

## Opportunities and Challenges of Utilizing Educational Technology in Developing Countries: The eCANDLE Foundation

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Millions of people lack the opportunity for higher education. In countries around the world, tuition costs, competition, and the opportunity costs of leaving employment to study full-time prevent many from learning the skills necessary to increase their standard of living. There are many opportunities and challenges associated with the use of innovations in technology for extending educational opportunities in developing countries. In addition to discussing some of these, we use as a case study the eCANDLE Foundation, a nonprofit organization, which projects to deliver online education content to students in emerging third-world economies. eCANDLE aims to give students opportunity for personal growth and scholastic learning, helping them become economically self-reliant. The assumptions of eCANDLE were studied this summer in the Chinese context and those findings helped shape future projections. This paper overviews worldwide educational needs and presents eCANDLE's revised long-term approach following the initial research designed to discover the best ways to meet these needs.

**Keywords:** e-Learning; developing countries; e-CANDLE; cultural diversity; distance learning

### 1. Introduction

In 2004, 1.4 billion students worldwide spent nearly \$2.3 trillion dollars on education [1]. An astounding 300 million of these students live in China [2]. Reports indicate that the number of students in China continues to increase significantly every year, a fact attributable to the recent migration of 140 million farmers to urban areas. According to China's Minister of Education, Zhou Ji, another 100 million rural farmers currently await permission to move to cities (Huanxi 2006). As worldwide student population and migration trends continue to increase dramatically, the education infrastructure simply cannot accommodate all who seek higher education, especially in regions where need remains the highest. Recently, the Chinese government approved to increase spending over the next five years for compulsory education from 2.79 percent to 4 percent of GDP [3]—an increase of over \$99 billion dollars<sup>1</sup>.

To compound the education deficit, job markets also struggle to provide enough employment for those who have college degrees. In his opening address at the International Association for Management of Technology in Beijing, China, Li Gong, Operational Manager of Research and Development for Microsoft, reported that Microsoft recently recruited new employees from the top 20 universities in China. Of the 100,000 applications received, Microsoft could accept only one out of every 500 (2006). Gong further stated that the majority of all applicants had doctoral degrees.

Nations like China cannot provide enough educational resources fast enough to meet the escalating demands for higher learning. The number of potential students, a saturated job market, and unsubsidized education costs prevent the building, staffing, and maintaining of traditional universities, especially in remote areas. Officials have identified an increase in the number of distance learning opportunities of-

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<sup>1</sup> The People's Republic of China reported a GDP of \$8,182,000,000,000 in 2005 as published in *The World Factbook*

ferred by public and private universities based on two key factors: an increased technological capacity for e-learning, and a surge in preference for Western-style education [1].

Fortunately, with the advent of wireless Internet, more educational opportunities are becoming available. Online education, however, has a steep barrier to entry: successful e-learning requires more than scanning digital textbooks and creating java-scripted multiple choice tests. Through careful psychographic and demographic research, a nonprofit organization called eCANDLE is seeking to find ways to overcome language, culture, comprehension, testing, and accreditation barriers to determine how best to aggregate and deliver online education.

## 2. Background to eCANDLE

The Kevin and Debra Rollins Center for eBusiness and the eBusiness Center's philanthropic branch, the eLeaven Initiative, in cooperation with Brigham Young University has created a student-run organization called the eCANDLE Foundation. Curt Allen and Dr. Wayne Brickey first envisioned it as the mobile learning project in early 2004. The eCANDLE acronym stands for the Electronic Coalition for Aggregation of Net-based Digital Learning Environments. The eCANDLE Foundation is intended to function as an educational vehicle for delivering higher education to the people of developing nations around the world.

The eCANDLE Foundation proposed 7 "e-silos" of academic content: E-Business, Entrepreneurship, Ethics and Leadership, English as a Second Language, Electronic Information Technology/Systems, Economic Self-Reliance, and Environmental Stewardship. Initially, eCANDLE is using Internet Marketing as the topic of study for the pilot, from there eCANDLE will expand to other academic disciplines.

eCANDLE is considering the delivery of courses in manageable sections that can be completed in relatively short amounts of time; varying from a few days to a few weeks. The educational content is ideally designed to provide education in a "just-in-time" manner and will not require students to quit their jobs or take time off work in order to complete. Various self-sustaining revenue models are being considered, taking into consideration cultural and economic forces.

One of eCANDLE's central objectives is to bring together, or aggregate, a coalition of university scholars, content developers, and industry leaders to develop content and a framework suitable for the targeted eCANDLE audience. The growing coalition already includes academics and professionals from Brigham Young University, the Marriott School of Management, Brigham Young University Hawaii, Tsinghua University, Franklin Covey Inc., and many other leading institutions.

Unique in its vision and scope, eCANDLE Foundation seeks to lift humanity through education and technology. As a student-run, professionally-mentored, and nonprofit program, it fulfills the altruistic mission of Brigham Young University to "Enter to Learn, Go Forth to Serve" ([www.byu.edu](http://www.byu.edu)). Students have been involved in developing research, websites, marketing, financial forecasting, language translations, and cultural localizations. The following characteristics have also been considered to distinguish eCANDLE from other distance learning programs.

**2.1 M-Learning** - eCANDLE is designed to deliver functional bite-sized portions of "just-in-time" education to people around the world through not only an e-learning model but also an "m-learning" model. M-learning is significant in that it is both mobile and micro. The mobile model does not restrict the users to a traditional PC or laptop but instead allows users the flexibility in choice of device, including mobile phones, hand-held PCs, ultra mobile PCs, etc. The micro model delivers compact courses, focusing on the most fundamental and useful theories and identifying sources available for additional information.

**2.2 Universal Platform** - A universal platform will enable eCANDLE to utilize the m-learning style. eCANDLE would be completely and easily transferable and translatable to any computer system because it would be completely coded in Flash or another similar program that is understood by all computer operating systems. Other benefits include eliminating downloading delays, complications, and the need for specific hardware.

**2.3 Alternative Pedagogy** - Traditionally, education has been very linear: professors teach from point A to point B. eCANDLE considered an alternative strategy by which students will have complete control of the speed and direction of their learning. Similar to a choose-your-own-adventure book, eCANDLE users could start at point A, jump to C, then Q, and back to B. Or they can choose to follow traditional linearity. In this way, eCANDLE intends to allow students to tailor the learning process to fit their individual needs. The alternative pedagogy would also include a balance of formal and informal education methods. Formal education is hierarchal: professor teaches from the top and students learn from the bottom. Informal education moves away from traditional teacher/student roles and allows a more collaborative learning environment. Some informal aspects include collaborative tools like scheduled mentoring sessions, group chats, message board discussions, and frequently asked questions (FAQ) pages.

### 3. Research Questions

In order to test the stated eCANDLE assumptions about m-learning and alternative pedagogy in the context of contemporary Chinese society, several research questions emerged: What are the current perceptions toward e-learning? How accepted would non-linear and informal approaches to pedagogy be? How important is it for e-learning to be a degree-granting program? What are some potential target audiences? What technology should be used initially for the delivery of content and communication?

### 4. Methods

eCANDLE's development is based on a vast bank of knowledge gathered from universities, the Internet, and many other sources. We have read thousand of news articles from Nexis.com, Google, the *Wall Street Journal*, and many other news sources. Other resources consulted include white papers from Hezel Associates and MEXT.com; popular reference books such as Thomas Friedman's *The World is Flat*, and Ross Terrill's *The New Chinese Empire*; and Factbooks from the CIA and the Census Bureau. While secondary sources have provided us with excellent information, we have focused on the results of primary research.

Primary research data regarding the use of educational technology in contemporary Chinese society was collected through several methods: surveys, focus groups, user testing and tutorials. Most of the data was collected on the campus of BYU Hawaii, Communication University of China, Tsinghua University, and from participants of the IAMOT and GCCCE Conferences, held in Beijing.

Surveys—Depending on the survey audience, we adjusted the surveys to be applicable to participants. Questions included information regarding understanding of distance learning, applicability, ranking content genres, internet connectivity, interest, and demographics. Answers have been compiled and analyzed, and some results are presented below.

Focus Groups—Our focus group was designed to be small and informative. The group consisted of six people from mainland China. In the focus group we explained the purpose of eCANDLE and provided a demonstration of what eCANDLE might look like in the future. After explaining and demonstrating some eCANDLE ideas, we followed standard protocol in asking our research questions recording the resulting discussion in both audio and video formats.

User Testing—We asked volunteers to go through Dr. Liddle’s e-Business presentation from start to finish without explaining to them what we were looking for and without any explanation of eCANDLE. As part of the test, we asked participants to think out loud and share what they are thinking as they went through the lesson. We recorded volunteers’ actions, body language, comments, and reactions. Some of the questions we asked in these interviews included, What did you understand from the presentation? Did you like the presentation—why or why not? Was the content engaging? Would you pay for content in this format? What was your understanding of e-Business before watching the presentation and what is it now? and other demographic questions.

Tutorials—As a cosponsor to the Global Chinese Conference of Computer Education, we had a three hour tutorial with 30 male and female educators from all over China. We provided an introduction to eCANDLE, outlined our goals and motivations, and showed a brief interactive demo of e-Business content. We then asked questions and tallied responses regarding understanding, usage, connectivity, validity, and also demographics. Students comprised of 64% of all participants, with 27% educators, professors, and administrators, and 9% of industry professionals. Participants are 95% Chinese and 5% Mongolian

Limitations--The research groups didn’t combine to be a statistically significant sameple size; however, these methods are intended for collecting thick, and rich data.

## **5. Results**

Results will be discussed in relation to each research question.

### **5.1 What are the current perceptions towards e-learning?**

The general perception towards e-learning in China is similar to that in the US. Although not usually the preferred method of education, sometimes it is the best that is available, and therefore it is both increasingly used and legitimized. Certain circumstances in China intensify the need because of supply and demand issues with quality education. Although they recognize that perceptions are changing, some individuals are concerned that because the Internet is currently used primarily for entertainment that some may find it difficult to use for educational purposes. Some specific data in relation to this question was collected as a part of the tutorial session held in Beijing at the GCCCE. Of those in attendance, 80% had either taught or participated in a class that was at least partially conducted over the Internet. In their opinions, 43% felt like distance learning was “somewhat effective”, 43% felt like it was “effective” and 14% felt as if it was “very effective.” We received zero responses indicating that distance or e-learning was “not effective”. The overall experience and perception we met towards e-learning in our interviews and focus group was both cautiously positive and optimistic. It seems that using technology in education is becoming more common and accepted.

### **5.2 How accepted would non-linear and informal approaches to pedagogy be?**

Although many still expect a very authoritarian, rote memorization instructional approach in China, this is also slowly changing. As there is more interaction with educational administrators and leaders between the East and West, there are gradual changes occurring in the methods and modes of instructional delivery. Interestingly, part of what is helping to change paradigms is the introduction and diffusion of technology in education. This is because educational content and interactions delivered via technologies introduces new flexible environments where new rules and expectations are formed.

Having said this, however, one response that was common throughout our research, was the insistence to have to a live teacher for most subjects. Although this is also true for Western learners, our feeling is that it is even more true for learners from China. Helpful interaction tools include chat rooms, forums, conference calls, and peer review groups over the internet. The degree to which non-linearity and informality could be integrated in educational content is still unclear, and continual feedback cycles in

the development and implementation of eCANDLE will help ensure that these methods are helpful and not distracting to learners.

### **5.3 How important is it for e-learning to be a degree-granting program?**

Students need a degree-granting program. Although initially envisioning the value of “just-in-time” learning that might or might not be tied directly to educational credit leading to a degree (e.g. having a use value in itself that is perhaps not tied to a degree granting program), the very clear message from almost every data collection method was that most learners need any education (including e-learning) to lead to a degree or they would not be interested. Both the degree-granting status and the recognition of this degree by the government or major corporate entities was important. The following quote provides an example emphasizing the perception and need of a degree or certificate

“When looking at e-learning like this, the first question I ask is ‘Will I get a degree?’ and the second question is ‘Will the government recognize that degree?’”

### **5.4 What are some potential target audiences?**

As we suspected, the initial audience we had prepared for, the poorest of the poor, could not pay for the services, and those who could afford the courses demanded a much different type of education. For example, business management students in the poor section might need to learn simple concepts related to break-even theory, while those who can afford an education might instead need to learn about concepts related to calculating margin and tracking inventory. Some of the potential target audiences for eCANDLE content could eventually expand to include poor and destitute migrant workers, job centers, work training facilities, stay-at-home or single mothers, university-bound students preparing for university acceptance, government entities, professionals, and large corporations. However, because of the need differences, even in the same subject areas, different learner groups, and necessitate an effort that is more focused on a specific niche.

### **5.5 What technology should be used initially for the delivery of content and communication?**

Because technology is notorious for disrupting implementation, we had many questions regarding technology diffusion as well as the typical capacity and usage patterns. For example, how easy is it in major cities to obtain Internet access? What are the most common devices that people connect with? How common is connection and downloading content onto mobile devices?

Initially, we assumed that Asia’s development and cellular phone use far surpassed trends in the US. In some areas, like Japan, this is true; however, what we experienced in Beijing is not necessarily the same case. Initially, we considered using cell phones as a delivery option for eCANDLE content, transmitting information through phone networks in much the same manner that cell phone users download ring tones.

We found that cell phones are very prolific; every attendee at the conference, and those that we interviewed without fail had a cell phone. Even though most have the technology, most users don’t normally use cell phone in the same way that people in the US do. It is important to note that payment structure and customer service agreements with the service provider is different. Most cell phone users purchase pre-paid phone cards instead of receiving a monthly bill, they purchase time as needed. Additionally, cost issues prohibit accessing or downloading anything from the Internet onto mobile devices, other than an occasional ring tone. Although the capability of these devices to connect to the Internet existed, it was rarely used. The most common ways to connect to the Internet are still PCs, and very few of the PCs are wireless.

**Table 1** Consider the following data from the GCCCE tutorial participants:

<b>Text or instant messaging</b>	
I don't text or instant message on my phone	0%
I seldom text or instant message with my cell phone	0%
I sometimes text or instant message	69%
I frequently text or instant message	31%
<b>How often do you listen to music on your cell phone?</b>	
I don't listen to music on my cell phone	69%
I seldom listen to music on my cell phone	23%
I regularly listen to music on my cell phone	8%
<b>How often do you download to your phone (ring tones, games, etc)</b>	
I don't download, ever	17%
I seldom download	83%
I frequently download	0%
<b>How often do you browse the internet on your cell phone?</b>	
I never browse the internet on my cell phone	44%
I seldom browse the internet	56%
I frequently browse the internet	0%

## 6. Conclusions

Though our research is far from complete, we are now beginning to understand some of the issues that face a Western style education organization entering an international arena. In response to this research, eCANDLE has altered several initial perceptions and strategies. There is now a heavier emphasis on mentoring, and creating digital tools that help to leverage a mentors ability to reach more learners. eCANDLE is considering several different approaches to offer a degree or tying course completion with credits that can be used for degrees at participating universities. The target audience for initial trials of eCANDLE delivery is being focused and specified. And although content is created so that it can eventually be transferred to any mobile device in the future, initial offerings are going to be directed to those using any traditional PCs connected to the Internet.

Looking ahead, we realize the need to simplify and reduce the cost of producing deliverable content. Our initial content portion was too expensive to be scaleable to include different content. Instead, we are looking into developing a program shell where professors could feed in their own video and other resources and the program would produce the content deliverable. Although this research is far from complete, these initial findings have been substantive in providing understanding of what would be most helpful in providing benefits to students around the world.

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