QUANTITATIVE AND QUALITATIVE ANALYSIS OF CONTRIBUTED OPINIONS IN A LEARNING TOOL IN HERBAL MEDICINE

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Abstract- Learning herbal medicine is an important part in pharmacy curriculum. In Thailand, traditional medicine has been derived from several cultures, e.g., traditional Indian medicine (Ayurveda) and traditional Chinese medicine. Practitioners including pharmacists need knowledge of herbal medicine. With a limitation of time, it is hard for a student to familiar with several medicinal herbs. To increase understanding in herbal medicine, a multi-lingual and multi-cultural learning tool for herbal medicine should be established. In this paper, KUIHerbRx2015, a Web-based supplement learning tool on herbal medicine, is introduced. The KUIHerbRx2015 supports a collaborative learning to improve knowledge and skills in multi-cultural herbal medicine with a scientific method. Activities of collecting, contributing new opinions, vote to existed opinions, and providing useful information to the system, were proposed to learn herbal medicine. Moreover, quantitative and qualitative analysis of contributed opinions from students, are evaluated. From the results, students can provide adequate information to the system. However, methods for inputting multi-lingual herb names and quality of references should be improved.

Keywords- Collaborative Learning, Herbal Medicine, Learning Tool, Quantitative Analysis, Qualitative Analysis

I. INTRODUCTION

Herbal medicine is a part of traditional medicine, which is set as important products on healthcare system. Beside the western medicine, Traditional Thai medicine (TTM) has been influenced by several cultures, especially from China and India, has also been frequently used in Thailand. Pharmacists including other healthcare professionals now need basic knowledge of these topics for their professional practices [1, 2]. However, it is hard for a student to familiar with medicinal herbs with a limitation of time for study. Due to some special characteristics of herbal information, e.g., herb names and their medicinal usages, these may be distinct according to their cultural background. These data should be contributed by contributors from different regions. With Web 2.0 system, it provides an opportunity for sharing information from a group of members on a topic of interest [3, 4]. The Knowledge Unifying Initiator for Herbal Information (KUIHerb), a system for collective intelligence on herbal medicine, is used as a platform for building a Web community for collecting the intercultural knowledge [5]. The KUIHerb has been collected information from its members for a period of time. Therefore, at least four reasons that it is not suitable to use as a learning tool. Firstly, it has only a little room for students to share their new opinions. Secondly, information provided by members in KUIHerb may be from their experiences while pharmacy students should contribute herbal information related with scientific evidences. Thirdly, herb names should be given in several languages, especially English and languages which are frequently used in the Southeast Asian countries. This feature is not implemented in the KUIHerb. Finally, several errors in content may occur during the learning process. The consequent is that members and visitors of the KUIHerb, may receive incorrect information. In this paper, we present an idea for building a new and clean Website based on the KUIHerb and use it as a Web-based and social network learning tool on herbal medicine, which is called KUIHerbRx2015. Information of herbs in several regions can be distributed and exchanged among groups of students. Information about herb names are collected in Thai local names and multi-lingual names. Regions of applying the name and methods of assigning the name, can be input. Furthermore, opinions given to the KUIHerbRx2015 should be evidence-based opinions. To support this concept, a set of reliable references should be suggested. The quantitative and qualitative evaluations are done to proof contributions from students.

In the rest of this paper, the detail of herbal information is described in Section 2. Section 3 presents the concept of the KUIHerbRx2015, a learning tool in herbal medicine. Section 4 gives the experimental settings. The experimental results are discussed in Section 5. A conclusion and future work are made in Section 6.

II. HERBAL INFORMATION

Information about medicinal herbs is also called herbal information. Several topics are included in herbal information, e.g. herb names by scientific and multi-lingual names, indications of herbs, how to used them, precautions and toxicity, images of herbs. In a pharmacy curriculum, a series of courses about herbal medicine are arranged. Due to a limitation of

time, it is hard for a student who living in a city or urban area to familiar with medicinal herbs. Normally, students learn herbal medicine in both lecture and practice classes. Some topics such as name identification and medicinal uses, which may be different among cultures, are still problems. Another way to make students familiar with herbs, they should see the whole plant and take pictures of those plants in both whole plants and their parts used. The scientific name of an herb and its images are used for common understanding. However, scientific names are not usually used as common term in communication between healthcare professionals and patients. In Thailand, Traditional Thai Medicine (TTM) has been developed for a long time. Besides the TTM, Traditional Chinese Medicine (TCM) is also popular in Thailand. In a Chinese drug store, the names of crude drugs are called in Chinese languages, normally in Chaozhou (Tewchew) dialect. However, the standard dialect of Chinese languages, Mandarin, is increasing in popularity among this region [8]. Only two alphabets are usually used in Thailand, i.e., Thai and English. Therefore, names of herbs and crude drugs are presented in Thai, English or Latin and/or transliterated into Thai and English. Some problems occur when names of these herbs and crude drugs are in other languages, e.g, Chinese. The name in Chaozhou and Mandarin dialects are still important to use for identifying a Chinese herb or a crude drug. However, it is hard for a new generation pharmacist to recognize herbs or crude drugs with these dialects. At this moment, pharmacy students should be studied more about herbal medicine. Due to Asian Economic Community (AEC) will be coming, students may be faced with a harmonized healthcare system. For raw material about herbs and herbal products, students should be able to understand their names in several languages. Traditional and modern applications of herbal medicine for each country should be studied. Moreover, information in herbal medicine provided to professionals and patients should be based on scientific evidences.

III. KUIHERBRX2015: A LEARNING TOOL IN HERBAL MEDICINE

At present, the first version of KUIHerb, has collected herbal information for seven years. The structure of KUIHerb is very valuable. We can establish a new and clean Website and use it as a learning tool for herbal information creation. This KUIHerb's version, which is used as a tool for a supplement learning herbal medicine, is called KUIHerbRx2015. Three types of information creation, i.e., initial, voting and non-voting types, are constructed in the Website.

3.1. Initial Type

Initial information is created and provided by professors. Three topics are initialized, i.e., scientific and general names (both Thai and English), general characteristics (except for some herbs) and references. Professors select a set of medicinal herbs and assign some of them to students.

3.2. Sharing Opinions with Voting System

The voting mechanism is widely used to improve accuracy of the system such as in [9]. For more accurate information, only registered students (and administrators) of the system are able to contribute and modify their opinions. A set of higher weight opinions for each topic, tends to be more believable. Three topics are applied by voting system, i.e., local names, medicinal usages and images of herbs. The voting system for local names and medicinal usages is explicit. It is represented by a voting score. A member can vote once for each opinion. On the contrary, a voting system for herb image is an implicit hit counter. It is applied for summarizing the frequency of zoomed images by members. Therefore, a member may give several hits for an image. When data from these topics has been collected for a period of time, several data mining techniques, e.g., association rules [10], may be applied for finding valuable knowledge in herbal medicine.

1) Local Names and Multi-lingual Names

Information is usually used for identifying an herb is usually the scientific names and its pictures, which can be used for identification. However, local people know an herb with its local names. Name confusion may cause several serious problems. The thing should be kept in their mind is that an herb may have several names for each naming system and one name may be referred to several herbs. The relationship between herbs and their names is many-to-many. The KUIHerbRx can be used as an excellent tool for gathering local names and multi-lingual names. These terms can be applied in an herbal dictionary that is useful for herbal search engine.

The modified version of KUIHerb, namely, KUIHerbRx2015, is used as a learning tool for pharmacy students to share multi-lingual and multi-cultural herbal information. Multi-lingual script can be applied on all topics. However, the topic of herb names, is modified to be able to input herb names in multiple languages with a systematic pattern. Top 50 most widely spoken languages were used. Although Laos and Khmer (language of Cambodia) languages are not in the top 50 languages, they were added into the system due to the language in ASEAN. Four methods of inputting are defined with the example of an herb with the scientific name is Glycyrrhizza glabra:

• Characters: this method presents the herb name (common names, local names) by alphabets of its language, e.g., ชะเอมเทศ in Thai, licorice in English and 甘草 in Chinese characters.

• Romanization: the Hanyu Pinyin has been used officially to Romanize Mandarin, which is often used

to write the herb name in Mandarin dialect, e.g., Gan Cao.

• Transliteration: this is a method for conversion of a text from one language to another. In Thailand, it is usually used for converting Chinese characters to Chaozhou dialect in Thai characters, e.g., 甘草 (Chinese characters), is transliterated to กำเช่า (Chaozhou dialect in Thai characters).

• Combination: this method is the combination of three methods, mostly, characters with transliteration to Thai or English in order to help users to pronounce words correctly, e.g., 甘草 (กำเช่า).

2) Medicinal Usages

This component is composed of parts used of an herb, indication and how to use for this indication. Medicinal uses may be different among cultures. For example, the aqueous extract of Tinospora crispa is used for treatment of stomach trouble, diarrhea and indigestion for Filipinos and Malays [11]. In Thailand, the decoction from its stems, leaves and roots is used to treat fever, cholera and etc. The KUIHerbRx2015 is used for pharmacy students who concern to create link between beliefs of the communities to scientific methods. From this reason, opinions are given here should cite to reliable sources of information, e.g., scientific research, standard textbooks and information from the Internet. References can be given in the tab of References. Although information from articles in journal and books is more reliable than documents from the Internet, some websites publish reliable sources [12] and can be used for references.

3) Images of Herbs

In this system, images of an herb can be uploaded to the system. To make these images more reliable, keywords and contributors' names should be given to the system. Contribution of images was optional due to the fact that it is hard to find several herbs in the local area. Moreover, some parts of plants may be difficult to take the photo, e.g., root, flowers and fruits.

3.3. Sharing Opinions with Non-Voting System

Topics of precaution/toxicity and additional information are separated from the others. These are. These two topics are free text without majority voting. For a precaution, any suggestions will be kept for warning when someone would like to use the herb. For additional information, other valuable information such as cultivation may also be given.

3.4. References for Each Opinion

This space can be applied for suggesting references for an opinion in order to make the opinion more reliable. In KUIHerb, this topic is allowed only an administrator. However, students can access this topic in KUIHerbRx2015. When students contribute their opinions in other topics, each component should be cited by a set of reliable information sources, e.g., scientific research paper, standard text books, and etc.

IV. EXPERIMENTAL SETTINGS

To evaluate contributions from students, the third year pharmacy students in faculty of pharmacy, Silpakorn University that registered the course "health informatics" in the academic year of 2014 (Jan, 2015 to May, 2015), were assigned to contribute their opinions in KUIHerbRx2015. The number of students was 166. The KUIHerbRx2015 was initialed with information of 911 herbs. The 200 herbs began with information on all topics to use as samples. The rest were initialed in topics of scientific name, English names and general characteristics (for some herbs). Three assignments were given to students: 1) each student was an initiator on two herbs (assigned by a professor) in all topics (herb image is an optional) as much as possible and was a participant for at least one herb (can vote or input their opinions) 2) short descriptions of two herbs that were previously mentioned were summarized and 3) the student should do the questionnaire about the KUIHerbRx2015. Only the first assignment is discussed in the paper. The students were encouraged to contribute local names in Thai and multi-lingual names especially, languages in ASEAN. Opinions provided to the KUIHerbRx2015 should be evidence-based information and avoid copyright violations.

V. RESULTS AND DISCUSSION

5.1. The KUIHerbRx2015

The homepage of the KUIHerbRx2015 composes of four components, i.e., information access, information providing, Website's statistics and information sharing. For information access, information of an herb can be reached by two methods i.e., keyword search and directory search. The KUIHerbRx2015 provides the ability to keyword search by using a Thai common name, a local name (in Thai and other languages), an English name, a scientific name of an herb, a family name as well as an indication. It also provides the ability to browse categories of part used and symptom.

In KUIHerbRx2015, seven topics are taken into account, i.e., general characteristics, pictures, local name, medicinal usages, precaution/toxicity, additional information (extra information) and references. Among these topics, a voting system is implemented on local names, medicinal usages and herb images. A student may choose to work individually by posting his/her opinions about those topics. Any opinions or suggestions are committed to voting. In this version, all members are given equal weight. If other students agree with the opinion, a simple click on the button "Vote" will increase the score by one. The opinion with higher score will be moved up to upper part of the window. The other

three topics are separated from the others. These are precaution/toxicity, additional information and references. These three topics are free text without majority voting.



Fig.1. Multi-lingual herb names can be added into the KUIHerbRx2015.

Each student was assigned to be a member of the system. Therefore, he/she could contribute and modified his/her opinions. Information or opinions given to the KUIHerbRx2015, should be supported by reliable references. Students were assigned to contribute opinions in five topics, i.e., herb names, medicinal usages, precaution/toxicity, additional information and references. The contribution of herb images was an optional because it was hard to find some herbs in the local area. Moreover, some parts of herbs might appear in short period of time, e.g., flower and fruit. However, images of herbs have been transferred from the KUIHerb to the KUIHerbRx2015. Figure 1 presents contributed local names with several languages and methods of inputting. A popular Website for multi-lingual herb names is "MULTILINGUAL MULTISCRIPT PLANT NAME DATABASE" from the University of Melbourne, Australia. It was usually used as a source of multi-lingual herb names.

5.2. Quantitative Analysis of Contributed Information from Students

The 166 third year pharmacy students (academic year of 2014) were assigned to contribute their knowledge in a scientific evidences. The result is shown in Table 1. Two patterns of statistics are taken into account, i.e., the total opinions and the total herbs. The total opinion (Opinion) is the numbers of opinions contributed from the students for each topic. The total herb (Total Herb) is the numbers of herbs that students provide information for each topic. Moreover, the numbers of herb names in top ten languages are shown in Table 2.

Table 1: Distributions of contributed information from students

Topic	Opinion	Total Herb
Local and Multi-lingual Name	2516	341
Medicinal Usage	2913	338
Precaution/Toxicity	335	203
Additional Information	409	282
References	590	204

Table 2: Distributions of herb names in top ten languages

Language	Number of Herb Names
Thai	7675
English	445
Chinese	199
Malay	123
Vietnamese	105
Japanese	103
French	83
Spanish	57
German	52
Russian	41

From the results, some observations can be made. The students can collaborative work and contribute knowledge on all topics. Topics of medicinal usage as well as local and multi-lingual names were the most and the second contributed knowledge, respectively. Several references in herbal medicine had been suggested. For local and multi-lingual names, a large number of names were given in Thai and other languages. From the Table 2, English and Chinese names are commonly used in Thai. For other ASEAN languages, Malay and Vietnamese are also frequently found. Due to the fact that pharmacy students do not have strong background in linguistics, some patterns of herb names in other languages, were provided but not a consistent pattern. We will analyze these patterns in the next experiment. Several suggestions about precaution/toxicity and additional information were also contributed. The results indicated that students could contribute adequate information to the KUIHerbRx2015. However, qualitative analysis would be done on the next experiment.

5.3. Qualitative Analysis of Contributed Information form Students

In order to assess quality of contributions from students, 20 herbs were randomly selected. Two analysis were done. Firstly, the correctness of the method of inputting herb names (herb names in scientific name, SCI Name) was evaluated and the result is shown in Table 3. For example, Jasminum officinale was contributed 12 names. However, 10 names were correctly assigned the inputting method. The numbers of correct and incorrect inputting methods of herbs with scientific names, were reported, respectively. Secondly, the numbers of references contributed to each topic for each herb and the types of references are also analyzed and reported. Three types of references were applied, i.e., journal, book and other types of documents which can be retrieved from the Internet. The result is shown in Table 4.

Table 3: The Correctness of the method of inputting herb names.

SCI Name	#Correct	#Incorrect
Barleria strigose	1	0
Bridelia ovate	3	2
Cerbera manghas	9	1
Ficus elastic	7	6
Jasminum officinale	10	2
Lepidagathis incurve	0	6
Litsea cubeba	3	5
Mammea siamensis	2	0
Melia azedarach	8	0
Phyllanthus pulcher	1	0
Pothos scandens	0	1
Strychnos nux-vomica	5	2
Syzygium jambos	3	2
Tectona grandis	0	1
Thunbergia laurifolia	4	0
Trianthema portulacastrum	1	0
Trichosanthes anguina	8	2
Vatica diospyroides	3	1
Vitex glabrata	4	7
Percentage	**65.18**	**34.82**

CONCLUSIONS AND FUTURE WORK

In this work, the KUIHerbRx2015 was used as a Web-based supplement learning tool in herbal medicine to improve knowledge and skill in herbal medicine with a scientific method and support multi-lingual and multi-script herb names. Several topics were assigned to students, e.g., local and multi-lingual names, medicinal usages, precaution/toxicity, additional information and references. Activities of collecting, contributing new opinions or vote to exist opinions, and providing comments to the system, enhanced skill in herbal medicine. Students gained more experience on herbal medicine.

Both quantitative and qualitative contributions from students were evaluated. For quantitative evaluation, students could provide information on all topics. Several main languages used in ASEAN including English and Chinese, were also provided. Skill in searching information using traditional method such as books or modern technology such as the Internet, was improved.
According to our results about qualitative evaluation, methods of assigning languages should be improved. The new ways for explanation to gain more understand, should be used. For references of contributed opinions, more reliable sources of information, i.e., journals and standard text books should be more concerned. These will be implemented for our future work.

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SCI Name	Indication	Precausion /Toxicity	Additional Information	References		
				Journal	Book	Website
Barleria strigose	6/6	1/1	2/2	0/5	0/5	5/5
Bridelia ovate	5/5	1/1	1/1	0/4	0/4	4/4
Cerbera manghas	6/12	3/3	4/4	0/5	1/5	4/5
Ficus elastic	2/2	2/2	2/3	0/5	0/5	5/5
Jasminum officinale	17/17	1/1	2/2	0/4	0/4	4/4
Lepidagathis incurve	0/3	-	0/1	0/5	0/5	5/5
Litsea cubeba	5/7	-	0/1	0/4	0/4	4/4
Maclura cochinchinensis	5/5	-	0/2	0/2	0/2	2/2
Mammea siamensis	13/13	1/1	0/1	1/5	3/5	1/5
Melia azedarach	7/7	1/1	3/3	0/2	0/2	2/2
Phyllanthus pulcher	6/6	-	1/1	0/2	0/2	2/2
Pothos scandens	0/1	-	-	0/1	1/1	0/1
Strychnos nux-vomica	24/24	1/1	1/1	0/4	0/4	4/4
Syzygium jambos	0/10	0/1	-	0/1	0/1	1/1
Tectona grandis	0/1	1/1	-	0/1	0/1	1/1
Thunbergia laurifolia	1/1	3/3	1/1	0/4	1/4	3/4
Trianthema portulacastrum	4/4	1/1	1/1	0/1	0/1	1/1
Trichosanthes anguina	4/4	2/2	1/1	1/2	0/2	1/2
Vatica diospyroides	5/5	-	0/2	0/3	0/3	3/3
Vitex glabrata	9/15	-	2/2	5/15	5/15	5/15
Total	**119/148**	**18/19**	**21/29**	**7/72**	**10/72**	**55/72**
Percentage	**80.41**	**94.74**	**72.41**	**9.72**	**13.89**	**76.39**

Table 4: The reliability of contributed opinions

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