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Conventional teaching of Traditional Chinese Medicine (TCM) is highly teacher-centered, in line with traditional views of the teacher as "master." This article focuses on how modern teaching concepts and technologies can enhance the teaching of TCM in Hong Kong, a city noted for a culture where "East meets West." The project described in this article concerns the development and use of a media-rich collection of electronic cases (eCases) for TCM students at The Chinese University of Hong Kong. Initially, the applicability of interactive teaching and learning strategies in TCM were explored in order to refine the design of the eCases. Detailed evaluations (student surveys and expert reviews) confirmed expected learning benefits and provided ideas for further enhancement. The findings are positive, suggesting that teachers and students welcome this innovation. "New" concepts and "old" subjects are not necessarily incompatible.

Traditional Chinese Medicine (TCM) has attracted worldwide attention in recent decades (Chen, Wang, & Zhao, 2004) as people are beginning to look for alternative means for health protection and disease treatment (Yang et al., 2002). Chinese herbs, acupuncture, and moxibustion have been demonstrated to be useful in the treatment of many kinds of diseases including irritable bowel syndrome (Lu, 1999), chronic liver and gastrointestinal diseases (Yang et al., 2002), and cancers (Ceniceros & Brown, 1998; Konkimalla & Efferth, 2007), as well as in maintaining a healthy body (Kim & Chan, 2004). In 1979 the World Health Organization recommended acupuncture as an effective therapeutic technique for 43 diseases (Ma et al., 2006). As a result of its popularity, TCM as an academic subject is now being taught in many universities and colleges worldwide.

As a medical discipline, TCM is a science with clear empirical elements. In order to accrue necessary clinical experience, TCM practitioners need to go through a lengthy period of clinical training in which they are involved in the treatment of an extensive number of clinical cases.

In the past, the traditional teaching of pre-clinical TCM was primarily teacher-centered and highly theoretical. The knowledge that students gained was transferred from teachers in formal lectures in a unidirectional, teacher-to-student fashion (Luo, Chen, & Chen, 2007; Li, 2007). This traditional way emphasized rote memorization, placed students in a passive mode, and separated theory and clinical practice (Su, Men, & Li, 2007). The need to enhance the quality of TCM teaching has been recognized for some time (Wang, Zhao, & Chang, 2007), and detailed discussion about introducing modern pedagogical ideas and applying innovative techniques have begun (Kuang, Yang, & Guan, 2007). A change in TCM teaching is deemed necessary to bridge the gap of this ancient yet vibrant discipline with the new needs of the learners in the twenty-first century (Chen, Wang, & Zhao, 2004).

At present, formal TCM undergraduate and postgraduate courses are offered by three universities in Hong Kong: The Chinese University of Hong Kong (CUHK), Hong Kong Baptist University (HKBU), and The University of Hong Kong (HKU). The practice and learning of TCM in Hong Kong has unique characteristics. TCM in Hong Kong is almost entirely separated from mainstream Western Medicine (WM) practice. Unlike in TCM hospitals in Mainland China, registered TCM practitioners in Hong Kong are not allowed to use WM techniques or equipment such as X-rays or stethoscopes in diagnosis (Wong & Woo, 2005). There is no dedicated TCM hospital in Hong Kong, and so TCM students in Hong Kong see a relatively limited range of cases, usually in small TCM clinics. The students gain broad clinical experience only when they are placed in Mainland TCM hospitals, usually in the second half of their degree studies (Che, 2004). This format of clinical placement, however, has serious shortcomings, as the students have to travel a long distance to attend the teaching clinics that are often already crowded with local TCM students from China. The quality of such clinical placement is often very questionable. The lack of adequate clinical training is thus a major challenge for TCM education in Hong Kong.

Modernizing TCM Education through the Use of eCases

Two avenues for modernizing TCM education are explored in this article. One is through the adoption of pedagogical constructivist concepts whereby students become involved in the active construction of knowledge through studentoriented activities. We chose case-based learning as being an appropriate strategy to promote students' active learning. A case is a story, often told as a sequence of events in a particular place. Often, there are human actors woven into the case story (Shulman, 1992). Integrating cases into the curriculum is widely believed to be very beneficial to learning. Cases are intended to avoid passive learning of knowledge by providing clear contexts in which learners can construct meanings and concepts. They may also help learners to develop problem-solving skills and collaborative skills that are recognized as key outcome skills that students will need in their future professional lives (Morrison, 2001).

A typical medical case involves the authentic record of a patient going through diagnosis and/or treatment. As students work through the case material, they face questions that are designed to stimulate their thinking and aid them in distinguishing between possible diagnoses and/or treatments. Students use the information provided and also search for additional material so that they can apply the knowledge they have to finding potential solutions to the problems presented in the case. In many cases, collaborative learning processes between students occur (Lysaght & Bent, 2005; Hakkarainen, Saarelainen, & Ruokamo, 2007). Used in the medical context, case-based learning is regarded as an effective approach for enhancing students' analytical and critical thinking, and for relating theories to actual clinical decisions (Su, Men, & Li, 2007). Yuan et al. (2006) used cases in teaching anatomy to TCM students, and concluded that the case-based approach enriched students' practical skills, self-learning skills, and problem-solving skills.

Cases can be presented in a paper-based format, but the use of technology enables a richer portrayal of case material. The TCM community has gradually come to appreciate that eLearning can enrich the learning environment and students' learning processes through enhancing the access to media-rich content and facilitating teacher-student and student-student interactions (Chen, Wang, & Zhao, 2004; Ka, 2007). Multimedia materials can deliver content to the students in a more vivid and comprehensive manner (Wang, Zhao, & Chang, 2007). The presentation of multiple perspectives of a case is also facilitated by the use of multiple media such as text, images, video, and audio (Li, 2007; Gao, 2007). Electronic cases (eCases) can result in more efficient use of lecture time. The use of an eLearning platform (e.g., WebCT, used in this study) also assists students to take more initiative in their learning (Zhao, 2007).

There have been a number of initiatives using technology in the teaching of TCM. For example, Xiao and Zhou (2007) developed a bilingual internetbased educational system for TCM. Zhao (2007) applied information technology to the teaching of bone-setting, which included videotaping different forms of manipulation techniques and treatments. However, these studies have not used fully developed cases.

The present study integrates new pedagogy and technology in the development and evaluation of a number of eCases used in TCM teaching. ECases are quite common in other disciplines. For example, Hakkarainen, Saarelainen, and Ruokamo (2007) used online video-supported eCases in teaching a network management course. They remarked that the cases "promoted especially the active and contextual aspects of the students' meaningful learning as well as the students' positive emotional involvement on the learning process" (p. 87). Papadopoulos et al. (2006) used online cases to teach software project management and found that "eCase allows instructors to develop appropriate study paths for students" and "students acknowledge the learning efficiency of scripted material" (p. 751).

The use of eCases in TCM education has been rare despite some early advocates of the approach. Chen, Wang, & Zhao (2004) suggested that the technology could be used to provide a virtual clinical setting for TCM students to practice clinical skills involved in making diagnoses and giving prescriptions. However, as far as we know, this is the first well-developed project for the use of eCases in TCM education.

The key motivation for initiating the project was to overcome the lack of clinical experience in TCM education in Hong Kong. Through the virtual clinical experience, we hoped that students would be more effective in mastering clinical skills in basic TCM disease diagnosis and pattern differentiation, as well as formulating treatment strategies for their diagnoses.

The TCM eCases Project

In 2006 funding for establishment of a database of TCM eCases was secured. The eCases are currently accessible by undergraduate and postgraduate students of the School of Chinese Medicine at CUHK. In the future, students from other TCM education institutions in Hong Kong will also have access.

We expected the eCases to benefit student learning in the following ways:

- Better content: The eCases provide a large number of multimediaenhanced and authentic clinical cases with which students can practice clinical reasoning in a way that is not possible in a traditional, text-based environment;
- More interaction: The online case activities are designed to enrich interaction between students and content (by requiring student input in various decisive points in the cases and providing feedback) and among the students and teachers themselves (by using the eCases as basis for specific planned discussions in class);
- Improved engagement: Improved access to the online materials may support student motivation and engagement;
- Opportunity: The materials provide clinical learning for students who cannot be in a real clinical setting;
- Self-learning: Use of the eCases should cultivate the student's independent and critical thinking in clinical diagnosis and treatment.

The online learning format does not replace the existing clinical placement practice but enriches it by giving students an additional opportunity to benefit from interacting with more authentic clinical cases. The characteristics of the eLearning platform are summarized as follows:

- There is a wide array of clinical cases;
- There are questions that require student input at various decisive points of the cases;
- Students receive feedback based on their input. Feedback is provided for both correct and incorrect answers so that, even if a student selects the correct answer, further learning is still possible;
- Follow-up activities are suggested to facilitate discussions of the cases in class;
- The clinical cases are presented in a near-to-real scenario via web links together with high resolution digital photos, video, and graphics.

The implementation of the eCases project encompassed several steps – collection of case material, case editing and uploading onto WebCT, work-shops to promote the use of eCases, and collection of feedback and suggestions from students and TCM education experts.

As cases in Hong Kong are relatively limited in variety, most of the cases were collected from teaching hospitals on the Mainland. The clinic and hospitals used in case collection include the Teaching Clinic of the School of Chinese Medicine, CUHK; the Dermatology, Respiratory, Renal and Cardiovascular Departments of Guangdong Province; Orthopedics and Traumatology Department of Shijie People's Hospital, Dongguan City, Guangdong Province; Pediatrics Department of the Affiliated Hospital of Nanjing University of Chinese Medicine, Jiangsu Province; and Acupuncture & Moxibustion Department of Shenzhen Hospital of Chinese Medicine, Guangdong Province.

During the writing of this article, the first phase of the project was completed with more than 50 eCases developed. Appendix A illustrates an eCase example. WebCT is the platform used to host the eCases. By the end of 2008, 100 clinical cases will have been developed. These will cover various TCM specialties such as internal medicine (30 cases), dermatology (10 cases), gynecology (15 cases), pediatrics (10 cases), orthopedics and traumatology (15 cases), and acupuncture (20 cases).

Preliminary Evaluation of the eCases

Evaluation data of the first phase came from two main sources – student surveys and expert reviews.

Student Surveys

The aim of this initial evaluation with students was to explore from the student perspective the learning potential of the eCases while we were still at an early stage of the project so as to ensure a high quality design for the whole project. A series of four workshops (with year 1 to 4 students, respectively) were conducted during the period from August to October 2007 to introduce students to the eCase database. These students were asked to complete a questionnaire after the tutorials in which they described their first impressions of the usefulness of the materials. The questionnaire consisted of four statements to which students responded on a 5-point Likert scale. Space for open-ended comments was also provided. We were thus able to collect some good suggestions for enhancements, which could then be implemented in the next stage.

Expert Review

The second type of evaluation data has made the project team conscious of the quality of the eCases as perceived by expert TCM teachers in Hong Kong. We launched a promotion campaign to augment awareness of this clinical eCase platform to TCM teachers and students from Hong Kong's various undergraduate, postgraduate, and associate degree programs. Following this promotion, four interviews were held with four TCM teachers from four different TCM institutions in Hong Kong in December 2007. The expert reviewers were able to give the project team members in-depth opinions on a range of areas. For the eCases themselves, we wanted feedback on the content, design of the eCase interactions, coverage of topics, and perceptions about the learning potential. We also wanted views on our prospects of turning the eCases into resources that could benefit a wider TCM student population across Hong Kong.

Findings

Student Feedback after Introductory Workshops

Table 1 summarizes the opinions collected through the workshop questionnaire from year 1 (n = 19), year 2 (n = 26), year 3 (n = 18), and year 4 (n = 32) students, respectively. The response rate was 100% of those who attended the workshops and 83% of the total TCM student population in these four years. The data indicated that students were on the whole very positive about the potential usefulness of the eCases for enhancing learning. The responses of the students to the questions were all above 4 on the 5-point Likert scale where 1 stands for "strongly disagree" and 5 stands for "strongly agree."

In general, the students agreed that the workshops had effectively described the main features of the eCases to them (overall mean = 4.2). Content-wise, they considered that the eCases are good supplementary materials for study (overall mean = 4.1). The eCases also seem to suit students' learning needs (overall mean = 4.1). Students also seem to be willing to self-edu-

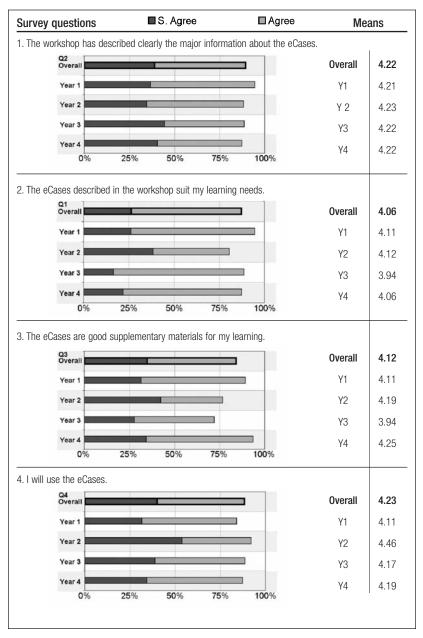


 Table 1

 Students' views collected in the workshop survey

cate as they indicate their intention to use the materials (overall mean = 4.2).

The students' open-ended comments also tend to confirm the expected benefits of enhancing interaction and providing an opportunity for students to practice using authentic cases. Below are some of the student responses to the question asking for the best features of the eCases (Chinese comments translated; English comments slightly edited for ease of reading).

- Real clinical cases for study: such cases are difficult to encounter for Chinese Medicine students in Hong Kong.
- The eCases enable students to see more cases some of them are rarely seen in HK Chinese Medicine clinics.
- Explanation for wrong answers.

However, we have little information at this stage about whether students are truly engaged in the learning activities. Logs in the server retrieved in April 2008 showed that half of the years 1–4 students (67 out of 114) in the school had visited the eCases website after the workshops. Only about one-fifth (20 out of 114) of the students had completed one or more of the eCases.

Consequently, motivating students to use the eCases, including converting some of them into course assessment, will be an important objective in the next phase of the project. At the point, more cases will be built and these eCases will be officially launched and used in the context of formal courses. Students' actions on the eCases will be monitored in the second phase.

The comments of the students across the different years did not seem to vary a great deal or vary in any particular pattern (Table 1).

The open remarks of the students in the survey were on the whole positive. There were, however, some very constructive suggestions for improvement, such as:

- Increase the number of cases with audio recording.
- Group the cases under different categories, for example, pulmonary diseases and heart diseases under Internal medicine.

The students also expressed concerns about the difficulty of the eCases, especially those in junior years:

- The questions in the eCases are very difficult for the junior year (i.e., years 1 & 2) students to answer correctly. It would be good, if possible, to present the eCases in various levels of difficulty to cater for wider students.
- The e-learning platform is very good, but I am in year one and cannot answer the questions presented in the e-cases, which really put me off.

Expert Reviews

The expert reviewers provided excellent feedback. Table 2 summarizes their key comments.

Table 2 Key comments from the expert reviewers	Suggestions for enhancement	CUHK 4 Dec 2007	
Ta l Key comments fron		CUHK 4	

Key comments tron	Key comments from the expert reviewers
Affirmation of eCase strategy	Suggestions for enhancement
CUHK 4	CUHK 4 Dec 2007
 Contents are helpful, and the coverage of topics is appropriate to the students. It also provides them with clear explanations. Students understand knowledge from different areas. Ecases associated with examples enhance their thinking, ability for diagnosis, and prescription. The feedback given by the eCases is helpful to them in making critical decisions. It helps develop their problem-solving skills. Level of difficulty for eCases is particularly appropriate to Year 4 students. 	 More audio and visual aids to show patient's condition would assist students in understanding the real- life cases Appropriate answers/ feedback should be given to the students at the end of each of the eCases as well as at each stage. Add the patient's work and/or daily living history to assist students to make a correct diagnosis of the eCases.
HKU 5	HKU 5 Dec 2007
 ECases are helpful in enhancing students' knowledge. Overall design of the eCases is good, and the eCases provide rich information for students to learn relevant subject knowledge. 	 Appropriate instructions or guidance in using eCases should be included online. More detailed background history of the patient, such as overall vitality, facial complexion, body gesture and movement, are needed. It would be better to have even more interaction between learners and the web content. It would be better to incorporate tailor-made pictures and slides for pulse conditions. Diagnostic results of the patient (e.g., laboratory results, x-ray and electrocardiogram from Western Medicine) could be used concurrently.
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 Table 2

 Key comments from the expert reviewers

Affirmation of eCase strategy	Suggestions for enhancement
HKBU 7	HKBU 7 Dec 2007
 All topics covered in the eCases are important in Chinese Medicine. ECases provide explanations to both correct and incorrect answers. 	 Add instruction to indicate prerequisite knowledge expected of students for the cases. Provide more information on the photos of face and affected parts of the patient's body. Adequate instructions should be provided online for the eCases.
CUHK – Tung Wah Group of Hospital Comm	CUHK – Tung Wah Group of Hospital Community College (CUHK-TWGHCC) 20 Dec 2007
 Contents are appropriate and the coverage of the topic is reasonable ECases are a supplement for students in assisting them to make appropriate prescriptions. The level of difficulty of the eCases is fair and appropriate. Multimedia materials are used appropriately. 	 It would be helpful if more cases on patient's diagnosis were provided. A connection between the Chinese Medicine theory and the Chinese medical classics would benefit students in making clinical treatments. False diagnosis/ malpractices/ ineffective treatment provided for the patient could be used as an example for teaching. Specific cases handled by the renowned Chinese Medicine practitioners would benefit students.

Overall, the learning potential of the eCases was acknowledged by all reviewers. They confirmed that eCases meet the needs of the students and are invaluable supplementary learning materials. They praised the richness of the content. Many important topics in TCM are covered and are clearly explained through the use of multimedia. The interactive design of the eCases is also acknowledged as the eCases provide explanations to both correct and incorrect answers. They also confirmed the learning opportunity the eCases provide to the students as the cases cover the application of knowledge from a number of different TCM areas. Students should be able to improve their thinking skills, and their ability to diagnose and prescribe.

The reviewers noted room for improvement and made many concrete suggestions that have informed the second phase of development. Specifically, in the next phase we will:

- refine the contents of the existing eCases and their presentation style (e.g., more audio and visual material to show a patient's condition, instructions to indicate prerequisite student knowledge, and more information on the photos of face and affected parts);
- extend the development into new eCases (e.g., specific cases handled by renowned Chinese Medicine practitioners, and cases covering false diagnosis/ malpractices/ ineffective treatment provided for the patient); and
- review assessment tasks in the courses that use the eCases to ensure better alignment in course design (Biggs, 2003),

Discussion

We have some empirical evidence to support a very positive picture of this first phase of our TCM eCases project. We believe that our design for innovative eCases (combining case-based pedagogy with the use of technology) is practical and beneficial in the teaching of TCM. We were originally concerned that a shift of teaching mode would be particularly difficult in a traditional, teacher-centered, theory-oriented subject like TCM, but this has not happened.

Both the teachers and the students appear to welcome the innovative teaching and learning ideas and materials. Many of the researchers' original expectations of the learning benefits seem to be confirmed from our empirical data – eCases are appreciated as high quality learning content, and the interaction provided to students through the feedback in exercises is regarded as useful. Teachers and students all valued highly the learning opportunities for practicing clinical skills. Modernization of the teaching of TCM is not only desirable (Chen et al., 2004), but it is also practical.

What may not be confirmed yet, however, is the level of students' engagement and the ability of the students to actually self-learn. As noted, steps are being taken to highlight the eCases more extensively in the next phase of the project through reviewing the alignment between overall course content, the eCases, and course assessment.

The study also indicated to the researchers that eCases can have even more potential with further enhancements. Many of the suggestions from the experts and students have inspired the team. The second phase will include the following enhancements and evaluation strategies:

- collection of a wider variety of clinical cases in various TCM specialties;
- promotion and dissemination of the eCases system to other TCM education institutions in Hong Kong so that more students can access and utilize this web-based TCM education resource;
- further collation of suggestions and feedback from students and educational experts;
- evaluation of the level of engagement of the students in the eCases through tracking students' actions online; and
- monitoring any improvements in students' learning of clinical TCM, including their capability in diagnosis, formulation of treatment strategies, and selection of formulae and herbal drugs.

Conclusion

The traditional teaching of TCM is highly teacher-oriented. Modernization of the subject is deemed necessary as we are facing the new demands of the new generations of learners. This article demonstrates how modern teaching concepts and technology (eCases) are potentially useful in the teaching of this ancient yet vibrant field of medicine in Hong Kong. The study we have conducted has also highlighted the necessity of continuing the evaluation of the eCases in the next phase. The information collected so far will serve well as baseline data to compare with later stages of the study. Innovations and new concepts are not necessarily incompatible with an old subject.

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APPENDIX

Dermatology - Case One (Hong Kong) (Translated from Chinese to English)

Lee, female, age 22 years. First visit: 26 April 2006 Chief complaint: Facial blemishes for 10 years, worsening during the last month.

Case history:

Miss Lee started to have serious skin blemishes 10 years ago. At the time of consultation, there were patches on her face, particularly on the cheeks. The skin lesions manifested as pus that was red in color. There was excessive oily secretion on the face with skin itchiness but not pain. There was frequent palm-sweating. Last menstrual period was 15 April. Menstruation was absent in February but resumed in March and April. She also had past experience of long menstruation periods that lasted for over one month. Her appetite was good, although she was particularly fond of sour food. She had bowel movements once per day with soft stools. Urination was fine. She could sleep well. She had a previous history of stomach pain, which had not reoccurred during the past eight years.

TCM inspection:

TCM skin inspection: See the picture below



Palpation examination: Thready and slippery pulse

TCM tongue inspection: See the picture below



Questions:

1. From a Chinese medicine perspective, what skin condition is Miss Lee suffering from?

- A. Acne
- B. Eczema
- C. Psoriasis
- D. Damp toxin

(The correct answer is A. Detailed explanations are provided as to why answer A is correct and B, C, and D are incorrect.)

2. What is the pattern of this disease?

- A. Stagnation of phlegm, dampness and blood stasis
- B. Damp heat in the gastro-intestine
- C. Wind heat invading the lung channel
- D. Disharmony of Chong and Ren channels together with retention of damp heat

(The correct answer is D. Detailed explanations are provided why answer D is correct and the rest are incorrect.)

3. What is the most appropriate treatment strategy for this case?

- A. Regulate the Chong and Ren channels, clear heat and transform dampness
- B. Clear heat and transform dampness and release toxin
- C. Expel dampness and transform phlegm, invigorate blood and dissolve nodules
- D. Expel wind and clear the lung

(The correct answer is A. Explanations are also provided as to why answer A is correct and the rest are incorrect.)

4. What are the appropriate formulae and herbs?

- A. Variation of Two-Cured Decoction combined with Four-Substance Decoction with Safflower and Peach pit (For simplicity, the detailed herbal components are omitted here)
- B. Variation of Two-Ultimate Pill
- C. Variation of Artemisia Yinchenhao Decoction
- D. Variation of Pi-Pa for Clear the Lung Decoction

(The correct answer is B. Explanations are provided as why answer B is correct and the rest are incorrect.) (The student is allowed to try three attempts on each case.)