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Wikipedia as an Academic Reference: Faculty and Student Viewpoints

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ABSTRACT

Wikis are becoming popular with business and academia as a way to harvest, archive, and manage knowledge. One of the most popular and well-known wikis is Wikipedia, the online encyclopedia started by Jimmy Wales and Larry Sanger in 2001. Since its inception, much has been written (both pro and con) about Wikipedia; however, Wikipedia is one of the most popular sites on the Internet today. As its popularity increases, more and more "net generation" students will be utilizing its articles as reference sources for academic work. This paper explores the emerging "wiki way" of Web 2.0 tools and highlights the good, the bad, and the management of Wikipedia as an academic reference. Further, this paper benchmarks how faculty and students are using Wikipedia, as well as exploring their viewpoint on using this information in the academic environment.

Keywords

Wikipedia, knowledge management, dynamic content, academic references

INTRODUCTION

Wikipedia is a rapidly growing phenomenon in the online world of collaborative (Web 2.0) activities. Since the advent of the public Internet, many types of shared activities have been evolving, with massive multi-player online games leading the list of popular activities that have stood the test of Internet "time." However, a new type of collaborative activity is gaining momentum, the wiki. As per Wikipedia, the online encyclopedia, a wiki is "a web application designed to allow multiple authors to add, remove and edit content" (Wikipedia, 2007a, para. 1).

The origin of the word wiki has its roots in the Hawaiian language and is found to be derived from the phrase "awiwi, wikiwiki" which is translated to mean quick or fast (Hawaiian Dictionary, 2007). Ward Cunningham is widely attributed for pioneering the first wiki in 1995 by writing server software that allowed any web page to be edited by any user (Szybalski, 2005). Some wikis work like a library for a document in that users check out the document, modify the document, then check it back in for other users to read, edit, or modify. Thus, a collected knowledge is contained within the document as well as archived through saving all previous editions.

College students in 2010 (the so-called Google generation or net generation) have grown up using web based resources and consider them to be a component of daily life (Murley, 2008; personal observation in the classroom of a 21st century college). As such, it is not surprising to see many reference lists stocked with web based articles, Internet sources and hyperlinks. However, is the Web the most authoritative source for academic work? Moreover, is Wikipedia an authoritative academic source given its dynamic nature? If society continues to digitize journals, magazines, and encyclopedias, management of online content and its usage in an academic arena will need to be addressed. This paper explores these ideas and encourages the reader to discover the initiatives under way in dynamic digital knowledge management.

Wikipedia burst onto the scene in early 2001 and grew to one of the largest publically accessible knowledge repositories on the Web in a very short time. Wikipedia has also had its share of positive and negative publicity and academics have strong opinions about Wikipedia, many of them negative. On the other hand, Randy Pausch of "The Last Lecture," and a long time faculty member at Carnegie Mellon University in Pittsburgh, has written for a traditional encyclopedia (World Book) and being familiar with Wikipedia, summed up his experience:

> I have not bought the latest set of World Books. In fact, having been selected to be an author in the World Book, I now believe that Wikipedia is a perfectly fine source for your information, because I know what the quality control is for real encyclopedias.
> (Pausch,2008, p. 42)

LITERATURE REVIEW

Interest in Wikipedia is growing among the academic community as Figure 1 illustrates. Figure 1 is obtained from data on Wikipedia's site and is not exhaustive. In performing a Google Scholar search for the term "Wikipedia," 20,200 hits were returned, illustrating the academic interest in the subject.

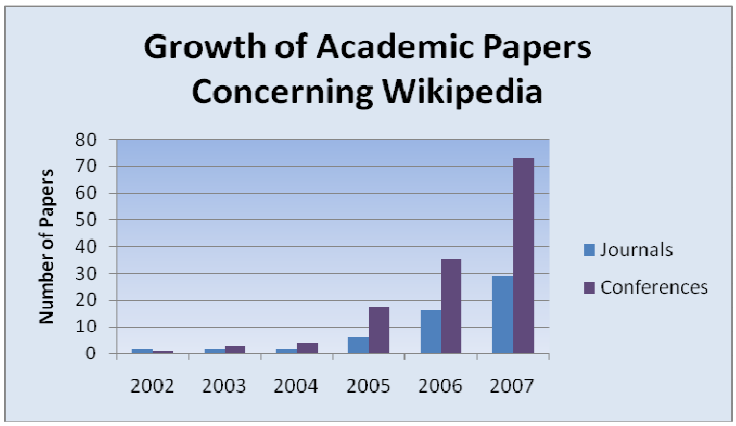

Figure 1
Academic papers relating to Wikipedia (Wikipedia, 2008a)

Authors are utilizing ideas from mathematics, social theory, graph theory, and information quality to assess the value of Wikipedia articles. A concise review of the literature is given in Table 1.

Wikipedia Usage	Author(s)
article degree centrality using social network analysis and search engine metrics	Korfiatis, Poulos and Bokos (2006)
graph theory	Brandes and Lerner (2007)
classification tasks to identify vandalism	Potthast, Stein, and Gerling (2008)
information quality metrics	Stvilia, Twidale, Gasser and Smith (2005)
accuracy and completeness of articles	Halavais and Lackaff (2008); Snyder (2007)
controversy rank models	Vuong, Lim, Sun, Le, Lauw, and Chang (2008); Adler and de Alfaro (2006)
comparison studies (with other encyclopedias)	Chesney, (2006); Giles (2005)

Table 1
Current scholarly literature concerning Wikipedia

In light of this interest in Wikipedia and the Web, these dynamic content sites will be appearing in literature and reference lists, forcing the academic community to manage the soundness of the citation and of the site. This verification of information will be a task for students, faculty, and other interested parties to undertake. Table 2 gives an idea of where Wikipedia is beginning to emerge into the academic community.

User	Usage
Efraim Turban, E-Commerce Textbook (Turban, et al., 2008)	Wikipedia referenced for problem assignments, definition of "online intermediaries," Wikipedia used as an e-commerce application case
Douglas Samuelson – OR/MS Today Article (Samuelson, 2008)	Definition of "Colony Collapse Disorder" for honey bee colonies
International Association for Computer Information Systems 2007 Call for Papers (IACIS, 2007)	Wikipedia definition for "globalization"
Paper appearing in IJKLO Vol. 3 (Parker and Chao, 2007)	Utilize Wikipedia as a teaching tool
Paper appearing in JISE Vol. 19(2) (White, Longenecker, McKell, and Harris, 2008)	Wikipedia definition of "assessment"

Table 2
Users and uses of Wikipedia in the academic arena

Table 2 illustrates that Wikipedia is appearing in the academic arena, and a recent survey by eWEEK (2009) of their readers revealed that blogs and wikis are the Web 2.0 applications that are most frequently appearing in the workplace. Almost half of the respondents reported that wikis are being deployed at their organizations. If these numbers hold, or grow, students need to be trained in the appropriate use of wikis and how to verify information in wikis, including Wikipedia.

For all the good of Wikipedia and other wikis, there is a dark side to publicly accessible, freely altered content. In a high profile case, a Nashville area resident changed the Wikipedia entry of John Seigenthaler, a one-time administrative assistant to Robert Kennedy, to read that Mr. Seigenthaler was involved in the Kennedy assassinations. The Nashville area resident claimed to have posted this to "fool" a colleague (Goodin, 2005; Said, 2005). While the article was eventually corrected, the personal damage was done. John Seigenthaler responded to the false content posted about him in an article in USA Today and explained how difficult it was to uncover who had posted the malicious information about him. His summary thought about Wikipedia was "I am interested in letting many people know that Wikipedia is a flawed and irresponsible research tool" (Seigenthaler, 2005, p.2).

The Seigenthaler article also points to one of the major dividing lines on analyzing Wikipedia content, that of controversial articles versus scientific articles. While it is relatively easy to post "opinion" about a subject such as an individual's biography, and have this opinion escape examination and editing, it is much more difficult to do the same in an article concerning scientific facts. This discrepancy in article accuracy has been noted (Wikipedia, 2008d), and many attempts to identify incorrect information, vandalism, dispute, author credibility, and controversy are currently being debated in the academic community (Vuong, et al., 2008; Brandes and Lerner, 2007; Wilkinson and Huberman, 2007; Potthast, et al., 2008; Braun and Schmidt, 2007). Wikipedia itself recognizes the issue of credibility and readily publicizes the issue in an attempt to solicit ideas or procedures to correct these issues (Wikipedia, 2008d). Quoting Wikipedia, on their viewpoint toward using Wikipedia as an academic reference and/or teaching tool,

> If you're a professor, teacher, or student within the college community, we encourage you to use Wikipedia and/or Wikiversity in your class to demonstrate how an open content website works (or doesn't). Many of these projects have resulted in both advancing the student's knowledge and useful content being added to Wikipedia.
> (Wikipedia, 2008e, para. 1)

The key idea is the parenthetical acknowledgement that this entire experiment might not work! By expressing their own doubt, the Wikipedia management team is acknowledging that quality issues can exist with the content and that they are concerned with improving and maintaining quality in their product.

QUALITY CONTROL AT WIKIPEDIA

Wikipedia is attempting to make their articles accurate and complete. Wikipedia's reliability is measured internally using the following set of criteria:

- Accuracy of information provided within articles
- Comprehensiveness, scope and coverage within articles and in the range of articles
- Susceptibility to, and exclusion and removal of, false information
- Susceptibility to editorial and systemic bias
- Identification of reputable third-party sources as citations (Wikipedia, 2007b).

The criteria used by Wikipedia parallels the concerns of authors in this subject area and three points are constantly re-enforced throughout the discussion: accuracy, completeness, and reputable third-party sources.
In a first attempt at an edited Web 2.0 encyclopedia, the *Wikipedia: Version 1.0 Editorial Team/Assessment* (Wikipedia, 2008b) project reviews articles and "grades" the articles based upon a consensus measure, which can be a subjective rating of the articles based on an editorial team member's experience. The grading scheme is illustrated in Table 2. Observing the article's grade is an option that a registered user of Wikipedia can enable under their "my preferences" menu, "gadgets" tab. The benefit to viewing an article's grade is knowing where the article "stands" as far as usage as an academic reference or a source of information.

The main focus on grading an article is how complete the article is, but content and language quality play important roles as well (Wikipedia, 2008b). If an article has attained FA or FL - class status, it is considered complete and thus usable as a general academic reference, while an A – class article, while complete, would benefit by having more specific references added before being used as an academic source. Below A – class articles need external sources for verification as well as augmentation of the topic in order to be utilized as an academic source. I.e. the article authors must "complete" the article with accurate, verifiable (via reputable third party sources) information. These outside sources should verify the accuracy of the content, thus building trust in the article.

FA or FL	A	GA	B	C	Start	Stub
Professional, outstanding, a definitive source for encyclopedic information.	Very useful. Fairly complete treatment of subject. Good for non-experts.	Useful to general readers. Approaching the quality of a professional encyclopedia.	No reader should be left wanting, but content may not be complete for research.	Useful to a casual reader. Not a complete picture, not ready to be an academic source.	Some meaningful content, but most readers will seek further information.	Little more than a dictionary definition of the topic.

Table 3
Reader experience of graded (ranked) articles in Wikipedia (Wikipedia, 2008b)

The bold border in Table 3 marks the dividing line between complete, accurate, reviewed articles with external sources (FA, FL, and A grade), thus suitable for use as an academic reference, while other graded articles could use outside sources and further research to enhance and verify the information.

FACULTY STATISTICS ON WIKIPEDIA USAGE

As a first step in exploring how to manage Wikipedia as an academic reference, a survey instrument was developed in the spring semester of 2009 and distributed to 321 full-time, part-time, and adjunct faculty at a medium sized, public, western US college. This survey is an initial attempt at benchmarking how faculty view, use, and manage Wikipedia in their classes, research, and personal life. As a starting point, faculty perceptions, viewpoints, and group consensus are explored using the reported statistics from the survey. Issues to be explored are contained in the following lists.

Faculty awareness of how:

a) article controversy affects Wikipedia usage.
b) article vandalism affects Wikipedia usage.
c) protected pages affects Wikipedia usage.
d) article rank feature affects Wikipedia usage.
e) article revision history affects Wikipedia usage.
f) article editing policies affects Wikipedia usage.

Faculty discipline affects:

a) Wikipedia usage, and the awareness categories listed above.
b) viewpoint as to student usage of Wikipedia in classes.
c) grade on assignments due to Wikipedia usage.

FACULTY SURVEY RESULTS

There were 80 surveys returned, for a return rate of 25%. From these 80 surveys, 24 faculty members reported that they do not use Wikipedia, while 56 faculty members reported that they use Wikipedia in some fashion. The demographics between the Wikipedia users and non-users are remarkably similar and are summarized in Table 4.

Demographic	**Wikipedia Users (n = 56)**	**Wikipedia Non-Users (n = 24)**
Age (in years)	$\bar{x}$ = 49.7	$\bar{x}$ = 49.6
Non-controversial discipline	35.7%	29.2%
Controversial discipline	28.6%	33.3%
Discipline not reported	35.7%	37.5%

Table 4
Demographics between Wikipedia users and non-users

The discipline classifications as "controversial" and "non-controversial" follows the Wikipedia article classification set forth in the papers by Brandes and Lerner (2007) as well as Halavias and Lackaff (2008). In other terms, this classification could be between Humanities and Natural Sciences, where articles in the Humanities classification generate more controversy due to the presence of interpretation and opinion, while the articles in the Natural Sciences generally describe sets of rules or laws. The classifications "Humanities" and "Natural Sciences" will be used for the remainder of the paper. The reasons given for not using of Wikipedia are summarized in the Pareto chart labeled Figure 2.

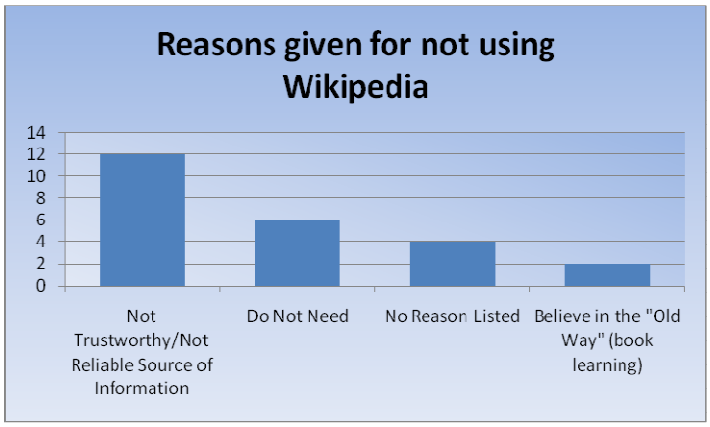

Figure 2
Reasons for faculty not using Wikipedia

Figure 2 establishes that faculty surveyed who do not use Wikipedia believe the information to be unreliable and untrustworthy. Some of the specific comments given included no peer review, anyone can edit, and no trust in the site. Faculty usage statistics are reported in Table 5.

Usage (times/week)	Natural Science Faculty, n = 19	Humanities Faculty, n = 16	Statistics (t-test)
During School Year	$\bar{x}$ = 3.10, s = 3.65	$\bar{x}$ = 2.06, s = 1.69	t = 1.05 p = 0.30
During Semester Breaks	$\bar{x}$ = 2.58, s = 3.13	$\bar{x}$ = 2.44, s = 3.81	t = 0.12 p = 0.91

Table 5
Faculty Wikipedia usage statistics

Further, Table 6 summarizes the type of Wikipedia usage during the fall semester of 2008.

Type of usage	Yes	No
for an academic paper	5	51
for other research	38	18
for independent learning (pleasure)	50	6
alternate types of usage:		
• initial research on a topic	32	24
• general topic review	38	18
• external links to topic	22	34

Table 6
Faculty usage of Wikipedia

Table 6 illustrates that faculty shy away from using Wikipedia as an academic reference, but are increasingly likely to use it as a general information source and for pleasure. These results lead the reader to the conclusion that even if faculty are not willing to utilize Wikipedia as an academic reference, there is a certain amount of trust in the site (and thus the information). Some of the general statistical results from the survey are summarized in Table 7. The legend for the survey results is as follows:

- View categories: 1 = very negatively, 3 = neutral, 5 = very positively
- Awareness categories: 1 = not very aware, 3 = somewhat aware, 5 = very aware

Category	N	Minimum	Maximum	Mean	Std. Deviation	Consensus
View in Gen Ed classes	46	1	5	2.85	1.032	0.73
View in Major classes	49	1	5	2.47	1.260	0.63

Aware of Controversial Articles	56	1	5	3.52	1.489	0.54
Aware of Vandalism	56	1	5	2.98	1.590	0.51
Aware of Protected Pages	56	1	5	2.57	1.683	0.44
Aware of Article Rank Feature	56	1	5	2.07	1.373	0.59
Aware of Article Revision History	56	1	5	2.98	1.567	0.50
Aware Articles Can Be Edited by Anyone	55	1	5	4.02	1.472	0.56

Table 7
Faculty Statistics for awareness and view categories with consensus

Table 7 highlights that faculty are most aware of Wikipedia's editing policies, and this awareness (most likely) has been generated from the high profile (and negative) cases in the media. The second largest awareness average is from the Aware of Controversial Articles category. All other awareness categories have averages of less than three, indicating that faculty are not very aware of the quality issues of current concern with Wikipedia. The category that faculty are least aware of is that of Article Rank Feature (see Table 3) which is a primary indicator of how appropriate a Wikipedia article is for use as an academic reference. Table 6 also illustrates that faculty view the use of Wikipedia in their general education classes neutrally (mean = 2.85) and usage of Wikipedia in their major classes more negatively (mean = 2.47).

A measure of consensus is added to the results (see the paper by Tastle and Wierman (2007) for a complete description of the consensus measure used) to measure the strength of the faculty *group* viewpoint toward each issue. A value of 0.00 indicates no consensus in the group, while a value of 1.00 indicates complete consensus, or agreement, within the group. There is no fixed boundary for determining consensus, but it is generally believed that a score of 0.80 is an indicator of consensus (Tastle, 2009). The largest consensus value is that belonging to the View in Gen Ed Classes category, indicating that faculty members are close to consensus about the usage of Wikipedia in their general education classes.

Table 8 divides the faculty into Natural Science and Humanities categories and evaluates differences in the awareness categories present in the survey.

Awareness Category	Natural Science Faculty	Humanities Faculty	Statistics (t-test)
Aware of Controversial Articles	$\bar{x}$ = 3.35 s = 2.24 n = 20	$\bar{x}$ = 3.06 s = 1.73 n = 16	t = 0.53 p = 0.603
Aware of Vandalism	$\bar{x}$ = 2.75 s = 2.72 n = 20	$\bar{x}$ = 2.38 s = 2.25 n = 16	t = 0.71 p = 0.481
Aware of Protected Pages	$\bar{x}$ = 2.45 s = 2.58 n = 20	$\bar{x}$ = 2.06 s = 2.60 n = 16	t = 0.72 p = 0.477
Aware of Article Rank Feature	$\bar{x}$ = 2.05 s = 1.63 n = 20	$\bar{x}$ = 1.50 s = 0.67 n = 16	t = 1.57 p = 0.126
Aware of Article Revision History	$\bar{x}$ =2.95 s = 2.05 n = 20	$\bar{x}$ = 2.69 s = 2.76 n = 16	t = 0.50 p = 0.620
Aware that Articles can be Edited by Anyone	$\bar{x}$ = 3.35 s = 3.08 n = 20	$\bar{x}$ = 4.60 s = 1.26 n = 15	t = -2.56 p = 0.016

Table 8
Differences in awareness

Table 8 indicates no difference in awareness between the faculty groups except in the "Aware that Articles can be Edited by Anyone" category. This is not surprising as faculty from the Humanities rely on more controversial types of work from which to harvest information. More interestingly and corresponding to the previous result is Table 9, which summarizes the feelings of faculty on the use of Wikipedia in their general education classes versus their major classes.

View of Wikipedia in:	Natural Science Faculty	Humanities Faculty	Statistics (t-test)
General Education Classes	$\bar{x}$ = 3.12 s = 0.86 n = 17	$\bar{x}$ = 2.17 s = 0.24 n = 12	t = 2.88 p = 0.007
Major Classes	$\bar{x}$ = 2.68 s = 1.34 n = 19	$\bar{x}$ = 1.77 s = 1.53 n = 13	t = 2.11 p = 0.043

Table 9
Faculty view of Wikipedia in their classes

Table 9 illustrates a difference in how faculty from the Natural Sciences and Humanities view Wikipedia in their classes. It is uniformly seen that faculty from the Natural Sciences view Wikipedia in a more positive light (less negatively) than do faculty from the Humanities.

Lastly, Figure 3 gives an indication as to the penetration of Wikipedia concerns into the syllabus, grading, and registered user categories as viewed by faculty. While faculty are willing to reduce a grade due to Wikipedia usage, many do not have a use statement in their syllabus, or an account on Wikipedia's web site.

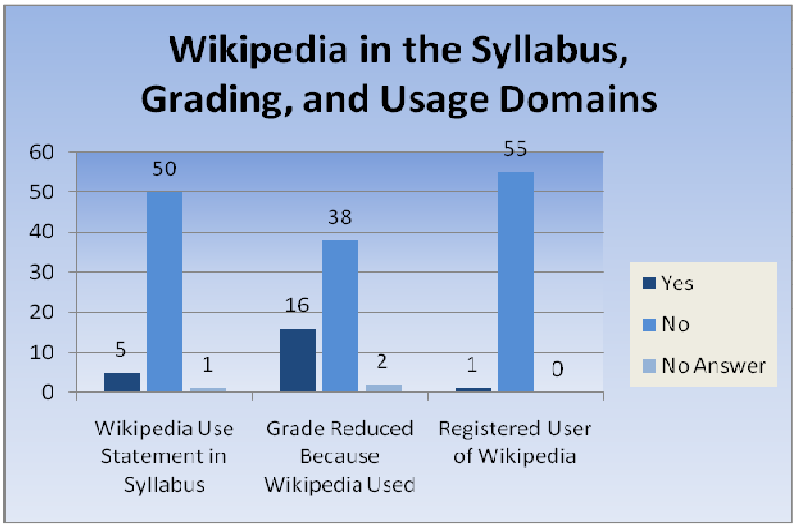

Figure 3
Syllabus, grading and registered users among faculty

STUDENT SURVEY RESULTS

As a parallel study, a student questionnaire was developed and given to students in the spring semester of 2009. The results on how students use Wikipedia are given in Table 10 and the results of the view and awareness categories are given in Table 11.

Type of usage	Yes	No
for an academic paper	179	179
for other research	237	119
for independent learning (pleasure)	262	92
used in high school	167	191
had grade reduced due to usage	21	335
registered user of Wikipedia	12	347

Table 10
Student usage of Wikipedia

Table 10 illustrates that students are using Wikipedia in greater numbers to conduct research and to do independent learning. As a percentage, students are using Wikipedia as an academic reference almost five times as often as faculty. Further student to faculty comparisons are addressed in the next section.

Category	N	Minimum	Maximum	Mean	Std. Deviation	Consensus
View by Gen Ed Faculty	343	1	5	2.35	0.94	0.65
View by Major Faculty	334	1	5	2.20	1.06	0.60
Aware of Controversial Articles	359	1	5	3.35	1.45	0.40
Aware of Vandalism	359	1	5	2.97	1.53	0.36
Aware of Protected Pages	356	1	5	2.53	1.48	0.37
Aware of Article Rank Feature	359	1	5	2.23	1.30	0.48
Aware of Article Revision History	357	1	5	2.69	1.41	0.42
Aware Articles Can Be Edited by Anyone	359	1	5	3.72	1.49	0.38
How Other Students View	343	1	5	3.62	0.85	0.70
View as Source of Information	351	1	5	3.21	1.08	0.60

Table 11
Student statistics for awareness and view categories with consensus

Table 11 gives an overview of students' awareness of Wikipedia issues and features and how they perceive their faculty to view Wikipedia. Table 11 and Table 7 illustrate that faculty are more aware of the issues surrounding Wikipedia (except for the Article Rank Feature) than are students. Of particular note is the "How Other Students View" category in Table 11. Students feel that their student colleagues have a more positive view of Wikipedia than they themselves do. It is interesting to note that this category also has the largest consensus value, indicating that the student group as a whole feels this way.

FACULTY TO STUDENT COMPARISON

Finally, a comparison between the faculty and student groups was performed to determine if any differences exist in usage, viewpoint, or awareness categories. The results are summarized in Table 12.

Category	Faculty	Students	Statistics (t-test)
School Year Usage	$\bar{x}$ = 2.98 s = 4.07 n = 53	$\bar{x}$ = 1.94 s = 2.61 n = 347	t = 2.48 p = 0.01
Non-School Year Usage	$\bar{x}$ = 3.02 s = 4.37 n = 53	$\bar{x}$ = 1.94 s = 4.32 n = 352	t = 1.69 p = 0.09
View in Gen. Ed Classes	$\bar{x}$ = 2.85 s = 1.03 n = 46	$\bar{x}$ = 2.35 s = 0.94 n = 343	t = 3.35 p = 0.00
View in Major Classes	$\bar{x}$ = 2.47 s = 1.26 n = 49	$\bar{x}$ = 2.20 s = 1.06 n = 334	t = 1.62 p = 0.11
All Awareness Categories			Equal Awareness

Table 12
Comparison of faculty and student statistics

Table 12 illustrates that faculty are utilizing Wikipedia more than students! This usage is occurring during the school year as well as during semester breaks. Further, faculty have a more positive viewpoint (in general) toward Wikipedia usage in general education classes as well as major classes (the latter not being statistically significant). These results are surprising, as faculty are generally seen as the enforcers for academic rigor in the selection of sources. This could be an indication of academic interest in Wikipedia at the classroom level, and also an actualization of: "researchers should read Wikipedia cautiously and amend it enthusiastically" (Nature, 2005, p. 890).

CONCLUSIONS

Is Wikipedia ready for main stream usage as an academic reference? No, not all of the articles, but academics have infrequently utilized an encyclopedia as an authoritative source for scholarly articles. However, the negative connotation that

Wikipedia has received in the academy is hardly deserved, due to a few high profile cases of vandalism. Wikipedia (in any language) can be a powerful tool to begin to explore academic issues. It can be utilized (freely) in the classroom, and fact checked by both faculty and students (a bonus exercise). Verification of information – no matter where it is found – is critical in an academic environment and should be carried out with all sources.

The net-generation is entering the academic arena, and with them come new tools and new uses for these tools. One of these tools, Wikipedia, has the size and popularity levels that make it a formidable knowledge base. Faculty need to manage the use of these web-based resources in an academic environment as a mechanism for quality control. Faculty are not using Wikipedia for academic purposes due to the perceived quality of information in the site; however, faculty do use Wikipedia for research and pleasure (more than their students!). As this paper and survey have shown, a lack of consensus on quality issues and responses to these issues could hamper progress toward using Wikipedia as an academic reference. The results indicate another underlying construct, that of trust in Wikipedia that should be studied further.

Wikipedia is trying to build trust by ranking articles, by establishing more stringent editing practices, by providing links to outside sources, and by protecting pages that are being or are subject to being vandalized. Awareness of these quality issues, along with awareness of Wikipedia's quality initiatives will aid faculty in better managing Wikipedia (or any digital source) as an academic reference in the future.

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