Designing Open Textbooks for Effective Teaching and Learning

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Abstract. Printed textbooks are often criticized for only 'transmitting' knowledge to readers in a linear fashion whereas in e-textbooks, interactivity can be built in; so learners are 'connected' with other resources. There are e-tools for learners to communicate with the teacher and their peers, and they can also support individualization in the learning process. Here we will need appropriate design elements in language usage, conceptual organization, spatial arrangement and levels of interactions. Electronic textbook content in various file formats (e.g. web, PDF, e-Pub, audio) can be used in different devices to suit learners' reading preferences. Open textbooks on the other hand, allow teachers to reuse, revise and remix the content. Linking to a repository of learning assessment items, an open textbook can also provide effective assessment of learning outcomes, an important requirement in Hong Kong schools. The paper first describes how an open textbook system for Hong Kong comes to fruition. It will then discuss in detail the pedagogical, quality assurance and technological considerations in the development of the open textbooks.

Keywords: Open textbooks, open content, open license.

1 The Problem of High Prices of Printed Textbooks in Hong Kong

The problem of too high a price for primary and secondary school textbooks has been haunting Hong Kong for the past decades. Before 2003, publishers were complained for revising textbooks too often, making it difficult for 'second hand' textbooks to be reused and pushing parents to purchase new textbooks. This problem seemed to be solved in 2003 when the government set up a 'three-year rule of no revision'. In 2009, this three-year directive became a five-year rule (Education Bureau, 2012, p. 64).

The high prices of textbooks are not due to high profit, but high production costs, publishers often explain. But textbook users are not satisfied with the luxurious format of the textbooks. There are criticisms about the overly colourful printing (4-colour printing), and that the papers used are too thick and hence too expensive. Some users hence call for 'no-frills' black and white versions of textbooks to be provided as a choice. Publishers' response is that the difference in cost between B/W and 4-C printing, and between thick and thin paper printing, is minimal. Besides, the choice

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for B/W textbooks is so small that it is not economically viable to provide such option to the market.

Publishers have also been criticised for mounting expensive marketing/promotional functions for the books, such as hosting talks for teachers in lavish hotel conference rooms, offering them gifts and teaching related items (Apple Daily, 2008; Legislative Council Panel on Education, 2010, paras. 20 and 21). Some publishers have also been accused of providing teaching aids to schools free of charge or on a permanent loan basis, or funding school functions, sponsoring school publications, sending speech day floral baskets, or giving scholarships to students. Such practices were halted by the government (Legislative Council Panel on Education, 2010, para.13).

Teachers are also given complimentary copies of the textbooks they have chosen for their classes, as well as the teacher's edition (teacher's guide). Other give-away items include: wall charts, worksheets, CD-ROMs with additional teaching materials, data files for project study, presentation files for use in lessons, assessment tasks, and assessment item banks. Supporting websites of the textbooks, for teachers' access only, are also set up to provide further materials to complete their teaching duties. It is believed that the cost of these items is one of the key factors which cause the prices of textbooks to become unreasonably high, contributing up to 30% of the total development cost according to some publishers. Again such offers were forbidden by the government starting 2010. Schools would need to purchase such material out of the school budget (Legislative Council Panel on Education, February 2, 2010, para.13).

High textbook price was also seen to be due to the bundling textbooks with unwanted learning materials, only a small part of which was said to be used. Publishers were required to 'debundle' the learning and teaching materials from the textbooks and to charge them separately (Legislative Council Panel on Education, February 2, 2010, para.12).

Parents, who pay for the textbooks are discontented that only teachers make the choice of textbooks but they have to pay for them. They argue that in the selection process, teachers only evaluate the quality of the textbooks; they usually do not consider the price in deciding on the final choice.

A textbook can be used and re-used by up to 3 or 4 students before they become too worn out, and reusing textbooks can reduce cost substantially (75% if a book is used 4 times). Unfortunately, the reuse of textbooks is not a common practice in Hong Kong:

- some parents do not prefer their children use used books because they are marked or torn;
- some parents do not find it fair when they pay for the same amount of money but some students (of an earlier year) can use a newer book while others have to use an older version;
- the fact that up to 38% of Hong Kong students receive full textbooks subsidies from the government for the purchase of new textbooks, will make it a disincentive for such parents to let their children to use 'second hand' books ; and
- the administrative effort for the distribution of the used textbooks by schools is so daunting that most schools are unwilling to take up such additional workload.

There was an attempt in 2008 to try out a 'textbooks reuse scheme' for a local pilot school to reuse textbooks, but it did not work out at the end.

A major solution to tackle the problem of high textbook price is the use of Open Textbooks. It is found that open textbooks is the substantial reduction in cost (Allen, 2011). As reported in the Student PIRGs study conducted in the US, this amounts to an average drop of 80%. This is a major reason that a concern group of staff at the Open University of Hong Kong proposes the Open Textbooks project for Hong Kong in 2012 (Leung *et al*, 2012).

2 A Proposal for an Open Textbook System for Hong Kong

Experience from overseas confirms that open textbooks reduce the price substantially. However, crucial benefits of open textbooks are not just with cost but effective learning (Bliss *et al*, 2012). In Hong Kong open textbooks will help to solve the following pedagogical problems faced by teachers and students currently using printed textbooks only:

- Printed textbooks are not flexible enough to cater for the specific needs of students of individual schools or classes since they cannot be timely customized for a variety of learning objectives and contexts.
- Online and mobile learning is increasingly becoming a trend but publishers are unwilling to take much advantage of digital technology and provide the electronic version of the textbook en masse online along with the printed version, due to concerns of piracy and copyright protection.
- Some teachers in secondary schools have attempted to develop their own teaching and learning materials, as well as assessment items and learning activities; they also wish to share with colleagues those materials with others, as well as using other resources.

An open textbook system containing quality open textbooks for adoption and adaptation by students and teachers at primary, secondary and tertiary levels is hence proposed to be developed for the benefit of all people in Hong Kong and other regions. The system is planned to be an online collaborative environment to host open source textbooks which are free, flexible, current and directly available for use and adaptation by universities and schools.

Three important components of the system are:

a. An online open textbook platform: A repository for hosting textbook contents, courseware, teaching materials and resources (such as links to online contents which are available overseas) will be developed. It also includes editing tools so that users can collaborate in contributing teaching and learning materials; it will also have a review mechanism for all users to review and rate the materials.
b. Online textbooks and teaching materials: A collection of open textbooks, at tertiary, secondary and primary levels, will be made available from the platform. Most importantly it includes a total of 12 open textbooks covering the curriculum for the English language subject for all primary and secondary levels, as well as

associated teaching materials. These will be expanded to other subjects of study in due course. Such textbooks will contain the

c. Community and capacity building function: A consortium made up of potential contributors and beneficiary educational institutions will be established. Training will be provided to teachers for using the open textbooks.

3 Pedagogical Considerations of Open Textbooks

The printed textbooks are often criticized for only 'transmitting' knowledge to readers in a linear fashion. Open textbooks, which are first and foremost e-textbooks, are an emerging technology which can allow for the inclusion of effective teaching and learning functions. Since they are open for revision and re-distribution, they are most useful to teachers who often wish to customise them to suit their students' needs.

Presenting contents in a variety of electronic formats (web, PDF, e-Pub, audio), e-textbooks can be 'read' in different reader devices to suit different learners' reading preferences.

Language usage, conceptual organization, spatial arrangement and levels of interactions are some of the important considerations in designing open textbooks for effective teaching and learning.

3.1 Language Usage

As in printed textbooks, e-textbooks in general should also adopt a direct and simple writing style. Traditional printed textbooks however may not be able to cater for the varied needs and learning abilities of individual students in all classes or schools. As well, timely customization for specific learning objectives and contexts by teachers is difficult without copyright infringement. One important feature of open textbooks is that they can support individualization in the learning process (Sun *et al*, 2012).

Open textbooks grant, in advance, the right to all users for all kinds of modifications. Open textbooks can be easily customized by teachers in terms of language usage for accommodating the different needs of learners. Teachers can provide additional explanations, and whenever possible, use real-life examples to illustrate abstract theories and concepts. Teachers can also use only selected parts of an open textbook, but adding to it other learning resources, some of which may be their own work.

There are also common functions with regards to language which facilitate learning.

Dictionaries and Pronunciation. Built-in dictionaries for glossaries save students carrying along a printed dictionary. A dictionary with synchronized audio pronunciation has been shown to assist students learning English as a second language (Chu, 2003). Built-in pronunciation is of great assistance to students in their reading and the learning of a foreign language.

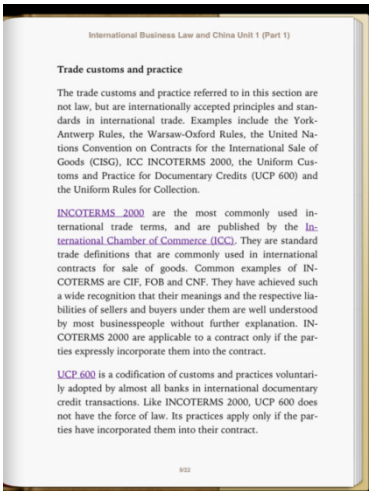
Text-to-Speech Function. Text can be read out to the learner conveniently, especially in some specific learning environments, such as when the learner is travelling inside a moving bus.

3.2 Conceptual Organization

The human processing-system searches for a conceptual organization in all sensory experiences, except the sense of smell. Learners look for and build structures of the knowledge they are learning, and such structures are used for future processing and storage of information (Gribbons, 1992). (Knowledge here includes facts, concepts, principles, rules, and procedures.) Hence, helping learners to build a structure or organization of the content to be learned is crucial for effective learning.

Conceptual organizations of content, for example concept maps, are important tools for presenting the content knowledge in textbooks. With such a structure, the component contents can be filled in.

Open textbooks allow teachers to incorporate different materials of their choice (such as websites and articles they have access to), into the learning structures. Teachers may also replace existing contents with those they identify to be of interest to their students.


International Business Law and China Unit 1 (Part 1)

Trade customs and practice

The trade customs and practice referred to in this section are not law, but are internationally accepted principles and standards in international trade. Examples include the York-Antwerp Rules, the Warsaw-Oxford Rules, the United Nations Convention on Contracts for the International Sale of Goods (CISG), ICC INCOTERMS 2000, the Uniform Customs and Practice for Documentary Credits (UCP 600) and the Uniform Rules for Collection.

INCOTERMS 2000 are the most commonly used international trade terms, and are published by the International Chamber of Commerce (ICC). They are standard trade definitions that are commonly used in international contracts for sale of goods. Common examples of INCOTERMS are CIF, FOB and CNF. They have achieved such a wide recognition that their meanings and the respective liabilities of sellers and buyers under them are well understood by most businesspeople without further explanation. INCOTERMS 2000 are applicable to a contract only if the parties expressly incorporate them into the contract.

UCP 600 is a codification of customs and practices voluntarily adopted by almost all banks in international documentary credit transactions. Like INCOTERMS 2000, UCP 600 does not have the force of law. Its practices apply only if the parties have incorporated them into their contract.

Fig. 1. Hyperlinks

In e-textbooks, the component chunks of knowledge in the conceptual organization are easily accessible through the use of hyperlinks (see Figure 1). Hyperlinks allow learners to have immediate access to related topics, cases, simulation and videos. It has been shown that using such links facilitates learning (McGowan, *et al*. 2009).

3.3 Spatial Arrangement

Spatial arrangements depicting the structure of information reduce the cognitive demands on the learner (Hartley, 1997). Less information processing work is required for understanding semantic information if it is presented in a spatial format, rather than in a serial, or textual manner. In the learning process, learners are often required to make sense of a complex set of information provided, to recognize the core ideas, and then to internalize difficult concepts and less essential concepts by using the graphic organizers to illustrate the problems. Graphics can also help students separate what is important to know from what might be interesting, but not essential information. Using a few clicks on those interactive graphics can lead students to explore the concepts step by step. This is one of the reasons why graphics, illustrations and tables are powerful tools to facilitate learning of students with language-based learning disabilities. In the e-textbook environment, the interactive graphics play the important roles for different learners.

3.4 Levels of Interactions

Interaction is an internal dialogue of reflective thought that occurs between the learner and the material. Things that might trigger and support this internal interaction of learning could be interaction with media—course materials that provide direct instruction (Ehrman, 1994).

Belanger and Jordon (2000) suggested three approaches to online courseware development, according to the levels of interactivity between learner and learning content. These include

a. Text and graphics

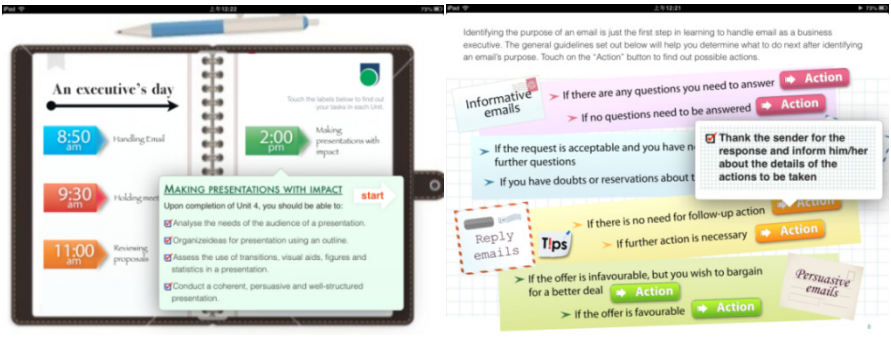


Fig. 2. Online content in text format in colour and with clickable information

b. Interactive activities with feedback

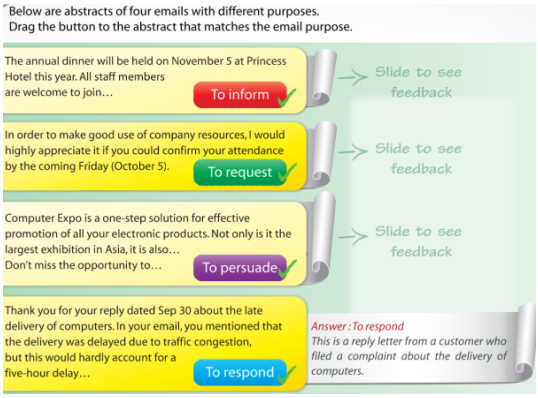


Fig. 3. Interactivities with feedback

c. Interactive multimedia components

Fig. 4. Audio components

In short, each event connected to an instructional strategy is an interaction that occurs between the learner and other human or technological resources. Interaction allows learners and participants to experience content, make sense of meaning, and be actively involved or participate in the learning process.

3.5 Other Functions in e-Textbooks Which Are Conducive to Effective Learning

Search Function. In traditional printed textbooks, an index page provided at the end of a book serves the purpose of locating the place when a topic is discussed in the book. In an e-textbook, this index function is conveniently served by the 'Search' function (Figure 5). This is a small but important tool for locating the places where a subject is discussed.

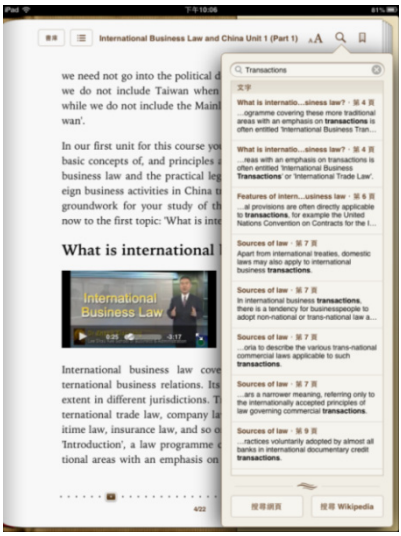


Fig. 5. The Search function

Interactive Tables and Figures. Interactive tables and figures in an e-textbook (Figure 6) provide convenient interaction between the learner and the content. Learners can visualize many 'what if?' situations when some of the figures are varied, but their own choice.

Fig. 6. Interactive tables and figures

Highlighting, Bookmarks and Notes Making. Some students find highlighting part of the text in a textbook assist memory of main points, especially for the purpose of examination. Others need to go to the place where they have left off with the e-textbook, or to jot down explanatory notes in places in the text to assist them in their revision. Such functions are easily provided for with e-books. See Figure 7.

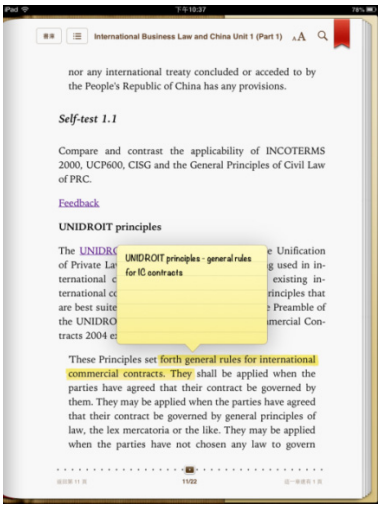


Fig. 7. Highlighting, bookmarks and notes making

Enlargement of Text. Some learners will also find this function useful when some text are presented in small font size (Nicholas and Lewis, 2009; Smith, 2008). Proper use of this function can perhaps resolve the problem of eyestrain in using the electronic display (Figure 8).

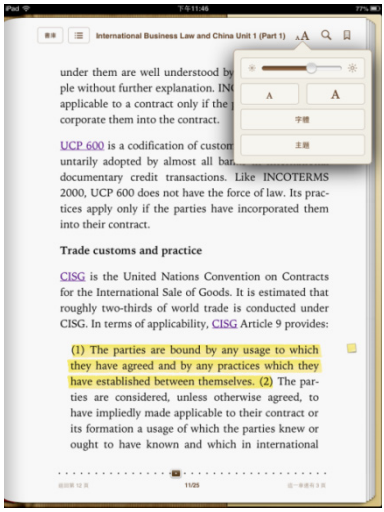


Fig. 8. Text enlargement

Communication Tools. Through this function learners are able to communicate with the teacher and their peers (Figure 9). The feature of notes sharing is another king of communication between students.

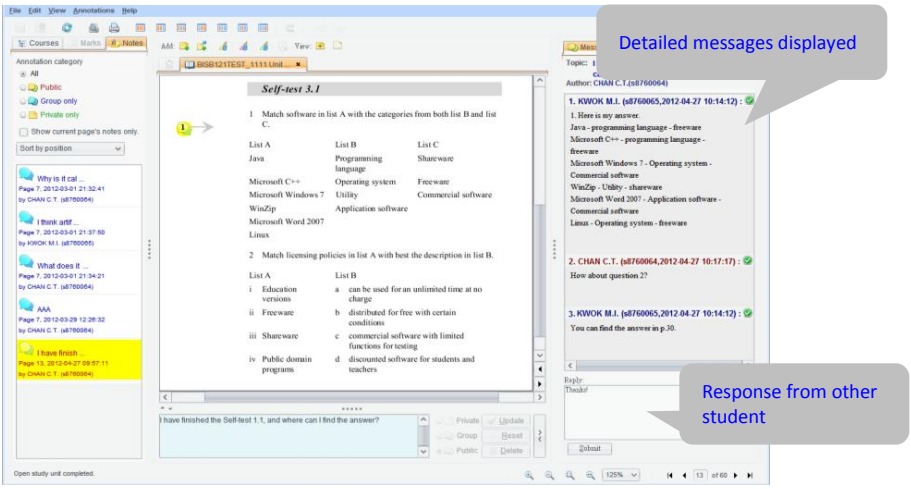


Fig. 9. Communication tools

4 Technological Considerations

Presenting the textbook content in a variety of electronic formats (e.g., web, PDF, e-Pub, audio), e-textbooks can be used in different reader devices to suit different learners' study preferences. The versatility is crucial to e-textbooks, as this is an important factor, perceived by 59% of purchasers of e-textbooks in an MBS Textbook Exchange study (Simba Information, 2006), for buying the e-textbooks.

Hence the first function the Open Textbook platform will provide is a repository for hosting textbook contents, courseware, teaching materials and resources. They will appear in different formats serving different purposes. Teachers and students can select appropriate textbook contents, teaching materials and resources, and they should be downloadable to a variety of PCs and mobile devices.

To tailor for students of different ability levels, teachers would very much wish to have an e-textbook which they can customize, i.e. they can use only selected parts of a book while adding to them other learning resources, some of which may be their own work. Due to the very restrictive copyright and technological constraints, such customization is often not easily achievable. Only open e-textbooks, which allow teachers to reuse, revise and remix the content, are able to satisfy the teachers' need. Linking to a repository of learning assessment items, an open textbook can also provide effective assessment to learning outcomes, and this is an important requirement in Hong Kong schools.

Hence the second function of the Open Textbook platform is that it will provide facilities for teachers to customize their adopted textbooks to fit specific teaching needs. The system has to support a two-way, interactive and iterative process whereby teachers can browse, download, revise, re-create and upload material to the same site.

The built-in architecture would anticipate and accommodate an on-going organic growth of the content driven by the bottom-up involvement of an ever expanding body of users, stakeholders and volunteers.

Moreover, the platform allows users to download and print out the selected and customized textbooks and courseware. It also allows teachers and students to send online requests to printing houses for mass printing of the textbooks. Besides, electronic versions of the selected customized textbooks and courseware are available to support online and mobile learning. The platform also provides a function for schools and teachers to generate an individual school site to house their customized textbooks and courseware.

In order to accommodate the flexible features, a content management system platform is required, which can handle many of structural, page layout, and metadata complexities. A flexible open source platform can handle re-flowable and page fidelity formats and incorporate with media-rich, integrated and interactive features.

A conceptual framework of the platform is given in Figure 10.

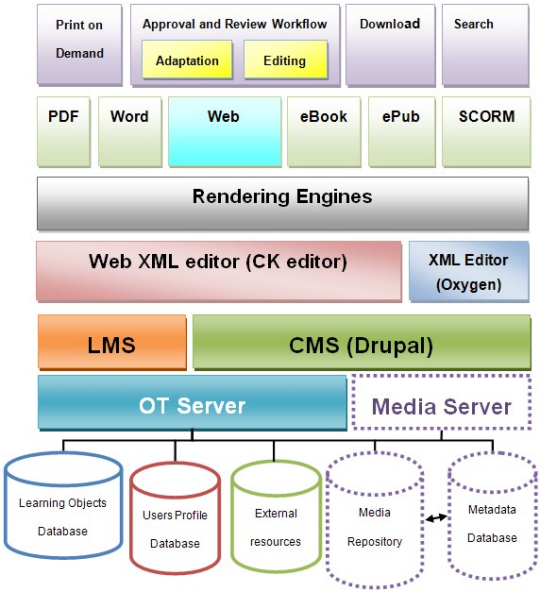


Fig. 10. A conceptual framework of the platform

5 Quality Assurance

To alleviate the worries and scepticism over the quality of free learning resources, a quality assurance mechanism will be set up and overseen by a team of subject experts, editors and technologists to monitor the development process, assess the quality, and review each item admitted to the system. These professionals take the role of 'co-authors' and 'gate-keepers' for the quality of the textbooks. The content will be continually reviewed, updated, improved and enriched with reference to the ratings and

feedback gathered online and offline. Apart from internal quality procedures, the following recourses will also be in place:

- Peer review – Where appropriate, the developed content will be forwarded to individual peers or groups from professional organisations, by voluntary or paid service.
- Government review panels – In the case of textbooks for primary and secondary education, the final product will be submitted for assessment by Review Panels of the Textbook Committee of the EDB in the same way as a commercial textbook, with a view to being placed on the Bureau's 'Recommended Textbook List'.
- Open review and rating – The online platform should provide an opportunity for teachers, educators, parents and other users to review and rate the materials in public. Such transparency helps to identify any shortcomings, ensure the effectiveness of the particular resource and in turn further bolster its quality.
- Systematic evaluation and research – The OUHK has the expertise to ensure that systematic and timely studies together with other stakeholders are carried out to evaluate the service outcomes and assess the level of users and participants satisfaction.

6 Conclusion

The project has come a long way from its conception to detailed design to development. We have only started our first step and we understand huge difficulty is still ahead of us.

However we believe that open educational resources characterized by digital development, online access and open licence will significantly reduce textbook costs, shorten production time, improve and widen public access and enhance delivery efficiency. Most importantly they will allow active participation of teachers and will enormously enhance the effectiveness of teaching and learning.

In the medium term, the benefits attained will prove their value and justify strong support by users, institutions and policy makers.

In the long run, the project will become a public platform providing services primarily to teachers and students, and any other users with the enthusiasm to collaboratively contribute to the content, whether by way of writing, editing, enriching, commenting or amending. The expanding community and capacity thus generated will ensure a clear understanding of quality standards and requirements, and provide ample energy, relevant experiences and favourable conditions for the continuous improvement of the programme and achievement of successful outcomes.

References

1. Allen, N.: A cover to cover solution: how open textbooks are the path to textbook affordability. The Student PIRGs, Chicago (2011)
2. Apple Daily, News article reporting on 'publishers organizing expensive marketing/promotional functions for textbooks' (April 22, 2008)
3. Belanger, F., Jordan, D.H.: Evaluation and implementation of distance learning: Technologies, tools and techniques. Idea Group, Hersey (2000)
4. Bliss, T.J., Hilton, J., Wiley, D., Thanos, K.: The cost and quality of open text-books: Perceptions of community college faculty and students. First Monday 18(1) (2012)

5. Chu, H.: Electronic books: Viewpoints from users and potential users. Library Hi Tech 21(3), 340–346 (2003)
6. Education Bureau, A parental guide to textbook matters. Curriculum Development Institute: Textbook Committee (2008), http://www.edb.gov.hk/attachment/en/curriculum-development/resource-support/textbook-info/inside-e.pdf (retrieved June 24, 2013)
7. Education Bureau, Working Group on Textbooks and e-Learning Resources Development (2009), http://www.edb.gov.hk/attachment//en/curriculum-development/resource-support/textbook-info/wg%20final%20report.pdf (retrieved June 24, 2013)
8. Education Bureau, Hong Kong, Guidelines on Submission of Printed Textbooks for Review. Education Bureau, Hong Kong (2012), http://www.edb.gov.hk/attachment/en/curriculum-development/resource-support/textbook-info/GuidelinesOnSubmissionPrintedTextbooks_201204.pdf
9. Education Bureau, Hong Kong (Working Group on Textbooks and e-Learning Resources Development), Main Report. Education Bureau, Hong Kong (2009), http://www.edb.gov.hk/attachment//en/curriculum-development/resource-support/textbook-info/wg%20final%20report.pdf
10. Ehrman, S.C.: Foreword. In: Markwood, R.A., Johnstone, S.M. (eds.) New Path-Ways to a Degree: Technology Opens the College, pp. 1–7. Western Interstate Commission for Higher Education, Boulder (1994)
11. Guess, A.: E-textbook – for real this time? Inside Higher Ed. (2008), http://insidehighered.com/news/2008/01/03ebboks
12. Gribbons, W.M.: Organization by design: Some implications for structure information. Journal of Technical Writing and Communication 22(1), 57–75 (1992)
13. Hartley, J.: Applying psychology to text design: A case history. International Forum on Information and Documentation 22(1), 3–10 (1997)
14. Henke, H.: Consumer survey on e-books. Open e-book at openebook.org (2003), http://www.idpf.org/doc_library/surveys/IPDF_Consumer_Survey_2003.pdf
15. Legislative Council Panel on Education, Hong Kong, LC Paper No. CB(2)868/09-10(02) (April 4, 2010), http://www.legco.gov.hk/yr09-10/english/panels/ed/papers/ed0208cb2-868-2-e.pdf
16. Leung, C.M., Yuen, K.S., Li, K.C., Cheung, S.K.S., Tsang, E.Y.M., Wong, A.J.W.: Development of an Open Textbook System for Hong Kong: a Proposal to the Chief Executive's Community Project List (2012) (unpublished paper)
17. McGowan, M.K., Stephen, P.R., Bradley, C.W.: Student perceptions of electronic textbook. Issues in Information Systems 10(2), 459–465 (2009)
18. Nicholas, A.J., Lewis, J.K.: The net generation and e-textbooks. eScholar@Salve Regina (2009), http://escholar.salve.edu/fac_staff_pub/17 (retrieved June 24, 2013)
19. Simba Information, MBS moves into second phase of e-textbook sales initiative. Educational Marketer (2006)
20. Smith, B.A.: A quantitative analysis of the impact of e-books format on student acceptance, usage and satisfaction. Doctoral dissertation, Capella University (2008)
21. Sun, J., Flores, J., Tanguma, J.: E-textbooks and students' learning experiences. Decision Sciences Journal of Innovative Education 10(1), 63–77 (2012)