

ARTICLE

Wikipedia Neuroscience Stub Editing in an Introductory Undergraduate Neuroscience Course

Joseph R. Burdo

Biology Department, Boston College, Chestnut Hill, MA, 02467

In response to the Society for Neuroscience initiative to help improve the neuroscience related content in Wikipedia, I implemented Wikipedia article construction and revision in my Introduction to Neuroscience course at Boston College as a writing intensive and neuroscience related outreach activity. My students worked in small groups to revise neuroscience “stubs” of their choice, many of which had little or no useful content. The exercise resulted in the successful development of well-written

Wikipedia neuroscience articles, and was received well by my students, receiving positive marks in our course evaluations. Much of the student guidance and assessment was done by student peer groups as well as other Wikipedia editors outside of our course, reducing the instructor involvement to below that of a typical term paper.

Key words: Wikipedia, science writing, small group work, introductory course, collaborative, outreach

As of August 2011, there were over 700,000 registered editors working on over 3.8 million articles on Wikipedia, the online free encyclopedia that is open for all to edit. On a daily basis, about 14% of all internet users worldwide visit Wikipedia for reference information (<http://en.wikipedia.org/wiki/Wikipedia:Statistics>). During the spring of 2009, the Society for Neuroscience (SfN) issued a call to action for its members to participate in neuroscience outreach on Wikipedia by improving the neuroscience related content on the website (http://www.sfn.org/index.aspx?pagename=neuroscienceQuarterly_09spring_wikipedia). Specifically, it was decided that the main neuroscience page would be the focus of initial effort for editors participating in this activity. While this main page may be a jumping off point for readers interested in the general field of neuroscience, there are thousands of neuroscience related articles on Wikipedia, hundreds of which are too short to provide encyclopedic knowledge on a particular topic, and are therefore termed “stubs.” These stubs may also contain incomplete descriptions of their topics, have poor referencing, or may be factually incorrect.

In my Introduction to Neuroscience course at Boston College, I have instructed my students in a Wikipedia neuroscience stub improvement activity for three semesters. Our most recent semester’s description can be found here: http://en.wikipedia.org/wiki/User:NeuroJoe/BI481_Fall_2011. My students work in groups of 3-4 to substantially improve a stub of their choosing from a list I have compiled using the hundreds of neuroscience stubs that exist on Wikipedia (http://en.wikipedia.org/wiki/Category:Neuroscience_stubs). Even though my students have improved upon dozens of neuroscience related stubs during the three semesters we have run this activity in class (and received valuable experience in scientific and technical writing), many stubs still remain, ensuring a steady supply of enjoyable work for us and whomever takes up the challenge of improving the neuroscience related content on Wikipedia.

STUDENT INTRODUCTION TO WIKIPEDIA ACTIVITY

Figure 1 depicts a temporal flow of the semester long activity. During the second week of the course after our add/drop period has passed, I introduce the activity to the students and lay out my expectations for their editing work during the semester. At this time I provide them with a link to our course page on Wikipedia (http://en.wikipedia.org/wiki/User:NeuroJoe/Boston_College_BI481_Neuroscience_Stub_Editing_Activity) and also show them the course pages for our previous semesters’ work. This allows them to view the work done by their peers that have taken the course in the past, and gives them a very good idea of proper formatting, content inclusion, general organization, as well as links to help with the technical aspects of editing that I have compiled throughout the semesters.

Registration (free) on Wikipedia to obtain a username is not required by the site itself but I do require it in my course during our third week of meetings. It allows me to know who has made changes to the particular articles we are working on, and allows the students to receive credit for the hard work they put into the assignment. One of the benefits of editing Wikipedia articles as a writing intensive assignment in the neuroscience classroom is that students learn to participate in a small group collaborative project, and respond to feedback from within as well as from outside of their group. As I tell my students early on to generate a sense of excitement about the activity, none of the hundreds of thousands of editors on Wikipedia get paid for what they do. They do it because it is a fun activity that contributes to the human knowledge base. While peer review is a graded part of the assignment (discussed later), we have had numerous non-peer editors from all over the world provide helpful feedback to my students throughout the term of their stub editing project. Since my students are working on stubs that for the most part have not been improved upon for months or years before we begin our

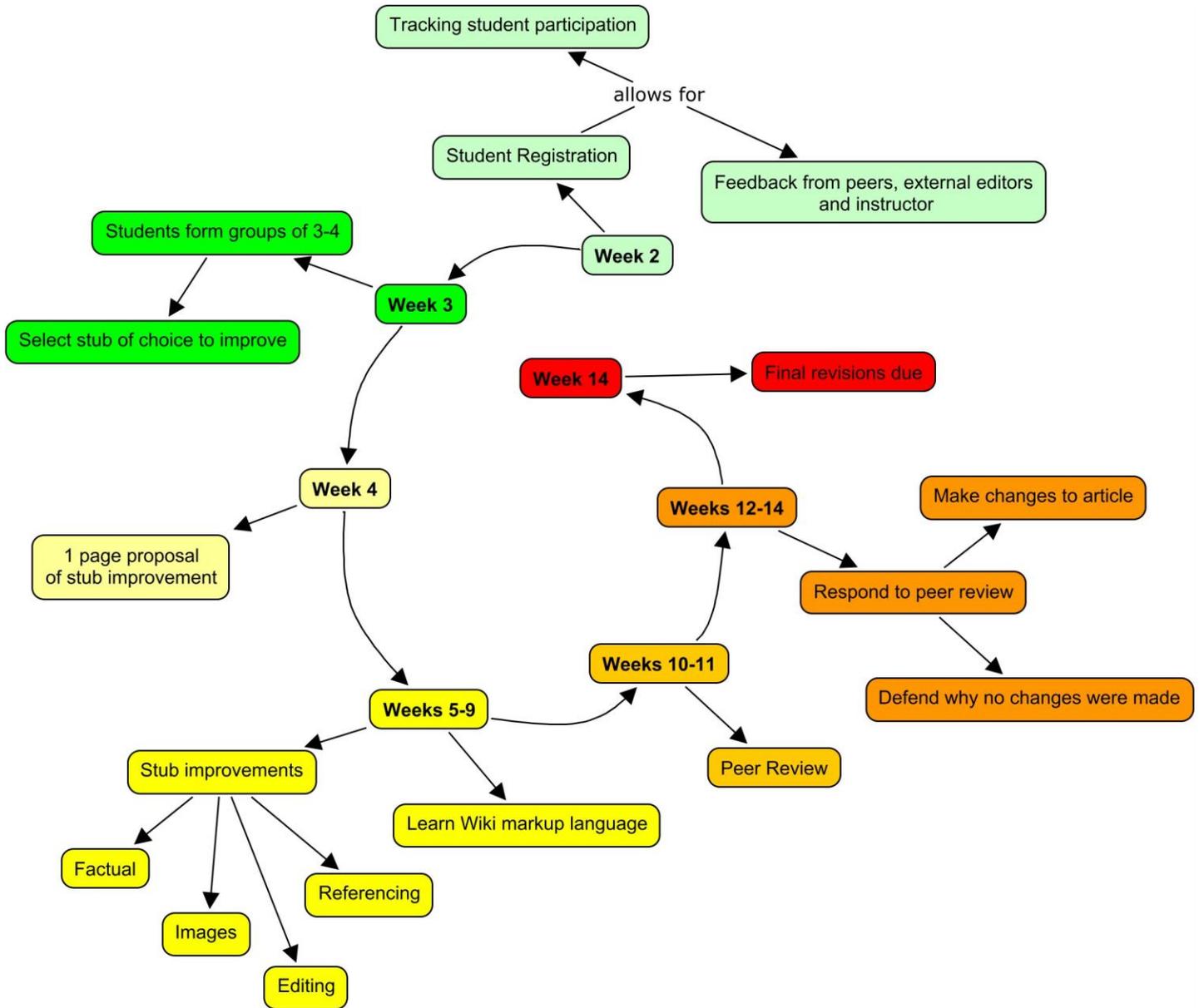


Figure 1. Temporal Concept Map of Student Deadlines for Wikipedia Activity.

semester’s work, we typically do not have to worry about outside editors making substantial changes to my students’ chosen pages while they are engaged in their project. However, since Wikipedia is a collaborative and open access encyclopedic project, there is nothing to prevent these editors from doing so. The few times this has happened in the past, my students tend to become worried that this will negatively alter their vision (and grade) of how they wanted to structure their article. If the students are logged in while they are editing their *stub*, the “View History” feature of Wikipedia will allow me to view their particular contributions to the article and assess them separately if necessary (Figure 2). If they do have outside editors working on their *stub* during the semester, I use it as an instructional moment and tell the students that many

times throughout their lives they will need to work with others that may or may not share their same vision or values, but they will still need to find common ground to complete a project successfully. Fortunately to date, we have had none of the “edit wars” that can sometimes plague more controversial topics on Wikipedia.

STUB SELECTION AND INITIAL PROPOSAL

After the students register, they are responsible for choosing a *stub* to work on from a list that I provide them on our course page. The students work in groups of 3 to 4, so before the semester starts I will research some of the *stubs* that are listed on the Neuroscience *stubs* page and choose 40-50 of them to index on our course page for possible student selection. To choose that *stub* and

Wiki Term	Definition
Subpage	A page that exists within your own user page
Stub	An article considered too short to give an adequate introduction to a subject (often one paragraph or less).
Sandbox	A sandbox is a page that users may edit however they want. In addition to the public sandbox, users may create private sandboxes on subpages of their user page.
Edit War	Two or more parties continually making their preferred changes to a page, each persistently undoing the changes made by the opposite party. Often, an edit war is the result of an argument on a talk page that could not be resolved. Edit wars are not permitted and may lead to blocks.
History	All previous versions of an article, from its creation to its current state. Also called page history.
Mainspace	The main article namespace (i.e. not a talk page, not a help page, not a "User:" page, etc.)
Wiki markup	Code like HTML, but simplified and more convenient, for example <code>'boldfaced text'</code> instead of <code>boldfaced text</code> . It is the source code stored in the database and shown in the edit box.
Talk page	A page reserved for discussion of the page with which it is associated, such as the article page. All pages within Wikipedia (except pages in the Special namespace, and talk pages themselves) have talk pages attached to them.

Table 1. Definitions of common Wikipedia language.

indicate to other students that it is no longer available, they are required to list their names (hyperlinked to their Wikipedia accounts where our class project is described) next to the *stub* itself.

Before choosing a *stub*, the students must view the information that already exists for that *stub* and through PubMed and Google Scholar searches determine if they are interested in the topic, and also if sufficient volume and quality of scientific literature resources exists to improve it. In general, the Wikipedia editorial community prefers secondary literature resources as opposed to primary to ensure in part that majority views in the peer reviewed literature are also majority views in Wikipedia. There can be negative consequences to this policy. For instance, new hypotheses in the peer reviewed literature, which may be perfectly valid, that have not yet been addressed in review articles may not be given appropriate weight in Wikipedia. But this policy also avoids misrepresentation of poorly performed scientific research that is not well received by the scientific community.

During the next (4th) week of class, a one-page proposal must be posted to a *subpage* under the student's main page. The proposal consists of points to be covered in the article, a short list of resources, and how the students will divide up the workload within their group. The *subpage* where this information is posted is not in the Wikipedia *mainspace*, meaning that these pages are not stored and searched in the same way as articles on Wikipedia. This is important, as these types of "*sandbox*" pages where students are developing works in progress are speedily deleted if they are posted in the *mainspace*. This is clearly laid out in our course page. I believe that this is one of the more important points to pay close attention to by anyone

looking to undertake a similar project.

STUB IMPROVEMENT

During the next five weeks, the students work on developing factual improvements to the *stub*, as well as learning how *Wiki markup* language works to properly format text and images. The markup language is quite easy to learn, and there are many help resources available through Wikipedia, both electronic as well as people who have indicated a willingness to help out with problems that may arise. Indeed, I have listed our course project on two separate educational compendia (http://en.wikipedia.org/wiki/Category:Wikipedia_school_and_university_projects) and (http://en.wikipedia.org/wiki/Wikipedia:United_States_Education_Program), through which I have found Wikipedia "ambassadors" that have been willing to help out remotely, or even to meet with my students in person, as several of the worldwide representatives are in the Boston area.

I have tried two separate ways for my students to work on their article during this five-week period of "rough draft mode". They can collaborate inside of one of the group members' *sandbox* pages, putting together the individual pieces they are working on away from the attention of the general public who may be searching for information regarding their particular *stub*. Alternatively, the students can make their changes to the "live" Wikipedia article on the *stub* page that currently exists. There are positive and negatives to each of these approaches. If the students tend to work piecemeal and add to their article in stages on the live page, editors from outside the course may see individual sections showing up on the live article that are not well integrated because all of the individuals in the group have not yet completed their work. This may lead

Toggle between content and discussion of the article

User specific tools

Editing form

History of content changes

Section headings and subheadings

WIKIPEDIA The Free Encyclopedia

Glutamate receptor

From Wikipedia, the free encyclopedia

Glutamate receptors are synaptic receptors located primarily on the membranes of neuronal cells. Glutamate is one of the 20 amino acids used to assemble proteins, so is abundant in many areas of the body, but it also functions as a neurotransmitter and is particularly abundant in the nervous system. Glutamate receptors are responsible for the glutamate-mediated postsynaptic excitation of neural cells, and are important for neural communication, memory formation, learning, and regulation. Furthermore, glutamate receptors are implicated in the pathologies of a number of neurodegenerative diseases due to their central role in excitotoxicity and their prevalence throughout the central nervous system.

Contents [hide]

- Function
- Types
 - 1 Ionotropic
 - 2 Metabotropic
- Structure and mechanism
 - 3.1 Ionotropic
 - 3.2 Metabotropic
- Effects outside the central nervous system
- Clinical significance
 - 5.1 Excitotoxicity
 - 5.2 Neurodegeneration
 - 5.3 Neurodegenerative diseases
- Potential therapeutic applications
 - 6.1 Ischemia
 - 6.2 Seizures
 - 6.3 Parkinson's disease
 - 6.4 Huntington's disease
 - 6.5 Achting
 - 6.6 Diabetes
 - 6.7 Multiple sclerosis
 - 6.8 Schizophrenia
 - 6.9 Autism
- See also
- References
- External links

Function

Glutamate is the most prominent neurotransmitter in the body, being present in over 50% of nervous tissue.^[1] Glutamate was initially discovered to be a neurotransmitter in insect studies in the early 1960s. The two primary glutamate receptors are named after agonists that bind to them with high specificity: AMPA (α-amino-3-hydroxyl-5-methyl-4-isoxazole-propionate) and NMDA (N-Methyl-D-Aspartate).^[1] One of the major functions of glutamate receptors appears to be the modulation of synaptic plasticity, a property of the brain thought to be vital for memory and learning. Both metabotropic and ionotropic glutamate receptors have been shown to have an effect on synaptic plasticity.^[2] An increase or decrease in the number of ionotropic glutamate receptors on a postsynaptic cell may lead to long-term potentiation or long-term depression of that cell, respectively.^{[3][4]} Additionally, metabotropic glutamate receptors may modulate synaptic plasticity by regulating postsynaptic protein synthesis through second messenger systems.^[5] Research shows that glutamate receptors are present in CNS glial cells as well as neurons.^[6] These glutamate receptors are suggested to play a role in modulating gene expression in glial cells, both during the proliferation and differentiation of glial precursor cells in brain development and in mature glial cells.^[7]

The AMPA receptor bound to a glutamate antagonist showing the amino terminal, ligand binding, and transmembrane domain, PDB 3KG2

Glutamic acid

Figure 2. Typical Wikipedia page layout with descriptive annotations.

those editors to make changes to the article even before they have seen the students' completed work. We have found that if the students leave a notice on the article's *talk page* indicating that the article is being updated over the course of a given number of days, most outside editors will wait until that period has passed before making changes of their own. Alternatively, if a large amount of work is put together in the students' *sandbox* over the course of several weeks and then made live in one instance, there may have been changes made to the *stub* by outside editors during those weeks that the students are not incorporating into their work. This is not always a bad thing if the students' work is of higher quality than the recent additions to the *stub* and also incorporates the same general concepts. I instruct my students to use the article's *talk page* to announce all intended substantial changes to the article before they are made, which allows all potential editors to come to agreement about content in advance. This is also part of the good etiquette requested of all Wikipedia editors.

Once the groups upload their article, they are required to read and respond to any comments on its *talk page*, and take any necessary action. This involves making the appropriate changes or defending their decision of why

they decided not to make the changes requested. Many of these comments come from other students in the class, as peer review is a required portion of the assignment. All students must make substantive comments on three articles written by other groups. Those comments give the students substantial feedback on their work, which allows them to make their final product better. After the peer review has been posted on the articles' *talk pages*, the students have three weeks to act on those suggestions before the article is due in its final form. This takes them up to the final week of the semester.

STUDENT ASSESSMENT

When grading the assignment, I take numerous factors into account, which are laid out to the students in the rubric listed on our course Wikipedia page. The students are required to grade others within their group based on the amount of effort they felt everyone gave. These percentages of effort are emailed to me individually and are not communicated to the others in the group, but I do use them if there is rough consensus within the group to make small adjustments to individual final grades. The first time I used this assignment, I was somewhat skeptical that

	1	2	3	4	5	Mean	SD
1. The Wikipedia assignment improved my knowledge of neuroscience	1	11	7	61	24	3.95	0.88
2. The Wikipedia assignment was a positive experience for me.	2	7	16	53	25	3.90	0.93
3. Writing for Wikipedia was a better learning experience for me than other types of writing assignments I've had in other science courses.	3	11	14	38	37	3.96	1.05
4. The Wikipedia assignment improved my overall writing skills	6	23	31	34	9	3.16	1.07
5. I am likely to continue to edit Wikipedia articles in the future.	9	21	40	28	5	3.00	0.99

Table 2. End of semester student assessment of the Wikipedia *stub* editing assignment. Data from two separate semesters was used in this analysis. 1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree nor Disagree, 4 = Agree, 5 = Strongly Agree

students would be objective when assessing their own effort. In many instances, however, when two or three other students in a group have indicated that one individual did less than their fair share, I have found that the particular individual does agree. Some of the other criteria I use for assessment are:

- Wikipedia format for scientific articles is followed
- All images or graphics used have a Creative Commons license
- No primary literature was used for references, particularly for subjects with an established review literature *history*.
- Proper grammar and punctuation

In the past, I have asked the students to print out their articles and hand in the hard copies to provide me with a template for my written feedback and assessment. During the past semester I have used Scrible (www.scrible.com), a free web page annotation tool, to markup my students' Wikipedia articles electronically. The software is HTML 5 based, so there is no download necessary other than a bookmark that is loaded when the appropriate Wikipedia article to be assessed is on the screen. After adding text or ink comments (an iPad version is also available) to the group's Wikipedia article, it can be saved to a personal library of annotated pages on the Scrible site. Those pages can then be emailed to the students so they can view my comments.

ACTIVITY ASSESSMENT

At the end of two out of the three semesters that I have run this assignment, I have asked the students to provide feedback during their end of semester course evaluations. In general, the students have positive feelings about the assignment (Table 2). The aggregated student responses indicated that the students agreed with the facts that this assignment improves their knowledge of neuroscience, it was a better learning experience compared to other types of science writing exercises they had in past courses, and it was an overall positive experience for them. The aggregated responses were neutral when indicating if this assignment improved their overall writing skills and if they were likely to continue to edit Wikipedia articles in the future.

In conclusion, student authoring of Wikipedia neuroscience articles by way of existing *stub* improvement

is a writing intensive classroom activity that benefits the students, the worldwide community of Wikipedia users as well as the instructor. The students are typically more excited about this type of writing assignment since they know that their work may exist on the Internet for years to come and will be viewed by thousands of people from an interested audience. The global community benefits by gaining access to content created by knowledgeable and dedicated college students, who essentially become experts on their particular *stub* over the course of one semester. Finally, the instructor benefits by being assisted in student guidance and assessment by the student peer groups as well as outside Wikipedia editors during the course of the semester. While there is a relatively steep learning curve for both the students and the instructor, sufficient help resources exist for making this activity a positive experience for all involved.

REFERENCES

- Wikipedia current and archived statistics.
<http://en.wikipedia.org/wiki/Wikipedia:Statistics>.
 SfN Announces Neuroscience Wikipedia Initiative
http://www.sfn.org/index.aspx?pagename=neuroscienceQuarterly_09spring_wikipedia.
 Introduction to Neuroscience Wikipedia course page
http://en.wikipedia.org/wiki/User:NeuroJoe/Boston_College_BI481_Neuroscience_Stub_Editing_Activity.
 Neuroscience related *stubs* that currently exist on Wikipedia
http://en.wikipedia.org/wiki/Category:Neuroscience_stubs.

Received February, 26, 2012; revised May 08, 2012; accepted May 16, 2012.

Address correspondence to: Dr. Joseph Burdo, Biology Department, Boston College, 140 Commonwealth Ave, Chestnut Hill, MA, 02467. Email: joseph.burdo@bc.edu