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## Social bookmarking in the classroom

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## Social bookmarking in the classroom

### Abstract

The vast amount of content on the Internet causes complications when struggling to tame it. The purpose of this literature review is to uncover the viability of social bookmarking for managing Internet content for classroom learning. It also reveals how collaboration in social bookmarking can increase its effectiveness in the classroom and how social bookmarking models best facilitate learning. Sources researched were published in the last seven years, when social bookmarking started to become widely recognized. Studies in the areas of content organization, searching, collaboration, and education were reviewed. The conclusions acknowledge social bookmarking as not a replacement for, but a complement to more traditional methods of managing Internet content.

SOCIAL BOOKMARKING IN THE CLASSROOM

A Graduate Review

Submitted to the

Division of Instructional Technology

Department of Curriculum and Instruction

In Partial Fulfillment

Of the Requirements for the Degree

Master of Arts

UNIVERSITY OF NORTHERN IOWA

by

Sara Richardson

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This Review by: Sara Richardson

Titled: Social bookmarking in the Classroom

has been approved as meeting the research requirement for the  
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### **Abstract**

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## Introduction

The Internet sustains an inestimable amount of data containing unlimited ideas and information. The traditional method of organizing data consists of top-down taxonomies, such as the Dewey Decimal System and the Library of Congress Classification System. The sheer volume of data found on the Internet, however, creates a conundrum for classification. Search Engines (i.e. Google and Bing) have been the conventional way to retrieve information on the Internet, but result in robotic, content-only algorithms which fail to capture the entirety of relevant findings. Social bookmarking offers another, human-based and collaborative, classification system. It is a bottom-up approach and is flexible enough to allow not only content and sentiment tagging, but also individualized and group tagging.

The analysis of social bookmarking as a method of managing sources for classroom learning is appropriate because searching for, organizing, and retrieving relevant websites on the Internet is a complicated and frustrating process. Searching for information consumes valuable time, and the organization and retrieval can be equally time intensive. The tangled web of information on the Internet sits ready for liberation. By analyzing social bookmarking in the role of information detangler, alternative methods of information searching, organization, and retrieval can be explored.

Reviewing current literature on social bookmarking is important because of its potential benefits in a variety of sectors, including education. Searching for, organizing, and retrieving information collaboratively could save time and ease frustration. The social and collaborative nature of social bookmarking could positively influence student motivation and research in the educational realm.



This review will examine research in the viability of social bookmarking as a means to search for, organize, and retrieve information. The review will also examine the role of collaboration in social bookmarking, and then focus on models of social bookmarking in education.

The results of this review will guide Internet users toward the best method of searching for, organizing, and retrieving information. It will be beneficial for those seeking to manage Internet information for personal use as well as for groups of people looking to manage Internet information for each other. Additionally, results of this review will provide students and instructors with benefits of applying social bookmarking to the classroom setting. Ideas include opportunities for student collaboration, social and metacognitive learning, and textbook enhancement or replacement.

### **Research Questions**

This review will seek to answer the following research questions:

1. How does social bookmarking apply to classroom learning?
2. How can collaboration be used to increase the effectiveness of social bookmarking in the classroom?
3. What models for using social bookmarking in the educational setting best facilitate learning?

### **Definitions**

Throughout this review, words related to social bookmarking are incorporated into the text. Social bookmarking has a central data structure called a folksonomy (Krause, Hotho, & Stumme, 2008). This folksonomy “consists of a set of users, a set of tags, and a set of resources” (pp. 2-3). With words such as *users* and *tags*, social bookmarking has developed

what arguably could be considered a *folksonomy* for its own purposes. Definitions of words associated with social bookmarking, as they are employed in this review, are defined.

- *Folksonomy* is a unique structure of tags to define URLs and that make sense to a group of users for their purposes and personomy.
- *Social bookmarking*, as in the action of, is registering with a social bookmarking site and sharing links to websites with others through tagging (Educause Learning Initiative).
- *Tagging* is the process users engage in to create labels for websites, and then the websites are immediately shared on the Internet (Voss, 2007).
- *URL* (Uniform Resource Locator) is a formatted text string to identify the location of a source. The URL is the information a user tags to add to a social bookmarking service. It is what is bookmarked.
- *User* is a person who has an account with a social bookmarking service and uses this account to bookmark and tag resources.

In combination then, *social bookmarking* consists of *users tagging URLs*. The *tags* a particular group maintains becomes the group's *folksonomy*.

## Methodology

To identify and locate sources for this paper, Google Scholar, Panther Prowler, and the UNI Rod Library Databases were thoroughly scoured. The UNI Rod Library databases searched were from EBSCO, specifically ERIC, Education Full Text, and Library Literature and Information Science Full Text. In Google Scholar, sources which were cited by more than one other source were analyzed. The advanced search in Google Scholar, limiting the file type to portable document formats (pdf) and limiting the date to the past year, 2011, was also investigated. Some overlap occurred between the resources explored through the UNI Rod Library Databases and through the Google Scholar advanced search, but unique titles in each were also available.

Information was gained through searching several topics. The topics were *social bookmarking, education, social networking, folksonomy, social tagging, tagging, motivation, learning, education, school, student, web, Internet, collaboration, organize, organization, and retrieval*.

To select the sources to be analyzed, the criteria were that the sources must be relevant to social bookmarking or social tagging and the date of publication had to be 2005 or later. Social bookmarking sites and methods for social bookmarking are new innovations, so sources earlier than 2005 were removed from consideration. The articles also needed to be peer evaluated to ensure acceptability and validity of the research.

The procedure for analyzing the sources involved reviewing the abstracts and summaries/conclusions, checking the reliability of the authors, and examining the relevance to education. Abstracts and summaries or conclusions were read to ensure consistency in the studies from beginning to end. Information about the authors, their backgrounds, and their

institutional affiliations were also scrutinized. The research needed to be relevant to social bookmarking in regards to searching for, organizing, and retrieving information, with an emphasis placed on social bookmarking research with an educational emphasis.

The criteria for evaluating the information found consisted of scrutinizing the quality of the content, connection to the topic, currency, and objectivity. The literature needed to be well-written, logical, and free from bias. It needed to be about social bookmarking in relation to searching for, organizing, and retrieving information with special attention to social bookmarking in relationship to the field of education. All parts of the studies were required to have occurred during or after the year 2005. Over three hundred articles were located for initial inclusion in this literature review. After examining them, forty-four were selected as fulfilling the criteria, as described above, for inclusion.

## **Analysis and Discussion**

Social bookmarking is a Web 2.0 tool which has gradually wandered into classrooms, soliciting its application to learning. Research on social bookmarking in relation to searching for, organizing, and retrieving information has been extensively conducted, directly relating to classroom learning. Some of the research has been based upon computational data analysis (Hsu & Chen, 2011; Krause, Hotho, & Stumme, 2008; Santos-Neto, Ripeanu, & Iamnitchi, 2008) while other research has focused on human subjects (i.e. Huang, 2011; Prichard, 2010; Heymann, Koutrika, & Garcia-Molina, 2008). Both methods of research have targeted the statistics required to answer the research questions.

### **Social Bookmarking and Applicability for Classroom Learning**

Society has efficiently and effectively devised systems for searching for, organizing, and retrieving physical texts. Fields of study in this area include cataloging and librarianship. People entering these fields learn copious quantities of rules and regulations for standardization and usability to occur from place to place. Attempting to apply traditional, rigid cataloging to Internet resources, though, is not plausible. The amount of information is too vast for humans to touch and catalog every bit of content on the Internet (Yanbe, Jatowt, Nakamura, & Tanaka, 2007).

As is the problem of appeasing Internet content in society, so it is the same in the classroom. For learning to occur, lengthy URLs and exhaustive information must be managed. What has emerged in the place of centralized cataloging is a variety of tools and methods for information retrieval. Web directories and search engines are two commonly recognized tools. One method is a file folder system where web-crawlers categorize websites into a hierarchy that developers have attempted to create (Visser, 2010; Graefe, Maass, &

Hess 2007). The file folder system, though, does not assure effective or relevant searches because results are bound to the systems that the developers deem make sense (Visser; Graefe, et al.). Visser explained another method where the system waits until all search terms are entered before finding results. In this way, there is more control of the filtering (Visser). Yet another method is a PageRank algorithm that uses link structure analysis (Yanbe et. al, 2007). None of these methods, however, or others that have been attempted, are ideal for each individual user. Unlike traditional cataloging, on the Internet there is no one right way to categorize an idea and it is difficult to compromise on a hierarchical vocabulary. The outcome is a system that the minority at the top dictates to the entire society. What started as a plausible idea to organize content on the Internet has become outdated and ineffective when concerned with the best interest of each individual.

Individual users have long had the ability to personally engage in the file folder method by bookmarking sites on personal computers. This can sometimes be effective, but is only available from a single computer, consumes time, and raises frustration levels as more content is added. This is where social bookmarking and folksonomies are believed to have the ability to bridge the gap. It is a bottom-up approach that may, as Visser (2010) relayed, “be the only practical solution in a world of participatory content creation” (p. 38).

Studies examining the benefits of social bookmarking for searching for, organizing, and retrieving information have been prevalent the past ten years (i.e. Krause et al., 2008; Razikin, Goh, Chua, & Lee, 2008; Yanbe et. al, 2007). The popularity of social bookmarking as a topic of research is a guide to the realization that there is relevancy in the idea. As the literature was reviewed, many and varied results were revealed. Some studies affirmed the viability of social bookmarking for searching for, organizing, and retrieving information,

while other studies negated the proposal. The majority of the studies read, though, fell between affirming and negating social bookmarking, depending upon the type of search and how specifically the user tagged the URLs.

### **Affirmative**

Several affirmative studies concluded that social bookmarking is a valid approach to searching for, organizing, and retrieving information. Morrison (2008) targeted, in “shootout-style” (p. 1567), three methods of information retrieval systems on the Internet: search engines, directories, and folksonomies. Morrison directed 34 participants to search for queries based upon a set of given topics. The search queries went through eight different information retrieval systems, consisting of Open directory, Yahoo directory, Del.icio.us, Furl, Reddit, Google, Live, and AltaVista. The results were calculated for relevance as determined by participants, precision, recall, and retrieval rate. Although Morrison’s study was limited by number and types of queries, a promising conclusion showed that search results displayed in both a search engine and a folksonomy were considered to be more relevant than search results displayed in search engines only. Morrison’s study also found that folksonomy results about issues in the news were more relevant than the same queries through directories.

In another study, Tennis (2006) presented a framework analysis comparing social tagging to traditional subject indexing. Conclusions were made supporting social tagging for searching for, organizing, and retrieving information. One conclusion was that since social tagging does not pressure content into one-size-fits-all containers, it shifts to become a “decentralized and creative craft” (Tennis, p. 12). Tennis further explained that social tagging “is not dependent on anyone else’s authorization or authority” (p. 12). Another conclusion

was that social tagging has the potential to permit context into indexing, along with traditional terms. Users tag content with terms that pertain to the scaffolds created in their minds.

Similar to the potential for context tagging, social bookmarking also allows users to tag by associations. This was the center of a study by Kipp (2007). In this study, Kipp focused on the social bookmarking service CiteULike, which is similar to the more familiar service, del.icio.us. Surveying articles in two titles of medical journals available through PubMed, Kipp studied the article tags on CiteULike and compared them to the author-submitted keywords and Medical Subject Headings in PubMed. Findings indicated users tagged with terminology that was rare or altogether absent from author submitted keywords and Medical Subject Headings descriptor lists. Kipp stated that time and task tags, “such as ‘to\_be\_read’, ‘toread’, and a number of calendar dates (e.g. 31/03/06, 1998) were found as tags assigned to articles in this data set” (p. 11). Ultimately, Kipp concluded, social bookmarking may be beneficial for users to tag “by association rather than just categorization” (p. 12).

One other reviewed study by Lee, O’Brien-Strain, Liu, and Lin (2011), supported social bookmarking for information searching, organizing, and retrieval. The authors surveyed 435 students and working professionals on how they accessed, consumed, organized, and kept seven content types (news, entertainment, content posted by others, content posted by self, reference, work related documents, and documents for real world activities). Results indicated that social bookmarking surpassed other methods in the areas of searching for feeds, searching websites for work or school, and engaging in real world



activities such as banking. Social bookmarking also topped the list for saving and organizing web content.

The data from the four studies presented above encourage the prospect of social bookmarking as a method for searching, organizing, and retrieving information from the Internet. Morrison (2008) found that social bookmarking was better for topics in the news and Tennis (2006) established the use of social bookmarking as a way for users to create tags for their own context outside of the traditional factory model of indexing. Kipp (2007) reiterated the benefit of social bookmarking for the ability to tag by association and not just organize by categorization. The newest research (Lee et al., 2011) asserted the popularity and reality of social bookmarking for searching for some content topics, as well as saving and organizing web content. Although these and other studies affirm the value of social bookmarking, other studies question whether or not social bookmarking could ever replace traditional searching methods.

### **Mixed Results**

#### ***Better for Some Searches, But Not Others***

Results of some social bookmarking studies emphasize concerns of its viability when searching for relevant content. Goh, Chua, Lee, and Razikin (2009) analyzed a dataset of 150 tags and 22,500 documents from del.icio.us to determine if the tags were effective when users needed to find resources. Results showed that those tags which were objective and extrinsic in nature performed better than those tags which were subjective and intrinsic in nature. For example, content with tags such as *recipe*, *baking*, and *cooking* performed better than content with the tags of *fun*, *article*, and *art*. This implied that using tags to search for objective (extrinsic) information is more reliable than using tags to search for information

that is subjective (intrinsic). The effectiveness of a tag, according to Goh et al., depends upon the motive (extrinsic or intrinsic) of the user.

Another study compared search results from the traditional search engines Google, Yahoo, and MSN, and a social bookmarking site, del.icio.us (Krause et al., 2008). The results were based on a data set from May 2006. More specifically, the study examined the terms from traditional search engines and the tags from del.icio.us to determine the strength of content overlap between them. Google and del.icio.us showed the most overlap and Yahoo and del.icio.us the least, but yet with surprisingly high overlap overall. It was found that while the top search results were similar between the search engines and del.icio.us, results nearing the middle and bottom for each were more widespread. For example, when comparing results for different search terms, out of the first 25 results listed in Google, 24.17 were the same in del.icio.us. But, for the first 100 results listed in Google, only 85.23 were the same in del.icio.us. These results contended that top results in Google were similar to top results in del.icio.us, but the results began to differ as a larger number of results were compared.

The researchers Heymann et al. (2008) found that social bookmarking provided information not recognized through other methods. By comparing del.icio.us to Yahoo and the Open Directory Project, Heymann et al. discovered that social bookmarking had an advantage of being able to accept tagged websites with current information before a search engine gathers the information needed to update its database. Data suggested that around 25% of content tagged by del.icio.us users were new pages not yet indexed (Heymann et al.). Also, social bookmarking enables users to tag websites by a multitude of terms, helping those seeking information about, for example, *St. Patrick's Day* but looking up the word

*leprechaun* or *Ireland*. A search engine may not mark a website about *leprechauns* as *St. Patrick's Day* because that term is never mentioned on the site. But, users of a social bookmarking system can tag it *St. Patrick's Day*, and those searching for *St. Patrick's Day* on the social bookmarking site would find it. The flexibility of social bookmarking allows content to be tagged with numerous terms, even if the words are not explicitly found within the content.

However, Heyman et al. (2008) recognized that social bookmarking may not have the “size and distribution of tags necessary to make a significant impact” (p. 195). The data showed that about 120,000 URLs were posted to del.icio.us each day, but this number is small when considering other numbers for user-created content. The number of URLs posted in del.icio.us paled in comparison to the number of blog postings each day. Del.icio.us tags represented only one-tenth of the number of blog postings each day, for example. This demonstrated that content posted in del.icio.us did not represent a substantial amount of data. When searching on the Internet, a larger result list would predictably occur from a larger foundation of data. In this scenario, an Internet search engine including blogs would have a more significant amount of data to search each day as compared to searching by tags in del.icio.us. Although at the point in time when the study took place, the authors admitted that the content tagged on social bookmarking sites did not compare in size to content indexed by search engines, they believed that social bookmarking had the potential to grow enough to reach the scale of the web.

Some concerns about the quality of tags might be alleviated with a moderator. A moderator could expel spam tags and URLs, tweak misspelled or slightly variant tags, and ensure quality organization. Chen, Xu, and Whinston (2011) proposed and researched this

idea for online communities through a series of complex formulas. Results indicated that a moderator would improve content quality, but there were concerns. Employing a moderator would be costly. There was also a possibility that performance of typically high-reputation contributors would decrease while the performance of typically low-reputation contributors would increase. Reverse reputation may thus occur because typically high-reputation contributors could feel threatened, and typically low-reputation contributors could work to achieve high-reputation. The increase from low- to high-reputation could reach a point where contributors might then exploit their reputation. An “optimal moderation resource allocation” (p. 238) alternative where moderators scan content of typically low-reputation contributors more carefully than high-reputation contributors, for example, might increase performance of all contributors.

An example of a moderated environment can be found in the *LM\_NET* (Library Media Network) listserv. The first two times someone submits an inquiry or comment, a moderator reads it before it is posted. After two successful postings, a member’s e-mail address is set so that the message will automatically be sent out without going through a moderator. A method similar to this might be an improvement in social bookmarking settings. Then, if anyone’s tags get wildly radical after being moderated a few times, the community of members can let the contributor know that his/her additions are not acceptable (Chen, Xu, and Whinston, 2011).

Data from the studies listed above argued that social bookmarking may well be effective for searching, organizing, and retrieving information for some search types, but not others. The reviewed research reasoned that social bookmarking is effective depending upon the motivation of the user (Goh et al., 2009), how popular a search topic is (Krause et al.,

2008), the amount of content that is tagged (Heymann et al., 2008), and whether or not a moderator is present (Chen et al., 2011). None of the studies alluded to social bookmarking as not being worthy of searching, organizing, and retrieving, but that social bookmarking was more effective in some situations than others. This seems to be a common theme interwoven among social bookmarking research, and may be the reason some research has touted a hybrid approach as being the best for searching for, organizing, and retrieving information.

### ***Hybrid Approach***

After reviewing the literature on social bookmarking for searching for, organizing, and retrieving information, it can be determined that social bookmarking is in the process of developing into a viable alternative to search engines and other content organization systems. Social bookmarking is a growing tool. It allows users to apply a variety of tags to content and can be more current than traditional search engines. However, as Wetzker, Zimmermann, and Bauckhage (2007) learned, only a small number of users tagged the majority of the content, and the depth and breadth of content was not as extensive as the content that could be accessed by a search engine. The depth and breadth issue may well be the cause of studies that have suggested a hybrid approach to searching for, organizing, and retrieving information.

In *Alternative Searching Services: Seven Theses on the Importance of "Social Bookmarking"*, it is stated that empirical evidence pointed to only 20% to 45% of search engine results being relevant to the search (Graefe et al., 2007, p. 11). These percentages are figured through sending inquiries to search engines and then having experts evaluate results for *precision*, the most widely known unit of measurement for extraction of information. Whereas search engines can include information more quickly and with more detail,

companies can also manipulate the results by discreetly augmenting their sites with popular search terms. Since social bookmarking systems are used by humans instead of robots, they are not as persuasively manipulated in this way. This mixture of positives (including detailed information quickly) and negatives (infiltrating with popular search terms) directed the authors of this study to conclude that social bookmarking “be treated as qualitative complement of traditional searching services” (p. 18).

The link-based ranking method of some search engines, along with data from social bookmarking results were investigated as a “new kind of a complex search where contextual, temporal or sentiment-related information is used” (Yanbe et al., 2007, p. 195). Yanbe et al. compared PageRank, which is the link structure commonly used to rank URLs, to SBRank (Social Bookmarking Rank), which is a URL’s popularity created by consumers. Data results led Yanbe et al. to recommend combining the two. Being able to add SBRank popularity, relevance, and filters to a search limited to PageRank would unquestionably enhance a Web search.

Considering the literature reviewed, social bookmarking can be found to be of value when searching for, organizing, and retrieving information, and be applied to classroom learning for managing Internet content. An effective method would be to take a traditional search and combine it with data from social bookmarking sites to present users with a list of the most viable URLs. While social bookmarking can be important for individual users, it also encompasses a collaboration piece which is what makes it a Web 2.0 tool. Taking a closer look at collaboration in social bookmarking will increase the reader’s understanding about how collaboration affects the use and viability of social bookmarking.

## **Collaboration and Effectiveness of Social Bookmarking**

The essence of social bookmarking is collaboration. It is this collaboration which increases the effectiveness of social bookmarking in the classroom. People are motivated to work together for the good of the group. The quote below is from Howard Rheingold in *Steal This Bookmark!* (Mieszkowski, 2005).

I look to see who the other people are on del.icio.us who tag the same things that I think are important. Then, I can look and see what else they've tagged....And isn't that part of the collective intelligence of the Web? You meet people who find things that you find interesting and useful—and that multiplies your ability to find things that are interesting and useful, and other people feed off of you. (para. 5)

As definitions of Web 2.0 describe, these tools engage the user with the content, encouraging interaction and collaboration. Social bookmarking is one of these Web 2.0 tools. When working with others, though, whether face-to-face or over the Internet, interesting challenges can occur. Social bookmarking is no different in this regard.

### **Advantages**

There are numerous advantages to the collaborative nature of social bookmarking. One is that content is always changing. With open collaboration, content searched through a tag today may tomorrow be quite different. The URL collections are not static, but ever growing and changing (*Educause Learning Initiative*, 2005). Users think about connections to content in distinctive ways, so rechecking tags may lead down varied paths. For example, a user today may be tagging content about stuffed animal *bears*, then someone else comes along and adds information about *bears* in National Parks, then another person uses the tag *bears* for content about the Chicago Bears. A person then searching for content by using the tag *bears* could formulate connections that otherwise would have gone missing. The tag *bears* grows and changes.

Another advantage of the collaborative nature of social bookmarking is that users are able to observe the diverse avenues people have chosen to tag topics and then take the content that is most useful and relabel it to make sense in the user's situation (Rainie, 2007). An example here would be a user searching for pictures of various rocks. Some images might contain rocks, but be labeled for other content, such as *beach* or *riverbed*. The user could add a new tag to the URL, such as *agate* or *sedimentary*. Another user may be looking for *inspirational* images and may come across a rock image and label it as such. Unlike typical search engines, social bookmarking allows sentiment-based tagging, of which its merit "cannot be exaggerated as many times users require resources that reveal certain sentimental characteristic: for example pages that are funny, useful or inspirational" (Yanbe et. al., 2007, p. 199).

There is also intrinsic motivation for social bookmarking because of its collaborative nature. When tagging URLs, users possess the sense that they are "adding to a shared stream of knowledge" (Rainie, 2007, p. 6). The collaboration leads to connections with others who apply the same tags, and folksonomies are created. This "allows social groups to form around similarities of interests and points of view" (Rainie, p. 6). People connect with others who share common ground.

The collaborative nature of social bookmarking boosts its usefulness. As Voss (2007) wrote in his study, the nature of Web 2.0 and social bookmarking make traditional organization systems seem archaic. Social bookmarking employs the bottom-up approach to content organization (Rainey, 2007; Yanbe et. al, 2007), which engages a collaborative approach instead of a top-down imposition. Instead of a controlled vocabulary, users create meaningful tags, which in turn develop into folksonomies. This type of user-control benefits



all users, and as Voss (2007) also wrote, “computer scientists tend to forget that a clever interface to support tagging can be worth much more than any elaborated algorithm” (p. 7). In reality, however, Voss envisioned social bookmarking as a catalyst for positive changes in indexing because no system is perfect.

### **Disadvantages**

Just like collaboration in real life can go awry, collaboration online can too. In *Tagging, Sharing and the Influence of Personal Experience*, Lee, Goh, Razikin, and Chua (2009) investigated the role of user familiarity with tagging and the effectiveness of tagging for content sharing. This study engaged 262 anonymous volunteer participants. Participants were given a questionnaire with two parts. The first part collected information on participant demographics and familiarity with the social tagging process, and the second part was a multiple choice questionnaire asking participants to choose the best tag for the given content. The content and related tags were randomly selected from del.icio.us. Results proved that high familiarity with tagging, web directories, and social tagging systems were significantly positively associated with the number of correct tags. It also revealed that those users with the least experience were more likely to tag egocentrically, where the tags have “meaning only for the tag creator or a select few within a group” (Lee et al., 2009, p. 11). This result suggested that, in order to increase tagging effectiveness, user training or limitations based upon experience could be employed. In the conclusion of the Goh et al. (2009) study, the authors indicated that providing a technique for users to denote whether or not a tag was for *personal* or *universal* consumption might also be advantageous. Then, when users observed tags with *personal* notations, they could determine whether to eschew the material or spend time investigating it.

Another issue with the collaborative nature of social bookmarking is that tag spamming can occur (Goh et al, 2009; Wetzker et. al., 2007). This is where tags are assigned to content to attract traffic, even when the tags are not associated with the content. Social bookmarking is not without its issues with automated spam, just like email and other applications. One study took the top 20 most active del.icio.us users and found that 19 were non-human. Businesses pay to have an automated system create tags and backlinks for their products and services. “These 19 ‘users’ alone account for 1,321,316 bookmarks—around 1% of the corpus” (Wetzker et. al., 2007, p. 4). The magnitude of spam can cause errors in calculations when trying to decipher trends and certain other statistics. If a spam filter were applied, it would alleviate some of this concern.

Two more issues are users tagging URLs with similar, yet slightly different tags and what Gupta, Rui, Yin, and Han (2010) labeled “tag rot” in their *Survey on Social Tagging Techniques* study. Users often tag with similar terms, but “people frequently encode multi-word lexemes by connecting the words with underscores, hyphens, dots, or no symbol at all” (Krause et al., 2008, p. 105). An example of this would be *educational\_technology*, *educational-technology*, *educational.technology*, and *educationaltechnology*. The second issue is that tags can become outdated. For example, if a user tags a URL today as *best mountain bike*, after a while the tag is no longer meaningful. With collaboration comes variances on tag structure and spelling, as well as issues with time-sensitive tags.

Perhaps the most controversial concern with collaboration is that social bookmarking tends to have tags that are user-specific (Angelova, Lipczak, Millios, & Pralat, 2008; Graefe et al., 2007). This concern is controversial because it can be considered an advantage as well as a disadvantage. Whereas some believe that the bottom-up approach to organizing Internet

content is of value, others see the individuality and idiosyncrasies as a drawback. Instead of creating collaborative folksonomies, Wetzker, Zimmermann, Bauckhage, and Albayrak (2010) claimed that vast individual personomies are created. Personomies are similar to folksonomies, but derive from individual, personal vocabularies and categorizations. Wetzker et al. (2010) applied tag translation to the personomy vocabulary by matching tags of individual users to the larger folksonomy, and found that this improved accuracy. For example Wetzker et al. (2010) would take *webdev* and apply tag translation so it would match the tag of the majority of users as *web\_development*.

While collaboration poses perils to the searching, organizing, and retrieving process, it is notable that solutions to the issues presented above are feasible. Establishing a process to categorize tags as personal or public, implementing a spam filter, and stamping tags with a date of entry would be practical resolutions.

### **Social Bookmarking Intentions**

One other notable issue with the collaborative nature of social bookmarking is with user intentions when tagging. Several studies examined how user intention affects tagging behavior. In *Exploring the Influence of Tagging Motivation on Tagging Behavior*, Kern, Korner, and Strohmaier (2010) conducted a study on users tagging for *categorizing* versus *describing*. When *categorizing*, users tended to mark URLs so that they could browse content at a later date. Users intending to find specific material, though, more accurately *described* URLs. This difference led to a variance in folksonomies. *Categorizers* applied information-based tags such as *fashion\_magazine*, *fashion\_brand\_shoes*, *celebrity*, and *design\_magazine* and *describers* used content description tags such as *Excel\_functions*, *Flash\_drawing*, and

*flowcharts*. Kern et al. suggested that this motivation be taken into account for tag recommendation and retrieval.

The next study questioned whether tagging in social bookmarking systems grew from *motivational* purposes or whether it was a side effect of tagging for oneself (*circumstantial*) purposes. Arakji, Benbunan-Fich, and Koufaris (2009) hypothesized that both occurred. They conducted a survey-based field study involving 94 users with multiple demographic variables, and found users contributed to social bookmarking systems because they were *motivated* to tag for others. This was especially true when the users perceived that others were also bookmarking for the general public, and when the content was perceived to be important or helpful to others. Limitations included that the study only delved into two social bookmarking systems, did not track data over a long period of time, and the sample size was not large enough to notice other significant differences. However, enough evidence of *motivational* practice was gathered that Arakji et al. concluded users of social bookmarking systems felt their contributions were of value and that social bookmarking systems should continue to grow.

In *Can Social Tags Help You Find What You Want?* by Razikin et al. (2008), the authors termed the intentional social bookmarking behaviors as *sharing* and *keeping*. This study found that when *keeping* bookmarks individually, users tagged with words such as *interesting*, *funny*, and *free*, not necessarily focusing on the content, and resulting in tags that were not useful for sharing with others. When the intention was to *share*, however, objective terms that appeared in the content were tagged. Overall, although only popular tags were studied, results were similar to the others above, which are that “not all tags describe a

document's contents sufficiently for public access" (Razikin et. al., p. 60). The collaborative quality depends upon the intention of the individual users.

### **More on Social Bookmarking and Collaboration**

There are other significant points to consider when examining the collaborative nature of social bookmarking. Yanbe et al. (2007) explained that relevant tags could be predicted by just a few users. One reason for this might be because users see the previous tags by other users and decide to add their own with those terms. For example, a user could be searching for *blue material*, but notices others tagging URLs with the term *denim*. If this is the way the community of users describes an item within its folksonomy, then the other user(s) will soon adapt. Another method that may lead to relevant tags being assigned by a few users is called a tag recommendation system (Wetzker et. al., 2010). One way tag recommendation systems work is by remembering the words others have used to tag the content and suggesting those words to new users tagging the same material. The collaboration aspect of social bookmarking allows tag recommendation systems to work. Tag recommendation systems have been widely studied, leading to more accurate and higher quality user models (Wetzker et. al., 2010).

Social bookmarking reveals various levels of collaboration, from content reuse to shared user interest. In *Content Reuse and Interest Sharing in Tagging Communities*, Santos-Neto et al. (2008) studied these levels. Content reuse referred to the activity of using existing URLs in the community. Evaluating CiteULike and Connotea, the authors found that "these communities exhibit consistently low levels of content reuse and shared interest" (p. 1). Users were tagging new content more frequently than they were consuming existing content. Shared user interest as mapped through tag overlap was similarly sparse. This study was

published in 2008 and only included two tagging sites. Results of a similar study today may well be different.

Although there are negative attributes involved in the collaborative nature of social bookmarking, as a Web 2.0 tool, social bookmarking is credible. Users are motivated to tag URLs not only for themselves, but also for the whole social bookmarking community. Even though motivation for social bookmarking varies, the more content that is bookmarked the better the search base for everyone. Collaboration adds to social bookmarking's role in searching for, organizing, and retrieving information. It adds to the effectiveness of social bookmarking in the classroom. The collaboration causes users to feel essential, connects users through folksonomies, and expands horizons for those searching for information.

### **Social Bookmarking Models in the Educational Setting**

Student learning is evolving and changing with the onset of Web 2.0 tools (Crompton, 2012). The social nature of Web 2.0 provides powerful opportunities for instructors to seize and then apply content to advance student learning. Considering that technology (Rice, 2010) and collaboration are both motivational factors for student learning, social bookmarking seems to be a natural Web 2.0 tool to employ with students. In reviewing the literature for social bookmarking in education, there are several models of how it can be beneficial. Explained below are seven of them.

#### **Social Learning**

Whether texting, talking on a cell phone, or visiting face-to-face, students crave connections with peers. Social bookmarking is, by name, social in nature. It provides another avenue for connecting. Social bookmarking provides active social learning opportunities, which promote constructivism (mental models, or constructs) and constructionism (physical

models, or constructs) through finding, tagging, and reviewing relevant resources (Crompton, 2012). In other words, with social bookmarking, students can create mental and physical tags as they see fitting to their constructs. As Baird and Fisher (2005) wrote in *Neomillennial User Experience Design Strategies: Utilizing Social Networking Media to Support "Always On" Learning Styles*, "social networking media engages the user in the content and allows them to be included as an active participant as they construct a *learning landscape* rooted in social interaction, knowledge exchange, and optimum cognitive development with their peers" (p. 24).

Social bookmarking is a beneficial social learning tool for connections and construct, and it also engages and empowers students. Students learn and remember more of what attracts their attentions and interests (Atkins et al., 2010). Through social bookmarking, students can find websites of interest on a particular topic, tag them, and share with others. On any given topic, there are a variety of associated resources, many of which may attract student attention. Interacting with peers and partaking in real world experiences also engages students. With the social influence of Internet-based learning, such as social bookmarking, student satisfaction increases leading to increases in students' performance expectancy (Liao & Hsieh, 2011).

Social bookmarking also allows students to collectively and interactively find, organize, and determine the value of resources on the Internet (Estelles, del Moral, & Gonzalez, 2010; Lin & Tsai, 2011). Collective information searching (CIS) depends upon students contributing to the goal and interacting with sources others have tagged to define the most relevant sources (Lin & Tsai, p. 1250). In *Applying Social Bookmarking to Collective Information Searching: An Analysis of Behavioral Pattern and Peer Interaction for Co-*

*Exploring Quality Online Resources*, Lin and Tsai studied how 127 first-year junior high students interacted with a social bookmarking site called *WeShare*. Participants were required to bookmark sites that related to the question, “*What are the scientific principles involved in the transformation of nuclear power into electric power?*” (p. 1252). The students added websites and then commented on (peer reviewed) the content of sites their peers bookmarked. Results revealed a relatively low number of bookmarks per student. Students only bookmarked about one site each, a few acquired from the Internet, and slightly more from within *WeShare*. Also, students were more likely to comment on others’ bookmarks than they were to explain or comment on their own, but it was the opportunity for knowledge creation and sharing that made this social bookmarking a true CIS activity.

In education, then, stressing the social aspect of social bookmarking leads to engagement and satisfaction of learning. Social bookmarking is beneficial from a motivational standpoint and the social standpoint of collectively determining importance. It also benefits a model of learning called triological learning.

### **Triological Learning**

Triological learning, according to Crompton (2012), is where students learn through “collaboratively creating, manipulating and sharing information in a systematic way” (p. 3). Web 2.0 tools connect people with the purpose of collaboration, manipulation, and sharing knowledge (Crompton, p. 3). Web 2.0 tools and triological learning go hand-in-hand. With social bookmarking, students work collaboratively to share websites, add information and tags, and develop groups with common folksonomies. Students become actively involved in building these social artifacts. Within a folksonomy, students are creating meaningful tags,



perhaps manipulatively highlighting and annotating content, and publicly sharing their information. Trialogical learning is a benefit of social bookmarking.

### **Collaboration**

To advance in today's society, students need to be confident in collaborative situations. As discussed in *Enhancing the Effectiveness of Work Group and Teams*, Kozlowski and Ilgen (2006) wrote, "The evidence is clear that individuals' leadership and teamwork competencies influence team effectiveness and that these competencies can be learned" (p. 114). Students are acclimated to being evaluated as individuals, but collaborative teamwork becomes vital when students join the affairs of modern society. Social bookmarking allows students to work together collaboratively (Estelles et al., 2010), which teaches the competencies Kozlowski and Ilgen purported could be learned. Teachers can take opportunities, such as with collaborative social bookmarking, to walk students through the team process.

### **Independent Projects**

While collaboration is an important aspect of today's workforce, individual and independent works are also essential. Social bookmarking has its place in independent projects, just as it does in collaborative ones. Prichard (2010) studied how social bookmarking enhanced independent reading projects. Instead of reading on paper and recording what was read on paper, a class bookmark page on Diigo was created. Students were to read a total of 25 articles over the course and comment on each. Articles could be ones that the students found independently or that another classmate had tagged. Results of the electronic reading project versus the paper reading project showed that students enjoyed the electronic version and, if given the choice, would prefer it. Even though this was an

individual project, the students appreciated being able to interact and comment on articles that their classmates had posted. The teacher appreciated the ease of the management and being able to quickly comment and see statistics instead of lugging a class-full of notebooks home to grade over a weekend. Although implemented at the college level, similar results could be seen at earlier levels of education.

### **Metacognitive Skills**

Metacognitive skills are skills students possess that make them aware of how they learn and understand. With social bookmarking, students are allowed to take content and tag it as it fits into their own learning and understanding (Estelles et al., 2010; Huang, 2011). Social bookmarking allows students to build their knowledge in a wide assortment of fashions, thus improving metacognitive skills. Huang's research was a quasi-experimental pretest-posttest design that examined students' metacognitive skill growth. When using the Diigo tagging, highlighting, and annotating functions, the experimental group grew significantly more than the control (non-Diigo) group in the areas of self-planning, learner-monitoring, comprehension-monitoring, self-modifying, and self-evaluating. The study of social bookmarking systems, with an emphasis on Diigo, by Estelles et al. (2010) agreed with these findings. They wrote that "Diigo shows the way each user learns, thinks, and develops the knowledge that was obtained from the information previously selected, organized, and categorized" (p. 1). It also allowed students to show the different ways they think, learn, and build knowledge.

### **Personal Connections**

Similar to developing metacognitive skills, social bookmarking allows students to create personally meaningful tags (Crompton, 2012). The author has experienced the power

of creating tags that are personally meaningful while composing this literature review. By tagging relevant research as *social bookmarking* and adding other tags such as *personal connection*, *definition*, or *search*, *organize*, and *retrieve*, the author was creating personal connections as to the purpose of the research in relation to the literature review. Instead of trying to fit thoughts and ideas into a system that someone else has created, students engage their personal connections and create their own system.

### **Textbook**

Schools today are looking for ways to cut costs and help the environment. This issue, along with the push for each student to have a device in the classroom, has questioned how course content is delivered. While traditionally content has been delivered through a text book, schools are currently turning to other options. A solid option is to organize content on a social bookmarking site (Farwell & Waters, 2010). Farwell and Waters applied social bookmarking as a textbook technique using del.icio.us. This study resonated from the growing number of students taking online classes, but still required to purchase expensive textbooks. The study took place in a *Social Media and Public Relations* course with 53 students, and data was collected from student participation in focus groups. The data was transcribed and checked with each student to ensure validity. Results showed that the students preferred their content via social bookmarking versus textbooks for a number of reasons. The reasons ranged from cost to relevancy and currency of information to ease of use to availability of a broad range of materials.

Current research illustrates a number of reasons why social bookmarking is beneficial to students as well as some models that are being implemented. Social bookmarking appears to have a bright future in the educational setting. Whether searching for, organizing, or

retrieving information, students and teachers can find exemplary approaches for including social bookmarking in learning.

## Conclusions and Recommendations

This literature review found that social bookmarking is applicable to classroom learning and, although not as exact as traditional organizational methods, is a viable way to manage Internet content. The nature of collaboration improves the viability of social networking. This lends itself to educational contexts where students create, not only for themselves and their instructors, but also for their peers and others as well.

The three questions posed at the beginning of this paper can be answered by the research from the literature reviews. Current literature studies looking at the viability of social bookmarking to manage information have found this method to be worthy of implementing, not only in society in general, but also for classroom learning. The boundless abundance of content on the Internet begs for alternative methods of organization, and social bookmarking offers unique features to aid this conundrum. Morrison (2008), Tennis (2006), and Kipp (2007) compared social bookmarking against more traditional methods of searching for, organizing, and retrieving information and found social bookmarking to be consistent in providing valid solutions. Social bookmarking qualifies as a viable option for managing Internet content, but at this time, research indicates it would best be used in conjunction with other methods. Social bookmarking is still a novel tool and the amount of included data currently is not as vast as can be found through search engines (Heymann et al., 2008), but is expected to expand rapidly. The recommendation is to incorporate social bookmarking into the areas of searching for, organizing, and retrieving Internet content, but not to solely depend on it at this time.

The collaborative nature of social bookmarking leads to advantages and mixed results, but overall appears to be effective to classroom learning. Users tag sources for a

multitude of reasons (Goh et al., 2009; Lee et al., 2009) and in a multitude of styles (Angelova et al., 2008; Krause et al., 2008). Consequently social bookmarking lacks a common composition. However, it is the collaboration which allows expansion of ideas and knowledge and a bottom-up approach to organization which aids comprehension and meaning (Rainey, 2007; Yanbe et al., 2007). Collaboration, then, both positively and negatively affects social bookmarking, but the nature of collaboration is working together, and this allows for current substantial opportunities as well as opportunities as of yet unknown. It is recommended that collaboration in social bookmarking be understood as imperfect, but infused with positive promises.

Students thrive in and are motivated to excel in collaborative environments, and social bookmarking fulfills this requirement. Social bookmarking can be applied to benefit a wide variety of ages and content areas, and looks to be gaining popularity in the educational setting. Research has revealed models and methods for implementing social bookmarking into education. From socially engaging students in learning and understanding content with others (Estelles et al., 2010; Lin & Tsai, 2011) to making meaning personal with context tags (Crompton, 2012), social bookmarking offers advantages to students and educators. Novel resources and topically organized content can be shared as a class or in groups. Deep thinking occurs because social bookmarking is an interactive process where users attach tags to content with meaningful terms and have the option to add comments to their own postings and comment upon others'. It is recommended that social bookmarking remain a valued Web 2.0 tool to benefit learning.

From this point, further research on social bookmarking could be expanded to study issues ranging from the effects of social bookmarking replacing traditional textbooks, to the

direct effects of social bookmarking on student participation motivation. As textbooks are becoming virtual with content transmitted via URLs, managing content with social bookmarking is a feasible option and worthy of the time and effort needed for research purposes. If proven that the social and collaborative aspects of social bookmarking motivate students to participate in learning, this research would enhance the possibility of social bookmarking replacing textbooks. Top-down taxonomies and search engines may remain, but social bookmarking is an authentic and complementary system.

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