

## Central Queensland University

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### **The evolution of a free online textbook**

Abstract:

Within the higher education sector, various organisations and individuals have experimented with the provision of free or low-cost online textbooks in an attempt to contain rising costs. This article discusses the evolution of one such textbook over its fifteen-year history. It examines factors that influenced the development of the textbook, identifies the benefits for students and teachers, and questions the viability of this model for other academics and institutions.

Biographical note:

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Keywords:

Writing – Textbooks – E-books – Open education

## Introduction

The rising cost of higher education is a cause for widespread concern in many countries. In the United States, for example, published tuition prices and fees at public four-year colleges and universities have risen more rapidly over the past decade than over either of the two preceding decades (College Board 2012: 3). The cost of higher education is the primary reason why young adults in the US choose not to continue their education after high school (Taylor et al. 2011). Similar trends can be seen in other countries, including Australia (International Education Advisory Council 2013, 24).

Textbooks are one of the contributors to the rising cost of higher education. According to the US Government Accountability Office (2005: 2), between 1987 and 2004 college textbook prices in the US increased at an average rate of 6 percent per year, or twice the annual rate of inflation. A more recent report by Mark Perry (2012) from the American Enterprise Institute shows that between 1978 and 2012 the cost of educational books and supplies (primarily college textbooks) increased by 812 percent. The relative magnitude of this figure becomes apparent when it is compared to increases in the costs of medical services (512%), new home prices (325%) and the Consumer Price Index (250%) over the same period.

The high costs of textbooks sometimes put them out of reach for tertiary students who are under financial pressure. Studies by the college bookstore operator Follett indicate that 15 percent of students do not buy the required textbooks or access them at all (Scott 2010). In a survey of 327 students at Daytona State College, 29 percent of respondents admitted to not purchasing a required textbook at least once because of its cost, 24 percent blamed textbook expenses for taking fewer credit hours than desired, and 15 percent said that textbook expenses influenced their choice of major (Graydon, Urbach-Buholz & Kohen c.2011). Acker (2011) observes that when students refrain from purchasing necessary textbooks they fall behind, compromise their learning outcomes, and increase their risk of failing their course. Buczynski (2006) states that ‘this trend introduces inequality into the classroom’ in the sense that some students have the learning materials that are needed to succeed in the course while others do not.

In response to the rising costs of textbooks, various organisations within the higher education sector have experimented with the provision of free or low-cost online textbooks, also known as ‘open textbooks’. Rice University (n.d.), for example, established Connexions, a global repository of educational resources provided by volunteers for use by learners of all ages in a broad range of disciplines. Connexions content can be downloaded at no cost, and is available for remixing and editing. Another example is Flat World Knowledge (2013), a textbook publisher that gives away and sells open textbooks in a manner that it believes is financially sustainable. Educators can use this platform’s editing tools to tailor textbook content to match their syllabus, and students can get low-cost access to course content in either print or digital formats.

Individuals have also experimented with the provision of free or low-cost online textbooks. Baker-Eveleth, Miller and Tucker (2011) report on the use of a custom

online textbook written by a professor in an introductory economics course. Jones and Jackson (2012) have examined the development of a student-written textbook for an introductory business course. Following in the same vein as these individual efforts, this article discusses the evolution of a free, online, self-published web design textbook over its fifteen-year history. It examines factors that influenced the development of the textbook, identifies the benefits for students and teachers, and questions the viability of this model for other academics and institutions.

### **Textbook development**

The focus of this article is an online textbook that I have written, illustrated, edited, designed, published online and revised annually for a web design course in an undergraduate digital media program at Central Queensland University. The course has been taught at between six and nine campuses of the University and in distance education mode over the past fifteen years. During that time the prescribed textbook has been used by approximately 8,087 students as their primary learning resource within the course. Students have accessed the textbook by downloading it from the course web site to a computer or mobile device, printing it if desired, and reading it online.

The textbook began its life in 1998 as a collection of twelve very long web pages, prepared with the Hypertext Markup Language (HTML), Cascading Style Sheets (CSS) and related technologies. Today, fifteen years later, the textbook has developed into a 420-page electronic document in Portable Document Format (PDF). The textbook contains twelve chapters, three appendices, more than three-hundred images, multiple tables, hypertext links to external resources, tutorial activities, and sample solutions to exercises. The use of a style guide has ensured consistency in layout and formatting, such as the consistent use of icons for highlighting practical exercises, sample solutions, discussion activities and handy tips. Preparation of the book has been made easier by my skills and experience in digital media production, including graphic design, web design, digital image-editing and page layout. All of these modes of representation have played an important role in the development of the textbook, not just the writing. As Bezemer and Kress (2010: 10) note, ‘all modes operating in textbooks – typography, image, writing and layout – contribute to meaning and potential for learning’.

The conversion of the textbook from a collection of web pages into a PDF document occurred early in its development in 2000. One of the motivators for the transition was the understanding that scrolling lengthy web pages within a browser is an inefficient way to navigate information online (Nielsen 2000). The transition was also motivated by student feedback obtained through formal course evaluations. It became apparent from the comments that some students were printing the web pages that constituted the textbook rather than reading them online. In hindsight, it is understandable that some students chose to print the textbook. Computer screens in the late 1990s had a lower resolution than screens that are commonly used today, and reading online for lengthy periods of time could lead to eyestrain and fatigue (Larson 2007). PDF provided a better format than HTML for sharing a document that was intended for

print. PDF pages could be formatted for printing at a specific page size, with page numbers, headers, footers, margins, columns, gutters, tables of contents and other elements that aid reading. One of the drawbacks of preparing the textbook as a PDF document was that it had a much larger file size than the equivalent collection of HTML documents. The larger file size resulted in longer download times over the slow dialup modems that were common at the time. This issue became less problematic over time, as broadband Internet connections became more common than dial-up connections.

Resistance to reading online is still an issue today. As recently as 2009, McGowan, Stephens and West (2009) found that students prefer printed textbooks to electronic textbooks. However, this resistance appears to be diminishing with the introduction of e-book readers such as the Amazon Kindle and multi-function tablet devices such as the Apple iPad. According to Rainie et al. (2012), in December 2011, 17 percent of American adults reported that they had read an e-book during the previous year. By February 2012 that figure had increased to 21 percent following a holiday season spike in the ownership of both e-book readers and tablet computers. These mobile devices offer students the flexibility of being able to use electronic textbooks in a more natural way without being tied to a computer. Accompanying advances in screen technology are making it as easy and comfortable to read from an electronic display as it is from a printed page. For example, the Retina Display technology used in Apple devices such as the iPad and iPhone has a high enough pixel density that the human eye cannot distinguish individual pixels at a typical viewing distance (Apple 2013). In response to the growing acceptance of electronic publications, some tertiary institutions such as Central Queensland University have dropped all internal production of printed learning resources in favour of online resources.

One of the benefits of preparing the online textbook as a PDF file has been portability, or the flexibility of using the same software in different online environments. The decision to distribute the textbook as a PDF file has made it relatively easy to adapt to changes to the learning management system (LMS) that Central Queensland University employs for all of its course web sites. During the textbook's lifetime it has been hosted on an internally-developed LMS named Webfuse, a proprietary LMS named Blackboard, and an open source LMS named Moodle. Academics who built their course resources with the tools that are integrated into these systems often faced a significant amount of redevelopment work when they were required to migrate their courses to a new LMS. These difficulties sometimes even occurred when the University upgraded to a new version of the same LMS. Distributing the textbook as a PDF document made it possible to sidestep these issues.

The manner in which the textbook has evolved over time in response to ongoing evaluation of the resource and changes in the learning environment is consistent with the Learning Design Sequence (LDS) model proposed by Selander (2008). LDS is 'a theoretical map for the purpose of analyzing critical incidents in (a creative) learning process' (Selander 2008: 14). In a formal learning environment the process is characterised by the transformation and formation of signs (units of meaning) by different modes and media to achieve a required outcome or representation. Interaction between students and teachers creates a social space of possibilities and

limitations. When the expectations of the process are clearly defined at the outset, all stakeholders have a tool for evaluation and iterative improvement, as in the case of this textbook.

### **Motivation**

The initial development of the free online textbook was not motivated by economic incentives, nor was it purely altruistic. The textbook was introduced to solve a problem. During the late 1990s I was frustrated by the University bookshop's apparent inability to stock sufficient copies of the textbook that was prescribed for my course. Bookshop purchasing managers consistently underestimated the number of books that needed to be ordered, presumably because they didn't want to be overstocked. This practice led to textbook deliveries being delayed by weeks and students starting their courses behind schedule. The problem was compounded by several factors. Firstly, enrolments in the web design course increased significantly during the dot-com boom of 1997 to 2000 when demand for courses and careers in digital media reached an all-time high. Secondly, Central Queensland University had a large cohort of international students whose enrolments were sometimes delayed by late processing of visa applications. Thirdly, the web design course and other digital media courses were offered at multiple campuses and in distance education mode, which meant that the delivery of textbooks to students often involved shipping delays. Today, a problem like the late delivery of a textbook would not be such a significant issue. Students could circumvent the problem by ordering their textbooks online from any one of a number of online booksellers such as Amazon.com. But in the late 1990s, purchasing textbooks online was not a common practice in Australia. E-commerce was in its infancy, payment gateways such as PayPal were immature, and concerns about credit card security discouraged consumers from shopping online. The changing habits of online consumers do not negate the benefits of developing a free online textbook, as this paper will explain. The point is simply that textbook distribution issues alone would probably not provide the impetus for such a project today.

Since I had the necessary skills, I decided to handle all aspects of the textbook's production myself. I had the option of handing some of the editing and formatting work over to support staff within the University's Division of Distance and Continuing Education, but they required the complete manuscript to be supplied many months prior to release. The production timelines were convenient for the Centre, but not for academics, with deadlines often falling at the busiest times of the year. Handing production control over to the Division would have also made it difficult to update the document in a timely manner when changes were required.

### **Student response**

Every edition of the web design textbook has been very well received by students. Course evaluation data collected between 2001 and 2012 testified to the quality of the publication and the overall course. Total student responses numbered 565. Three

quarters of those students indicated that they were pleased with the overall quality of the course, felt actively engaged and motivated to do their best work, and clearly understood the expectations of the course (see Table 1).

Statement	Responses to statements as percentages (N = 565)				
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Overall, I was satisfied with the quality of this course	2%	4%	18%	53%	23%
I was actively engaged and motivated to do my best work in this course	2%	7%	20%	45%	26%
I had a clear idea of what was expected of me in this course	2%	6%	17%	52%	23%

Table 1. Responses to 3 key questions from course evaluations for the web design course (2001–12)

A new question about the quality of the course learning resources was introduced to the course evaluation survey between 2010 and 2012. Student responses to that question numbered 103. Eighty-two percent of those students felt that the course resources – primarily the free online textbook – supported their learning well. Examples of student comments endorsing the quality of the textbook are provided below. All of these anonymous comments were gathered from the formal course evaluation responses.

The teaching materials provided in this course were excellent.

Learning materials were all available online which meant I didn't have to purchase expensive textbooks.

Very comprehensive and well explained with plenty of examples to help in understanding the material.

The fact it is a PDF makes it easy to read and download for reference.

This [the textbook] was the most important thing above everything else.

Well written and easy to learn from.

The materials were professionally produced and very comprehensive.

## Benefits

The benefits to students and teaching staff of providing a free, self-published online textbook are numerous. They include: widespread availability of a key learning resource; cost-savings for students; synchronisation with the course structure; ease of making updates; ease of correcting errors; convenience of electronic access; integration with the course web site; portability; and the interactive features of PDF documents.

*Widespread availability* of a key learning resource is the first benefit arising from this initiative. No students are denied access to the textbook because of prohibitive cost. All students have access to it from the moment they enrol in the course.

*Cost-savings for students* is a closely related benefit. Although Central Queensland University is based in a region that is known for its booming resources industry, the national benefits of that boom do not directly benefit the majority of local residents. Central Queensland University services the largest proportion of under-represented students among all Australian universities. Many of them are the first in their family to undertake tertiary education. Most do not access full-time study because of economic reasons. For many of these students, affordability is a critical factor in their decision to study (Central Queensland University et al. 2011).

*Synchronisation with the course structure* is a third benefit arising from the provision of a self-published textbook. When an academic adopts a traditional textbook for a course, compromises and adjustments often need to be made because the structure of the textbook rarely matches the desired structure of the course. In courses where only part of the prescribed textbook is used, students may become irritated by the unnecessary expense, or they may decide not to purchase the textbook at all. All of these problems are avoided when the textbook has been written to synchronise perfectly with the course syllabus.

*Ease of making updates* is a fourth benefit. The web design textbook is typically updated on an annual basis to incorporate new knowledge and skills, to accommodate changes in relevant software tools, or to improve the manner in which lessons are taught. Traditional textbooks are limited in how often they can be updated. Stewart (2009) notes that ‘textbooks are usually out-of-date by the time they are published, usually two to three years after the author has finished writing the book’. This problem is particularly pronounced in fields of rapid change like digital media.

*Ease of correcting errors* is a related benefit. When students notify me of an error they have identified in the web design textbook, I generally correct the problem and upload a revised edition to the course web site within a day. Authors of traditional textbooks cannot correct errors in such a timely manner. They must usually wait until the next hard copy edition is released, sometimes years later. Some publishers try to address this problem by publishing an errata list on a companion web site, but this solution is not as effective as updating the textbook itself.

*Convenience of electronic access* is a sixth benefit of using a free online textbook. Students appreciate the convenience of being able to save the PDF file in multiple locations – on their computer, on their mobile device, on a portable USB memory stick, or elsewhere. And since the textbook can be downloaded from the course web site, it can be accessed via the Internet from anywhere, including the on-campus computer labs where most digital media classes are conducted.

*Integration of the textbook into the course web site* offers greater benefits than just ease of access. On the course web site, students can view the textbook alongside many other learning resources, including video and audio recordings of lectures, PowerPoint slides, an online discussion forum where students and teaching staff chat, an assignment management system, and more.

*The portability and weightlessness* of digital products like the online textbook is a benefit in the sense that it saves students from the burden of carrying a heavy hard copy to and from class. Various researchers have demonstrated that students who

carry heavy textbook-laden bags are at risk of significant spinal strain that can lead to injuries in the shoulder, arms, hands and back (Bettany-Saltikov and Cole 2012, Korovessis et al. 2005). Online textbooks eliminate that risk.

*The interactive features of PDF documents* comprise another benefit of using an online textbook. Like many electronic books, the web design textbook is searchable. It contains hypertext links to relevant online resources. Text can be selected, copied and pasted into other software applications such as a word processor. Readers can highlight lines of text or paragraphs in colour, just as they might highlight a printed textbook with a fluorescent marker pen. Text can be annotated through the use of virtual sticky notes. It can also be magnified to a size that is comfortable for reading.

## **Viability**

Is the provision of a free, self-published, online textbook a viable model for other academics and institutions to consider? Undoubtedly, the response from some readers will be ‘no’. Baker-Eveleth, Miller and Tucker (2011) suggest that ‘the imposition of a course fee for a custom, professor-written online text is crucial for faculty to develop a textbook’. While that might be true in many situations, this article has demonstrated that it is not always the case. Non-financial incentives can sometimes provide enough motivation for academics to undertake such an initiative.

The ‘autotelic experience’, also known as ‘flow’, is the term that Csikszentmihalyi (1990: 67) coined to describe the deeply satisfying state of mind that some people experience when they engage in an interesting activity, ‘not with the expectation of some future benefit, but simply because the doing itself is the reward’. People who experience flow may devote considerable time and effort to activities that provide no obvious extrinsic rewards such as money or recognition. They engage in the activity for the sheer sake of doing it (Csikszentmihalyi 1975). The open source software movement offers a prime example of this kind of behaviour. The term ‘open source’ refers to software whose source code is freely available to the public. Anyone can copy, study, modify or redistribute the source code without paying royalties or fees. Open source software applications such as the Firefox web browser, the Apache web server and the Linux operating system, evolve through the unpaid efforts of a community of volunteer programmers.

Extrinsic motivators such as financial rewards can sometimes undermine intrinsic motivation for an interesting activity such as writing a textbook. Deci, Ryan and Koestner (1999) conducted a meta-analysis of 128 studies examining the effects of extrinsic rewards on intrinsic motivation. They concluded that ‘tangible rewards tend to have a substantially negative effect on intrinsic motivation’ when rewards are contingent upon doing, completing or excelling at an interesting activity (Deci, Ryan and Koestner 1999: 658–9). The researchers suggest that intrinsic motivation is underpinned by psychological needs for autonomy and competence. The presence of completion-contingent, engagement-contingent, or performance-contingent rewards attempts to control a person’s behaviour and forces them to surrender a degree of autonomy. Intrinsic motivation decreases as a result. When those same rewards carry little or no affirmation of competence there is nothing to counteract the negative



effects of the control. Pink (2009: 206) observes that tangible rewards do not necessarily undermine intrinsic motivation for rule-based routine tasks 'because there's little intrinsic motivation to undermine and not much creativity to crush'. But the non-routine, creative act of writing a textbook would not fall into that category.

Even when an academic is not motivated by financial incentives, the development of a free online textbook can lead to economic benefits indirectly. Stewart (2009), for example, discusses the professional recognition that he has received from publishing free online textbooks in the field of oceanography. 'I am frequently stopped at conferences by all manner of readers, from strangers to renowned professors, who thank me for my books', he writes. In my own case, the development of the web design textbook and subsequent positive feedback from students contributed to my successful nomination for two national teaching awards. In August 2011 I received the iAward for National ICT Educator of the Year. The iAwards are Australia's premier technology awards, organised annually by three peak ICT industry bodies. In the same month I received a second national teaching award accompanied by \$10,000 in prize money – a Citation for Outstanding Contributions to Student Learning from the Australian Learning and Teaching Council (ALTC). These awards, in turn, contributed to an academic promotion in 2012. The contribution that the web design textbook made to these outcomes was small, but the point is that there are both individual benefits and institutional benefits to be gained by pursuing activities that enhance student learning.

## Conclusion

This article has outlined a case for tertiary institutions to consider giving motivated academic staff the time and resources required to self-publish free online textbooks for their courses. This practice has numerous benefits for students including widespread availability of a key learning resource, significant cost savings, the convenience of electronic access, close integration between the textbook and the course web site, portability, and the various interactive features of PDF documents. Self-published textbooks have benefits for course coordinators too: synchronisation with the course structure, ease of making updates and ease of correcting errors. Some academics may also find enjoyment and satisfaction in authoring their own textbook, along with potential flow-on benefits to their professional reputation. All of these factors add up to significant benefits to the sponsoring institution – benefits that may be easily overlooked in a system that is focused on generating revenue and making efficiency gains.

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