New Dynamic Interaction Game-based Learning Tool for Chinese Medicine

Yiu On LI, Head of Systems Section,
Lisa SONG, Head of Chinese Medicine Library,
Hong Kong Baptist University Library
Outline

I. Introduction
II. Development and Achievements of HKBU CM Digitization Projects
III. Strength and Weakness of using Static Databases for Teaching and Learning
IV. Special Features of CM Game-based Exercise
V. Conclusions
Summary

• The idea of game-based learning is very common in most teaching community nowadays, yet the use of games to facilitate learning and teaching is still a new attempt in an historic discipline like Chinese Medicine (CM).

• This presentation will share our experience on the design and implementation of the new online Chinese Medicine Game-based Exercise by the School of Chinese Medicine, and Library, Hong Kong Baptist University.
I. Introduction
1. What is Chinese Medicine (CM)

- Chinese Medicine (CM) is a health care and medical practices developed in China.
- CM have a history of over 2,200 years and has been recognized as one of the world’s oldest medical systems.
- In recent years, different disciplines have conducted studies and research to analyze and explain CM practices and knowledge through modern scientific theories.
2. Hong Kong Baptist University (HKBU)
   a. Established in 1956
   b. Offers undergraduate, taught postgraduate and research postgraduate programmes leading to Masters or Ph.D. degrees
   c. HKBU is in the top 100 universities in Asia, according to the new published university ranking reports:
      ◆ *Times Higher Education Asia University Rankings 2015*: 45th
      ◆ *QS University Rankings Asia 2015*: 51th
3. School of Chinese Medicine (SCM), HKBU

a. Established in 1999

➢ is the **first government funded** institution that providing **undergraduate, master and doctoral** degree programs in CM and pharmacy in Hong Kong.

**Question:** Any ranking reports for SCM?

**Answer:** No, I can only show Facts and Figures of SCM
### 3b. SCM – Facts and Figures

#### Students

<table>
<thead>
<tr>
<th>Undergraduates</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor of Chinese Medicine and Bachelor of Science (Hons) in Biomedical Science</td>
<td>198</td>
</tr>
<tr>
<td>Bachelor of Pharmacy (Hons) in Chinese Medicine</td>
<td>72</td>
</tr>
<tr>
<td>Taught Postgraduate</td>
<td></td>
</tr>
<tr>
<td>Master of Chinese Medicine</td>
<td>116</td>
</tr>
<tr>
<td>Master of Pharmaceutical Sciences in Chinese Medicine</td>
<td>42</td>
</tr>
<tr>
<td>Research Postgraduate</td>
<td></td>
</tr>
<tr>
<td>Master of Philosophy (MPhil)</td>
<td>6</td>
</tr>
<tr>
<td>Doctor of Philosophy (PhD)</td>
<td>37</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>471</strong></td>
</tr>
</tbody>
</table>
3b. SCM – Facts and Figures

- Teaching and Research Faculty

<table>
<thead>
<tr>
<th>Academic and Teaching Staff</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Professor</td>
<td>5</td>
</tr>
<tr>
<td>Associate / Assistant Professor</td>
<td>10</td>
</tr>
<tr>
<td>Lecturer</td>
<td>44</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Research Staff</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Associate Professor</td>
<td>14</td>
</tr>
<tr>
<td>Post-doctoral Research Fellow</td>
<td>12</td>
</tr>
<tr>
<td>Visit Scholar</td>
<td>13</td>
</tr>
<tr>
<td>Research Associate / Research Assistant</td>
<td>29</td>
</tr>
</tbody>
</table>

**Total**                                          **127**
3b. SCM – Facts and Figures

- Chinese Medicine Library

<table>
<thead>
<tr>
<th>Collections</th>
<th>vols</th>
</tr>
</thead>
<tbody>
<tr>
<td>Book and Bound Journal</td>
<td>37,191</td>
</tr>
<tr>
<td>Serials Title</td>
<td>394</td>
</tr>
<tr>
<td>AV Materials</td>
<td>3,862</td>
</tr>
</tbody>
</table>
3c. SCM – Mission and Vision

- In addition to providing CM quality higher education teaching programmes, one of SCM mission is “striving to promote the modernization and internationalization of Chinese medicine in teaching, research, clinical service and technology”


- Modernization and internationalization are the basis of our CM Digitization Projects
II. Development and Achievements of HKBU CM Digitization Projects
1. SCM Digitization Project – Mission

- In viewing of the limited numbers of open access and Chinese-English bilingual CM databases on the web, SCM has collaborated with the Library to implement the Chinese Medicine Digital Project since 2006.
1. SCM Digitization Project – Mission

- The aims of developing these CM databases and digitization projects are:
  
i. to enhance teaching, learning, and research activities in SCM;

ii. to provide convenient e-learning tools for CM learners, practitioners, and researchers around the world to pursue self-study and life-long education;

iii. to advocate the free open access to digitized CM research information;

iv. to advance the popularization and internationalization of CM study and research through new computer technology.
2. CM Databases

Since 2006, SCM and Library has collaborated to design and implement 4 image databases

http://library.hkbu.edu.hk/electronic/libdbs/cml_dbs.html
II. SCM Digitization Projects

2a. CM Specimen Database

**HKBU Chinese Medicine Specimen Center**

- “the only specialized and professional exhibition center showing a treasure of precious and rare Chinese medicine in Hong Kong”
2b. Medicinal Plant Images Database (MPID)

Contains **1159 medicinal plants** and provides

- With high-quality plant photos taken by Prof Chen HuBiao of SCM
- Identify the plant family genus, use and effect of special plants for the treatment of particular diseases
**Latin Name**  *Saussurea medusa* Maxim.

**English Name**  Medusa Windhairdaisy, Medusa Saussurea

**Family & Genus**  Asteraeae, *Saussurea*

**Description**  Perennial herb, 8-15cm high. Rhizome slender, rosette originates from neck, with brown remnant petiole. Stem covered with arachnoid tomentum, erect. Leaves crowded, basal leaves ovate rhombic or oval shape, upper edge with 8-12 coarse teeth, apex obtuse; upper leaves ovoid lanceolate, white lanose; the leaves on the top linear-lanceolate or linear, margin denticulate or laciniate. Capitulum numerous, sessile, dense to become globose at the stem ends; involucre 10-15cm long, candelabra; outer layer of involucral bracts purple, linear oblong, with white or brown tomentum; inner layer oblanceolate; corolla purple, ca. 12mm long. Achenes, 8-9mm long, linear fusiform; pappus white, inner layer plumose. Flowering: July to August, fruiting: August to September.

**Distribution**  Growing on grovel slopes or rock patch of mountains at altitude 4,100-4,800m. Distributed in Gansu, Qinghai, Sichuan, Yunnan, Tibet and etc. The medicinal materials are mainly produced in Qinghai, Gansu, Sichuan, Yunnan, Tibet and etc.

**Part Used**  Medical part: whole plant with roots. Chinese name: Xuelianhua.

**Harvest & Processing**  Excavated the whole plant in June-July per year when flowering, removed earth and air-dried.

**Chemistry**  Aboveground parts contain chrysoeriol-7-O-b-D-glucoside, apigenin-7-O-b-D-glucoside, and saussurea polysaccharide, etc.

**Pharmacology**  Anti-inflammatory, pain-killing, pregnancy interrupting and uterus-exciting.

**Properties & Actions**  Sweet, little bitter, warm. Warming kidney and invigorating yang, regulating menstruation and relieving hemorrhage.

**Indications & Usage**  Impotence, relative weakness in the loins and knees, leukorrhea, irregular menstrual periods, rheumatic arthralgia, hemorrhage caused by trauma. Oral administration: decocting, 6-12g; or made as medicinal liquor. External application: appropriate amount, smashed for applying.

**Examples**  1. Snow blindness, toothache: medusa windhairdaisy 6-12g. Eat freshly, or decoct in water and swallow.
   2. Traumatic hemorrhage: an appropriate amount of medusa windhairdaisy. Apply to the affected lesions.
   3. Asthenia and dizziness, tinnitus and blurred vision: whole herb of medusa windhairdaisy 9-15g, decoct and swallow 2-3 times a day.

Permanent URL: http://libproject.hkbu.edu.hk/was40/detail?lang=en&channelid=1288&searchword=herb_id=000701
2c. Chinese Medicinal Material Images Database

Contains **420 crude drugs** commonly used in CM practice, and provides

- High-quality annotated photos to illustrate and identify key properties and microstructures of the drugs
- Detail drug information, including source, origins, descriptions, quality, taste, and clinical indications
II. SCM Digitization Projects

2d. Phytochemical Image Database

Contains **200 bioactive phytochemicals**, and provides:

- Information, methods of sample preparation and quality analysis
- **UV / IR / MS / NMR** spectra images

*Phytochemical* = chemical compound found in plants which have health benefits in humans
**Name**: 1,3,5,6-Tetrahydroxy-7-(3-methylbut-2-enyl) xanthone

**Appearance**

**CAS No.**: 1080533-32-9

**Formulae**: C_{11}H_{15}O_6

**Molecular Weight**: 328.316

---

**Natural Resources**: *Garcinia xanthochmum* Han. Y. Li

**Identification**

**UV**

**MS**

**H NMR**

**13C NMR**

---

**Analytical Method**: UPLC-MS²

**INSTRUMENT**: Waters ACQUITY UPLC™ system (Waters Corp., MA, USA)

**COLUMN**: Waters ACQUITY BEH C₁₈ column (50 mm x 2.1 mm, 1.7 μm, Waters Corp., Ireland), 10°C

**MOBILE PHASE**: A. 0.1% formic acid in water, B. acetonitrile containing 0.1% formic acid, 0-0.5 min 50% B, 0.5-3 min 70% B, 3-6 min 70-85% B, 6-9 min 80-95% B, 9-10 min 95% B, 10-11 min 95 to 100% B, 0.3 mL min

**DETECTION**: UV 3310 nm, Waters Q-TOF Premier (Micromass MS Technologies, Manchester, UK) operating in positive ion mode, nebulization gas: 600 l/h and 300°C, cone gas: 50 l/h, source temperature: 80°C. The capillary voltage: 2700 V, cone voltage: 45 V, collision gas: argon 5.3 x 10⁻⁴ Torr

3. SCM Digitization Projects -- Achievements

- I believe that we have done a good promotion work on the modernization and internationalization of Chinese medicine in teaching, research, clinical service and technology

**Question:** Any evidence?

**Answer:** Yes, we hope the following three indicators can serve as proof
3a. High Usage from all around the World

- MPID Website Traffic Statistics since 1 Jan 2012 (log by Google Analytics, [http://lib-linux2.hkbu.edu.hk/ga/MPID_index.php](http://lib-linux2.hkbu.edu.hk/ga/MPID_index.php))
  - 2,221,622 pageview (i.e. 1,766 pageview per day)

- This usage is the highest among all in-house databases developed by HKBU Library

- More importantly, the users are not restricted to HKBU students, nor limited in Hong Kong, indeed the majority are coming from over 200 countries/regions all around the world
3a. High Usage from all around the World

- Top 10 country/region

<table>
<thead>
<tr>
<th>Country</th>
<th>Sessions</th>
<th>% Sessions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Hong Kong</td>
<td>142,250</td>
<td>29.56%</td>
</tr>
<tr>
<td>2. Taiwan</td>
<td>129,305</td>
<td>26.87%</td>
</tr>
<tr>
<td>3. China</td>
<td>106,520</td>
<td>22.13%</td>
</tr>
<tr>
<td>4. United States</td>
<td>31,902</td>
<td>6.63%</td>
</tr>
<tr>
<td>5. Canada</td>
<td>9,311</td>
<td>1.93%</td>
</tr>
<tr>
<td>6. Malaysia</td>
<td>9,057</td>
<td>1.88%</td>
</tr>
<tr>
<td>7. Australia</td>
<td>5,738</td>
<td>1.19%</td>
</tr>
<tr>
<td>8. Singapore</td>
<td>5,143</td>
<td>1.07%</td>
</tr>
<tr>
<td>9. Germany</td>
<td>4,144</td>
<td>0.86%</td>
</tr>
<tr>
<td>10. Macau</td>
<td>3,809</td>
<td>0.79%</td>
</tr>
</tbody>
</table>
3b. ALA Presidential Citations for Innovative International Library Projects Award

- We are very pleased to receive this internationally renowned award from the American Library Association in 2012
  - ALA is a non-profit organization based in the United States that promotes library services, library education and librarianship internationally
  - is the oldest and largest library association in the world
  - Founded in 1876, with more than 62,000 members
The ALA press release states: “While the (Chinese Medicine) databases were designed to improve teaching methods and effective use of these plants and herbs, making this information available for free via the Internet has historic and limitless benefits for medical providers and researchers across the globe”
3c. HKBU Non-teaching Staff Team Award

- This Award is presented under the Reward and Recognition Scheme for Non-teaching Staff for the first time in 2013
- is recognizing the endeavors of non-teaching colleagues who have made significant contributions in support of achieving the University’s strategic goals
“The Panel believes that in the Chinese Medicine Digital Project, the team fostered strong collaboration between academic and non-teaching staff. Making the best use of existing resources, the team made an impact on the teaching, learning and research of Chinese Medicine both within the University and throughout the world”

-- HKBU eNews, 27 May 2013
III. Strength and Weakness of using Static Databases for Teaching and Learning
1. Good Work ≠ Perfect Work

- The Awards mentioned here are only used to prove that we have done *a good promotion work in the past years* on the modernization and internationalization of Chinese medicine in teaching, research, clinical service and technology.

- We believe educators will generally agree that *good work* are never equal to *perfect work*.

- Our challenge is: *how to enhance our work to become more perfect*
  - Provide better and newer services
  - Endless Work
III. Strength and Weakness

2. Enhancement Strategies

- For enhancement, inadequacy identification is more important than concentrating on the past strength.

1. Review and Reflect
2. Identify Inadequacy / Weakness
III. Strength and Weakness

3. Weakness of SCM Digitization Project

*Traditional static databases lack of*

**i. Personalization**

- user personal linking are not provided
  - personal linking is vital to increase students' sense of ownership in the education process

**ii. User Interaction**

- databases can only provide one-directional service, user preference are not allowed
3. Weakness of SCM Digitization Project

*Traditional static databases lack of*

**iii. Self-assessment / Self-evaluation**
- databases are closed systems, learning initiative and motivation are neglected

**iv. Learning from Errors**
- users are limited to the passive viewing of content, dynamic user input are prohibited → unable to help users to check and detect their mistakes
3. Weakness of SCM Digitization Project

*Traditional static databases lack of*

v. Peer Group Review and Experience Sharing

- multi-user interaction and participation as well as social networking needs are not entertained

vi. Classroom Evaluation and Measurement

- databases fail to provide an immediate and easy tool to measure and discover students’ knowledge level
  - vital factor for teachers to adjust teaching methods and strategies
3. Weakness of SCM Digitization Project

Traditional static databases lack of

vii. Making Learning with Fun

- Education should not be boring, rather be challenging and full of fun
III.  Strength and Weakness

4. Transformation

- Known weakness/problems are broken down into small sub-problems
- Suggest effective methods to resolve sub-problems individually
- Finally, we come to our new product:

1. Review and Reflect
2. Identify Inadequacy/Weakness
3. Divide and Conquer Algorithm
Chinese Medicine Game-based Exercise aims to utilize and integrate the data from our existing Medicinal Plant Images Database. The innovative and flexible online platform enhances the interaction and communication among the students for the self-assessment purpose in their teaching & learning process.

http://lib-nt2.hkbu.edu.hk/cmgame/user.asp?realtime_lang=eng
IV. Special Features of CM Game-based Exercise
1. Computer–generated Questions

- All the questions of the CM Game-based Exercise are taken from Medicinal Plant Images Database
- A computer program is designed to convert the database fields into different types of questions automatically
- A total of **17,364** questions are generated
- These questions cover all important aspects of medicinal plants, e.g. how to identify the plant’s Latin name, English name, Family & Genus, use and effect of special plants for the treatment of particular diseases
1. Computer–generated Questions

Examples of questions on plant photos

- Given a plant photo, to identify the plant name
- Given the plant name, to identify the plant photo
What is the plant name of the following picture?

A: Polirel Barberry
B: Chinese Incarvillea
C: Septemlobate Kalopanax
D: Lavender Sorrel
IV. Special Features

Which one of the following is Catnip?

A.

B.

C.

D.
2. Self-motivated Learners

- Based on their preference, study needs and learning objectives, users are flexible to select different question types and levels for testing their understanding and revisions.
3. Automatic Marking and Reporting

- All the answered questions will be marked automatically.
- Direct links to MPIID will be provided to verify the answer and facilitate further information checking.
IV. Special Features

What is the Latin name of *India Yellowcress*?

A. *Ficus variolosa* Lindl. ex Benth.  
B. *Scrophularia ningpoensis* Hemsl.  
C. *Cucurbita moschata* (Lam.) Poiret  
D. *Rorippa indica* (L.) Hiern  
Correct Answer!
4. Personal Account

- Users are free to register, and create their own personal accounts → *increase ownerships and sense of belonging*
5. Personal Exercise Grade Result Analysis Report

- Exercise Grade Report are saved on Personal Account for user
  - to monitor progress
  - to compare his attempted grade on a specific topic with other users
IV. Special Features

Personal Exercise Grade Result Analysis

Personal Paper ID: 005
Total No. of Questions: 5
Question Types: Picture
Levels: Basic
No. of Try: 1

Grade in percentage (Correct Answers / Total no. of Questions): 0% (0/5)

Correct

Incorrect

Question Type Grade Analysis Table

<table>
<thead>
<tr>
<th>No. of Try</th>
<th>1st Try</th>
<th>2nd Try</th>
<th>3rd Try</th>
<th>4th Try or above</th>
</tr>
</thead>
<tbody>
<tr>
<td>My Record</td>
<td>0% (0/10)</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>All Candidates</td>
<td>72% (469/650)</td>
<td>88% (22/25)</td>
<td>100% (5/5)</td>
<td>--</td>
</tr>
</tbody>
</table>
6. Game Replay

- If a user does not satisfy with the Grade of an Exercise, he can retake it.
IV. Special Features

7. Public Exercises

- Experience sharing and peer group discussions are always the effective ways to
  - get motivated to study
  - enhance learning performance

- Users are free to *share* their Personal Exercises with classmates and friends as a *challenge / for comparison*
  - “Can you get a 100 mark on this Paper?”
  - “Why did I fail?” → if he find his classmates get a lower mark, he will
Chinese Medicine Game-based Exercise - Sharing

Share and Invite by 3 clicks!

Personal Paper ID: 734
Total No. of Questions: 5
Question Types: Picture
Levels: Basic
No. of Try: 1

1. Share

2. Set password

Nickname: 现代李時珍
Create Date Time: 2015/05/26 16:45
Personal Paper ID: 734
Total No. of Questions: 5
Question Types: Picture
Levels: Basic

- Share with password, please enter password:
- Share without password

Invite Your Friends to Join!

Subject: Invitation for participating Chinese Medicine public examination
Question Types: Picture - Public Paper ID(37)

3. Five sharing methods
8. Instant Classroom e-Measurement

- In a classroom, lecturer can easily create a Public Exercise as a quick quiz to
  - test student understanding of the concepts
  - monitor study level

- Provide vital factor for teachers to adjust teaching methods and strategies
IV. Special Features

9. Learning (Playing) without Walls / Mobile Waves

- A site designed with the new Responsive Web Design
- Allow easy browsing and navigation with a minimum of resizing, panning, and scrolling
  - across a wide range of devices (from desktop computer monitors, tablets, to mobile phones)
- E-learners can play the Game from anywhere at anytime
- Lecture can set a Game for students from anywhere at anytime
  - No Boundaries, No Restrictions
IV. Special Features

![Image of digital devices with Chinese Medicine exercises](image-url)
V. Conclusions
1. New Solutions to Old Problems

- New features of CM Game-based Exercise can help to overcome the weakness of Traditional Static Databases that existing in the CM Digitization Project
### V. Conclusions

<table>
<thead>
<tr>
<th>Weakness of Traditional Static Databases</th>
<th>New Features by CM Game-base Exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Personalization</td>
<td>Personal Account</td>
</tr>
<tr>
<td></td>
<td>Personal Exercise Grade Result Analysis Report</td>
</tr>
<tr>
<td>2. User Interaction</td>
<td>Self-motivated Learners</td>
</tr>
<tr>
<td></td>
<td>Public Exercise</td>
</tr>
<tr>
<td></td>
<td>Automatic Marking and Reporting</td>
</tr>
<tr>
<td>4. Learning from Errors</td>
<td>Computer–generated Questions</td>
</tr>
<tr>
<td></td>
<td>Game Replay</td>
</tr>
<tr>
<td>5. Peer Group Review and Experience Sharing</td>
<td>Public Exercise</td>
</tr>
<tr>
<td>7. Making Learning with Fun</td>
<td>Learning (Playing) without Walls / Mobile Waves</td>
</tr>
</tbody>
</table>
2. Usage Statistic

- The CM Game-based Exercise is open to public on Jan 2015
- Total Usage is increasing steadily
- One interesting phenomenon is that it attracts more players from U.S. than Hong Kong since 1 Apr 2015
  - Americans like playing games than Chinese?

◆ Americans like playing games than Chinese?
### V. Conclusions

<table>
<thead>
<tr>
<th>Country</th>
<th>Sessions</th>
<th>% Sessions</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>770</td>
<td>33.62%</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>722</td>
<td>31.53%</td>
</tr>
<tr>
<td>China</td>
<td>195</td>
<td>8.52%</td>
</tr>
<tr>
<td>(not set)</td>
<td>163</td>
<td>7.12%</td>
</tr>
<tr>
<td>Germany</td>
<td>55</td>
<td>2.40%</td>
</tr>
<tr>
<td>Taiwan</td>
<td>44</td>
<td>1.92%</td>
</tr>
<tr>
<td>Japan</td>
<td>41</td>
<td>1.79%</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>39</td>
<td>1.70%</td>
</tr>
<tr>
<td>Russia</td>
<td>31</td>
<td>1.35%</td>
</tr>
<tr>
<td>Canada</td>
<td>18</td>
<td>0.79%</td>
</tr>
</tbody>
</table>
Thank You!

Q & A