学生の情報の信頼性に対する認識と在籍中の情報の利用頻度と実際の引用のための化学実験の論文

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Students’ Consciousness of Reliability on On-line Materials, Referring Frequency and Actual Citation for Their Papers of the Chemical Laboratory Classes

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Key words: online materials, Wikipedia, students’ paper, citation, reliability of information provider

Students' consciousness of reliability on on-line materials (information on the Web), referring frequency and actual citation for their papers of the chemical laboratory classes were investigated. The Web pages actually cited in the papers handed in were classified by information providers (webmasters). The students’ referring frequency and reliance on the materials were analyzed by questionnaire investigation. On-line references cited in the papers were 60% of the whole, suggesting that the students referred on-line and off-line materials in nearly the same frequency. The most popular pages actually cited were technical and product information provided by the manufacturers (36%). Academic sources (university laboratory or faculty), public sources (government and administrative agencies) were cited in the same extent (11%), followed by the clinical sources (9%) such as professional organization of medical technologist or examination department of the hospitals. The referring frequency of these materials by the students was high and parallel with actual citation. Contrarily, actual citation of the pages on Wikipedia was only 7% while the frequent referring respondents were nearly 60%, comparable to that of manufacturers. This discrepancy is probably due to the reliability of the sites. Most of the students, 71% answered that they were conscious of the reliability of the information provider. In addition, the half of the respondents compared several materials on the issue. These results suggest that the students refer the on-line and off-line materials in nearly the same frequency and well conscious of the information source and its reliability.

Introduction

The advance and popularization of the network technology caused a drastic revolution in the transmission and retrieval of information. In the field of academic journals, electronic publishing prior to printing and browsing on the Web have become mainstream. Showing URL of the Web sites is now increasing for various citations. In recent years, various problems have been argued over the refer-
ence citation and quotation in the students' papers, derived from these surroundings.

One of the problem is the issue of so-called “copy and paste”\(^1\)\(^{-5}\). On-line materials are retrieved electronically and therefore readily pasted into the papers. However, simple copy and paste without reviewing the contents is none of the learning works. The students tend to facilely quote the contents ignoring the purpose of the sentences in the whole document. Quotations with inadequate interpretation and posting the original text including errors are often observed. In addition, copy and paste of the text as it is, without specifying the source, could be suspected of a copyright infringement.

Another argument is about the citation from Wikipedia. Many people are involved in editing the sources on Wikipedia; it is ever rewritten and updated. Therefore, it is unclear who is responsible for editing and browser sometimes doubts its reliability\(^6\). Some teachers have banned students from citing the materials on Wikipedia\(^7\).

As the background of these problems, the students seek the convenience in retrieving materials\(^2\). They may be also lacking knowledge of the rule for citation and have less experience of judging the reliability of the materials. In this study, the author investigated the students' consciousness of reliability and actual citation of the on-line materials (Web pages) for their papers on laboratory classes of medical technology.

**Methods**

*Students and class subject:* The students were 44 juniors in 2009 (Class of 2011) of the Department of Medical Technology, School of Health Sciences, Tohoku University. The laboratory class subject was *Clinical Chemistry* including urinalysis. This consisted of 10 themes, and the students had to hand in their papers on each theme.

*Referring frequency and reliance on the materials:* A questionnaire survey was conducted at the end of the laboratory course period. Papers of 7 out of 10 themes had been submitted at this moment. The questions are listed in Table 1. The materials were classified into 9 categories according to the feature of information providers (Table 1, question 4). The respondents were asked to show the value in question 1; to answer based on 4 rating scales in questions 2 to 5, and as free description in questions 6

<table>
<thead>
<tr>
<th>Table 1. Questions on the questionnaire sheet</th>
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<tr>
<td>1. What was the referring frequency ratio of on-line materials (information on the Web) to off-line materials (printed, electronic media, movies etc) for preparing your papers?</td>
</tr>
<tr>
<td>2. Are you conscious of what kind of provider (or webmaster) sends the on-line material that you refer?</td>
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<tr>
<td>3. Do you compare more than one document, regardless of on-line or off-line, when you retrieve the information?</td>
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<tr>
<td>4. How often do you refer the on-line materials (Web pages) provided by the followings?</td>
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<tr>
<td>a) University laboratory and faculty</td>
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<tr>
<td>b) Academic society</td>
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<tr>
<td>c) Society of medical professionals (such as medical doctors, technologists)</td>
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<tr>
<td>d) Clinical institution (hospital/medical laboratory)</td>
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<tr>
<td>e) Manufacturer of equipments and chemical reagents</td>
</tr>
<tr>
<td>f) Government and administrative agency (including patent gazette)</td>
</tr>
<tr>
<td>g) Database and electronic journals</td>
</tr>
<tr>
<td>h) Wikipedia</td>
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<tr>
<td>i) On-line community, especially knowledge community such as Chiebukuro</td>
</tr>
<tr>
<td>5. What is your rating for the reliability of each information provider categorized above in question 4?</td>
</tr>
<tr>
<td>6. How do you evaluate the reliability of the materials?</td>
</tr>
<tr>
<td>7. How do you find the materials that you cite for your papers?</td>
</tr>
</tbody>
</table>
and 7.

Analysis of submitted papers: The author reviewed all the 1,339 references cited in the papers submitted over 10 themes. In case of on-line materials, they were classified into 9 categories according to the feature of information provider, listed in Table 1 (question 4), examined by actually accessing to the described URL. The actual citation was analyzed by comparing the results of the questionnaire survey. The references were aggregated by every citation that is equivalent to page on the Web, not by the site.

Results and Discussion

The number of references actually cited for the students' papers was 1,339 in total; those of on-line and off-line materials were 877 (61%) and 522 (39%) respectively. According to the questionnaire survey, the given referring ratios of on-line materials were in the range from 10% to 90% with an increment of almost 10%. Among them, 22% of respondents gave the ratio of 60:40 and 24% as 50:50 (Fig. 1). This result supports with the actual citation ratio of the on-line materials, and suggests that approximately half of students refer to on-line and off-line materials at nearly the same level.

Regarding to the breakdown of the citation of off-line materials, the overwhelming majority was textbooks used in the classroom lecture of clinical chemistry, as well as other related subjects, reached to 85% (data not shown). Technical books and hand-outs in class followed at 9% and 4%, respectively. Naturally, description in a textbook covers very broad in an academic field, it should be considered that students refers many location in one book, and therefore the actual referring frequency should be more than that cited into the papers.

In main concern of this study with on-line references, the top majority of citation was technical and product information provided by manufacturers of equipments and chemical reagents, gaining 36% of the whole (Fig. 2). This is reasonable in consideration of the laboratory class. In addition, because such information is provided as source material for introduction and explanation of the products, it should be carefully checked and confirmed by the

Fig. 1. The ratio of referring on-line and off-line materials.
provider. Thus this kind of information can be considered more reliable. The following major categories were those provided by university laboratories and faculties (11%), by public institutions such as government and administrative agencies including patent gazette (11%), by clinical institutions and society of medical professionals (9% in together).

As for the referring frequency, according to the questionnaire investigation, the manufacturers’ sites were most frequently browsed. The respondents answered “frequently browsed” was 36%, and reached to 72% with “often” browsers (Fig. 3). Regarding the second majority sites, provided by university, academic society, professional society, and clinical institution, 40% of the respondents answered as “frequent” or “often” browser. In these cases, actual citation and the referring frequency seem to be well correlated.

Contrarily, the sources from Wikipedia were in the different situation. They are frequently browsed by 36% of the students and come up to 60% with often browsing, which is comparable to that of manufacturers. However, the ratio of actual citation for the submitted papers remains in only 7% (Fig. 2, 3). The reason for this divergence can be explained by its reliability discussed below.

The students’ reliance on the materials by each categorized provider is shown in Fig. 4. The materials provided by manufacturers, academic, clinical and public institutions had higher confidence level of around 40% and exceeded 80% in together with the answer “rather reliable”. The reliability of the materials by manufacturers is already discussed above. The Web sites by academic and clinical institutions are considered as resources for education and practical medical services, and sometimes explanation for the public. Based on such background, these sources can receive higher reliance. Especially for the students, these providers are deeply involved in their future, and it seems to be natural that they refer the sources with high frequency. However, it should be noted that the infor-
Students’ Reliability and Citation of On-line Materials in Papers

information provided by a university laboratory, there are two possibilities; the description is based on the doctrine claimed by the laboratory (researchers), or commonly accepted theory. It is doubtful whether the students can realize and distinguish them. In contrast, fewer students showed their reliability on Wikipedia, 20% in together with “reliable” and “rather reliable”. This can be the reason for that actual citation is less for the referring frequency. On-line knowledge communities, represented by such as Chiebukuro, are estimated their reliability favorable from less than 10% of the respondents. These facts suggest that the students are well conscious of the reliability of on-line materials.

In view of their reliability, it is assumed that the students frequently browse the source in Wikipedia and sometimes it is helpful, but does not serve as a determining factor in citation. Indeed, we can realize that Wikipedia was often used to clarify the meaning of the term, when we review the issue on the paper corresponding to the citation. It seemed that the students refer Wikipedia to search the terms and understand the outline, and then follow the reference pages to examine in detail. In accordance, the majority of the answers to the questionnaire on how they retrieve the materials were that they first tried to hit the source at Google and/or Yahoo by combination of the key words, and then follow the related sites. This technique is just taking advantage of the hypertext. Additionally, in some cases the reliability of Wikipedia is evaluated to almost even as compared to that of Encyclopædia Britannica®.

On the other hand, the sources of on-line knowledge communities are evaluated as less reliable than those of Wikipedia, although the ratio of actual citation for the papers is more than those on Wikipedia (12%). The cause of this phenomenon may be the difference in the description style of them. While the pages in Wikipedia are described in a style such as an encyclopedia, those in on-line knowledge communities are friendly and in a question and answer-style. There, the questions are more concrete and practical. In fact, we can often find issues pre-

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39
Fig. 4. Students' reliance on on-line materials categorized by information providers.

Fig. 5. Students' consciousness of information providers.

sumed to be an assignment at school.

As another category of the source, 8% of the citations were from the Web site provided by individuals, which was out of the choice in the questionnaire (Table 1). Although professionals such as doctors and pharmacists are included in this category, it is difficult to clarify the background of all the webmasters and its reliability.
Table 2. Representative answers from students for estimating reliability of the materials

- I judge the information to be reliable, when the similar descriptions are found in more than one Web site.
- I reject the evidently improper information by comparing more than one and judging from my knowledge.
- I trust on technical books and textbooks without doubting. The materials on the Web, such as Wikipedia, I compare more than one.
- I check whether the proper attribution is given.
- I accept the materials when I can reach to the off-line materials from the on-line materials. I hardly cite the material if I can find it in only one source.
- I think that the information provided by an institution, such as university and the manufacturer is reliable, and much more when the references are given.
- I trust the material when the proper attribution is given. As for the information provided by individual and on-line knowledge community, I just take it as an aid for searching, but do not cite as it is.
- I think the materials provided by professionals are more reliable than those by common people.
- I can trust the Web page provided by such as academic societies, but I examine the page by knowledge community more carefully to evaluate the reliability.

Fig. 6. Frequencies of comparing more than one document.

In the matter of consciousness that what kind of provider contributes to the materials, 71% of the students replied that they are aware of and recognizing the source, in together of “always” and “rather” (Fig. 5). According to the free descriptions, most of them estimated the reliability of materials based on whether the proper attributions are given, and comparing more than one document (Table 2). Fig. 6 shows that exactly the half of the students always or often compared the materials from different sources. The remaining students replied “sometimes” compared the different documents and only one students answered “almost not”. This result suggests that the students at least have a recognition that comparing more than one document enhances the reliability of the material.

From the results described above, it is revealed that our students refer to the on-line and off-line materials in a good balance on preparing the papers. They utilize on-line materials being well conscious of the information providers and their reliability, and comparing more than one source. The author
thinks that it is necessary to instruct the rules and the role of citation in academic papers in future.

**Conclusion**

Citation of on-line materials for the students’ papers was slightly over half of the total, off-line materials were referred and cited with nearly the same frequency. The category of the most cited sources was technical and product information by manufacturers, followed by the site provided by academic, public, and clinical institutions. In the case of Wikipedia, although it was frequently referred as well as manufacturers sites, actual citation and students’ trust were low. From these results, it was revealed that the students refer the on-line and off-line materials in a good balance and are well conscious of information providers and their reliability. The students do not cite materials unreasonably. It will be necessary to instruct the rules of citation in future.

**References**