaboratively written textbooks, free for use to anyone with an internet connection. You can read more about wikibooks in general on the Wikipedia entry for wikibooks at http://en.wikipedia.org/wiki/Wikibooks

The wikibook for AI is fairly weak at this point. For this assignment you will contribute to it. Maybe someday the students in my classes won't have to buy textbooks, in part because of the work you do on this. You may work alone or with a partner of your choice.

The assignment is in two parts.

Draft One

Draft one will be done on a word processor. You will turn it in on paper *and* by email (with a subject line "CGSC4001: wikibook chapter submission"). I will look over it, comment on it, and grade it. You will then get it back.

Final Draft

The second draft will actually be posted on the Wikibooks website. You will submit a link to it to me via email. You will be graded on the overall quality as well as how well you incorporated my comments from the previous draft.

Topic:

Each group (even if it's a group of one) will choose an AI search algorithm to describe. It need not be one from the lecture. It must be a search strategy that is not already on the site. No more than one group can work on a given algorithm. Examples include bi-directional search, depth-first search, and A*.

If you really don't want to do search, pick another topic and come talk to me. I may give you special permission to work on another topic, perhaps one that is of more interest to you.

Grading criteria:

The chapter must effectively communicate how the algorithm works to someone not trained in AI. You can model your chapter on wikipedia's entries on the search algorithms http://en.wikipedia.org/wiki/Search_algorithm but of course, you may not copy the Wikipedia outright.

Rules:

- All text must be written by you, unless quoted and cited.
- All important claims and ideas must be cited from primary sources (e.g. don't cite Wikipedia or other textbooks, only scientific papers and books.)
- All diagrams must be designed by you.
- Create pseudocode that demonstrates how the algorithm works.

Take a look at the following entries by my previous students to get an idea of how long it's going to be:

http://en.wikibooks.org/wiki/Artificial_Intelligence/Search/Heuristic_search/Astar_Search

http://en.wikibooks.org/wiki/Artificial_Intelligence/Search/Heuristic_search/Best-first_search

http://en.wikibooks.org/wiki/Artificial_Intelligence/Search/Exhaustive_search/Breadth-first_search

http://en.wikibooks.org/wiki/Artificial_Intelligence/Search/Heuristic_search/Depth-first_search

Look these over and emulate the best of each one.

In the AI textbooks I have, each search method takes a few pages. I have many AI textbooks; you are free to come and borrow them to help you.

APPENDIX C: PROJECT ASSIGNMENT TEXT FOR PODCAST

Podcast Transcript: (total 10%)

I am starting a podcast based on cognitive science. In this assignment, you will write a podcast transcript. If I choose to use it, and the author agrees, I will read your transcript aloud, record it, and put it on the podcast. If this happens you will get writing credit.

The topic of this podcast transcript must be related to Artificial Intelligence. Since none have been written so far, it’s wide open. There will be two tracks in the podcast: beginner and advanced. The beginner transcripts should be understandable by someone with two years of university education, and the advanced should be understandable by anyone with an undergrad degree in one of the disciplines of cognitive science.

When read aloud, it should be between two and ten minutes.

Keep in mind that it will be read aloud—this means that certain things don’t work, like the APA citation standard, footnotes, etc. Think of it as a lecture without slides.

Both drafts must be turned in through email (with subject line Cognology) AND hardcopy by the due date.

50% (of total 10%) First Draft

50% Final Draft
The grade for the final draft will be based on how well you incorporate my comments on your first draft.

APPENDIX D: BRAIN AREAS WIKI ASSIGNMENT

Mnemonic Presentation

In this assignment you must create three mnemonics for remembering cognitive associations with brain areas and present them in class. In class we will discuss them and try to make them better, and then you will write them up and email them to me.

Go to Wikipedia's page on brain areas
http://en.wikipedia.org/wiki/List_of_regions_in_the_human_brain
and choose three. Find out what cognitive functions they are associated with. Choose ones that are fairly well-established, not cutting edge. Cite your sources in your write-up. For each chosen brain area, create a description and, optionally, a picture that will serve as a memory aid for remembering what that brain area does. It's even better if it incorporates more than one cognitive association or the physical location of the brain area.

For example, the hypothalamus is associated with hunger, among other things, and is located below the thalamus (hypothalamus means "below the thalamus" in Greek.) A mnemonic for this might be a hypodermic needle injecting a hunger serum into a patient, under the watchful eye of some doctor named "Dr. Thalamus." It's good to be funny, sexual, or outrageous, since such things are easier to remember.

Create three things like this and present them in class for discussion. We will talk about it, and try to help you make it better. This should only take a few minutes per person. Afterward, you will write up the mnemonics and submit them to me through e-mail with the subject line "CGSC 2002 – mnemonic." You will get full credit on the grade if you make the mnemonics and submit improved versions in the write-up. If your mnemonic has a picture associated with it, please just insert the picture in the word document you send me.

The function of this assignment is to show you how effective mnemonics are for remembering difficult things like the associations of brain areas, and to give you practice in making them. Eventually the results of this assignment might be used for some educational website. If you wish your assignment to not be used for such a thing, or to not have your name associated with it, just let me know through email.

APPENDIX E: SUPERMEMO COURSE

Supermemo.net Contribution (10%)

Supermemo (www.supermemo.com) describes a series of programs designed to help people memorize things (it stands for "Super Memory.") It's basically a flash card program that keeps track of the users' ability to remember each item, and shows the user well-known elements less often than poorly-known ones. The idea is that you use supermemo every day (I do it for a half hour every morning) and you won't forget whatever is in there. Sets of supermemo elements are called "courses." There are public courses online, and users can create their own.

In this assignment, you and a partner must pick a lecture from this class and create a supermemo course based on it. You must choose a different one from the other teams in your class.

We will be using the free web version of Supermemo, at www.supermemo.net.

The class will all use the same login name and password.

Login name: **DaviesClasses**

Password: **deepblue**

The idea behind this assignment is that after a few years all of the "facts" that need to be memorized in this class will be encoded as supermemo questions and answers for students to use to learn. You can use supermemo as well to learn things in this class, however, it is important that you create your own account to do so. Only use the login and password above for creating courses, not for learning. The learning should be tailored to you, specifically, and not shared with others.

After you create your course, "publish" it, and I will grade it based on the coverage of the elements and quality of the elements. See www.supermemo.com for tips on how to create good questions. You can add graphics, but it's buggy and doesn't always work.

The questions should cover everything in the lecture, and may include elements from the reading if you think they are important.

APPENDIX F: PROJECT ASSIGNMENT TEXT FOR RESEARCH

Project: (total 35%)

Groups:

The project is a group project. Find yourself a group of two or three people, mixing skill sets. Some of you will have programming background and others will not. However all members of the group are required to work on the many parts of the project. That is, even if you've never programmed before, you are expected to learn how to program and contribute equally to the programming aspect of the project. 5% of your project grade will be how well you contributed to all aspects of this project. One of the goals of this course is to train you to work in groups, as real programmers do. At the end you will all submit confidential reports of how much your team members contributed.

Topic:

You must take the software I give you and add a module to implement a detector for some spatial relationship or visual attribute. For example, you might implement a detector that identifies whether or not something is "above" something else, or whether or not an object is "red." You will be given more details about the program you will augmenting in class. The project must involve creating an AI program. You will choose the specifics of this project as a group, but I must approve the project before you start it. Each group must work on a different visuospatial detector (for example, no more than one group can work on implementing "left-of"). The project might not end up being all that you dreamed it would be, it will probably not end up like it was supposed to, according to your proposal. That's okay, as long as you convince me you understand why it was done differently in the write-up. Even a "failed" project is fine if we come out of it with a better understanding of the problem, and know the details of why the proposal was off-track. That's the nature of open-ended projects. You can schedule time to talk to me about your project anytime, but to see me about other things please only visit during office hours.

Below I list the graded parts of the project. Percentages are out of the project grade, not the total class grade.

The proposal and final write up must be turned in as a hard copy as well as in an email. All email subject lines for turned in projects should include "CGSC4001a" as well as which assignment it is.

5% (of class total of 35%) Your personal contribution to the group project

You are expected to do your fair share of work on the project. All group members should contribute equally to programming and writing. This grade will reflect both your contribution as well as your teamwork skills. So don't exclude anyone.

24% Proposal Write-up and presentation

The proposal write-up should describe in three to ten pages 1) what the problem is, 2) background research, and 3) how you intend to solve it. There is a special lecture on how to write this. It should contain at least four books (by prominent scientists only, since books are not peer-reviewed), or refereed conference or journal publications. As cognitive scientists you should do some research into visual perception to make your AI as psychologically realistic as possible. So if you're implementing an "inside" detector, try to find some studies on when people think one thing is inside another and when they do not, and try to make your program behave the same way.

Your group must give a short presentation (see the schedule for which day). The length of this presentation (both proposal and final), in minutes, is 100 divided by the number of groups. So if there are seven groups each presentation will be about fourteen minutes long. The actual lecturing part of the presentation should be about half this long, with the second half of the allotted time for class questions and discussion. All group members must take part in the oral presentation. It should be, roughly, equally divided among the members.

70% Final write-up

The final write up has several sections. Each group will turn in one document (by email and hard copy) containing the sections below.

Scientific write-up. It should be written in the format for submission to the Cognitive Science Conference (http://www.cogsci.rpi.edu/~rsun/cogsci2006/submissions.html). I expect it to be between three and six pages long, including bibliography and excluding appendices, if any. This write-up will be graded on the quality of the writing, the explicitness of the hypotheses, whether those hypotheses were tested, and many other things that will be explained in the "how to write a scientific paper" lecture.

Program documentation. The second section is the program documentation. It is a written document, including prose, tables, diagrams, and whatever is best suited for describing your program design. I will briefly describe program design in class.

The actual code. The actual AI created as a result of this project will be graded on how well it works, whether it addresses the problem in the write-up, the quality of the comments and readability of the code. Print out the code you wrote or modified and put it in this section.

1% Relative group work write-up (required to pass course)

You must write up a description of who did what work in the group for use in the personal contribution to group project grade. You must not discuss what will go into this document with your group members, and not show them the document. It is a confidential document between you and the instructor. Just email this to the instructor.

Figure 1: The home page for the Cognitive Science Summaries website (Davies, 1999).

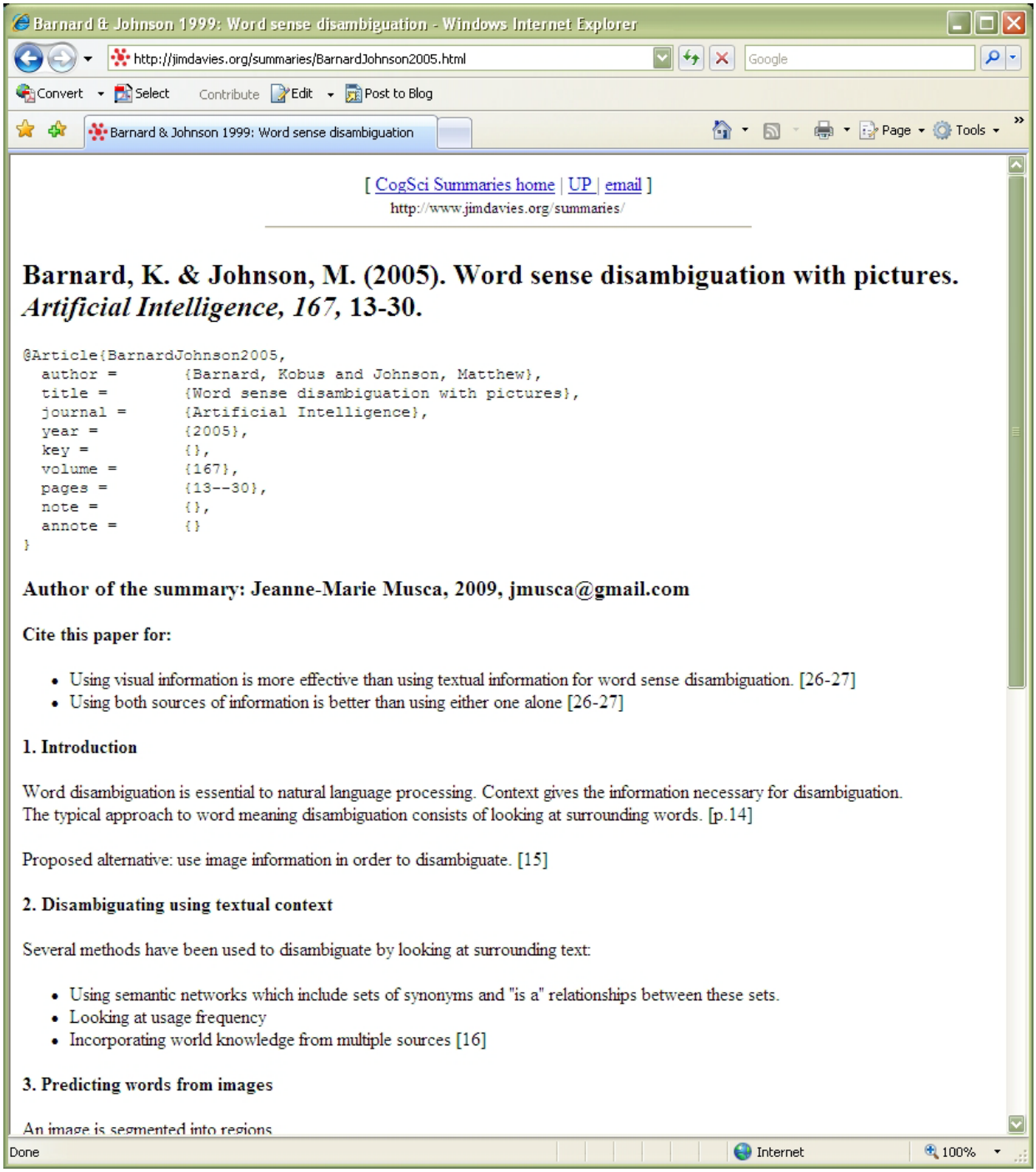

Figure 2: An example summary written by an undergraduate student (Musca, 2009).

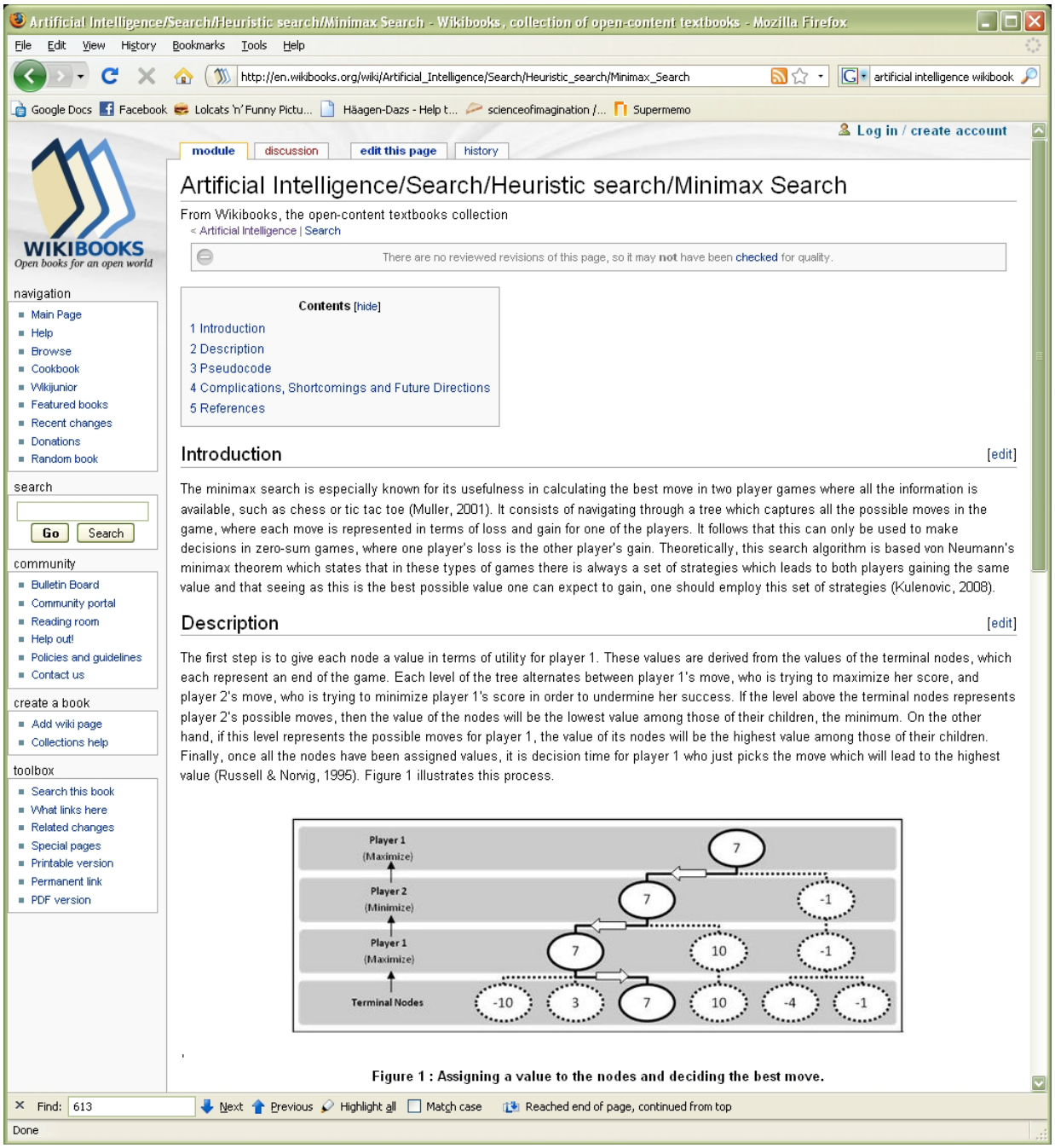

Figure 3: A chapter written by an undergraduate student for the Artificial Intelligence Wikibook.

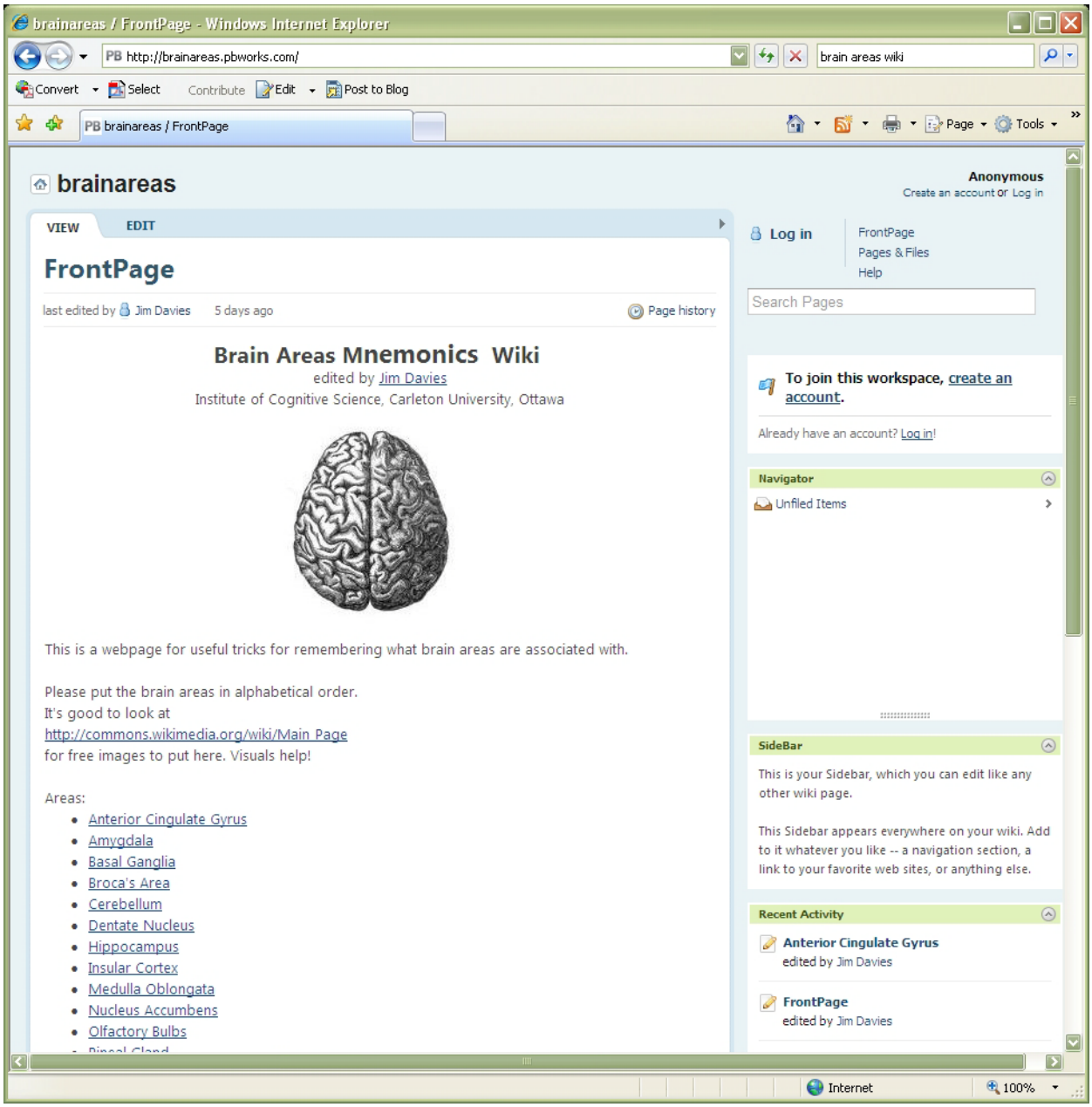

Figure 4: The Brain Areas Mnemonics Wiki web site.

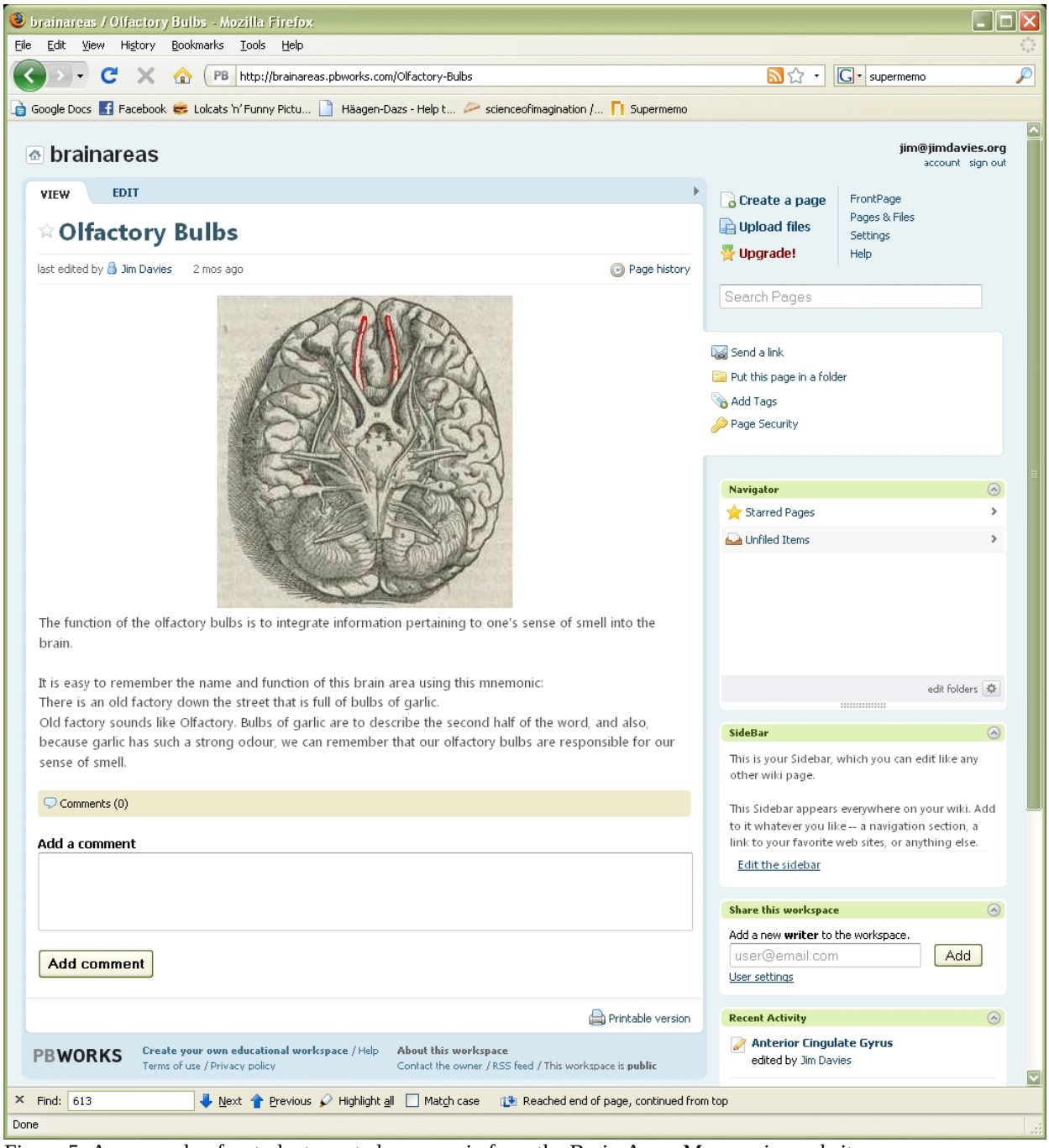

Figure 5: An example of a student-created mnemonic from the Brain Areas Mnemonics website.

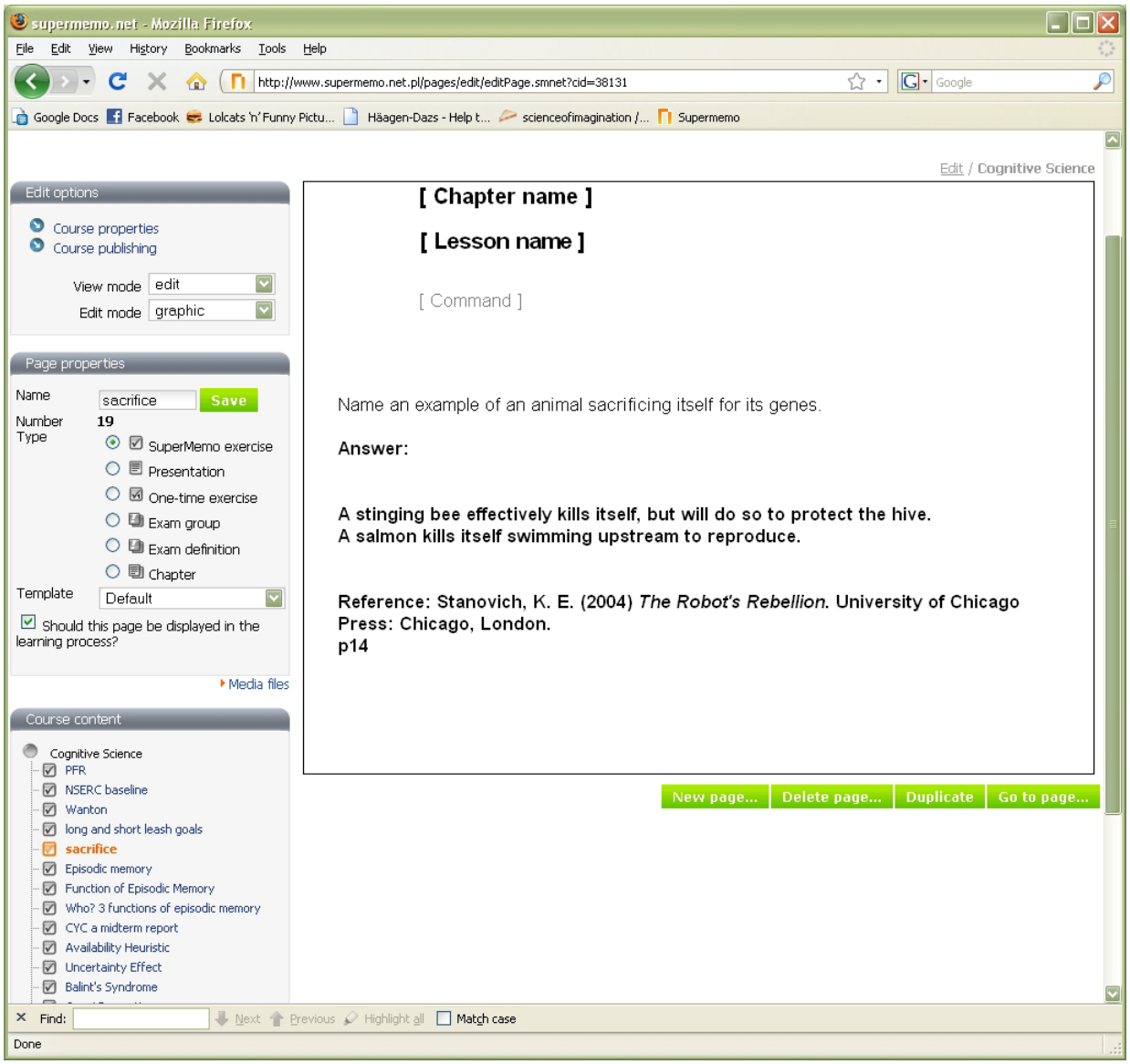

Figure 6: An example of editing a Supermemo question.