THE DEVELOPMENT AND MARKETING OF AN ONLINE GUIDED STUDY PROGRAM FOR THE GRE PHYSICS EXAM TOWARDS AN UNDERSTANDING OF FUTURE INSTRUCTIONAL METHODOLOGIES

by

MURAD ALI MITHANI

Submitted in partial fulfillment of the requirements

For the degree of Master of Science

Thesis Adviser: Dr. Robert Brown

Department of Physics

CASE WESTERN RESERVE UNIVERSITY

January, 2009
CASE WESTERN RESERVE UNIVERSITY
SCHOOL OF GRADUATE STUDIES

We hereby approve the thesis/dissertation of

MURAD ALI MITHANI

candidate for the Master of Science degree *

(signed) DR. ROBERT BROWN

(chair of the committee)

DR. CYRUS TAYLOR

PROF. EDWARD CANER

(date) AUGUST 20, 2008

*We also certify that written approval has been obtained for any proprietary material contained therein.
# TABLE OF CONTENTS

INTRODUCTION .................................................................................................................................................. 9

Distance Learning ............................................................................................................................................ 9

History of Distance Learning ......................................................................................................................... 10

Distance Learning Statistics .......................................................................................................................... 13

Teaching Physics through Distance Learning .................................................................................................. 15

GRE Physics and the Online Guided Study Program ..................................................................................... 16

CHAPTER 1: DEVELOPING THE ONLINE GUIDED STUDY PROGRAM ............................................................. 19

Identifying the Media and Other Communication Technologies ................................................................. 19

Program’s Online Readiness .......................................................................................................................... 22

Multimedia Mix for the Program ...................................................................................................................... 23

Web – The Central location of the Program .................................................................................................... 24

Program Development ................................................................................................................................... 27

1. Project Plan ............................................................................................................................................... 27

2. Course Design .......................................................................................................................................... 34

3. Production ............................................................................................................................................... 49

4. Program Evaluation ................................................................................................................................. 51

Intellectual Property and Copyright .............................................................................................................. 52

CHAPTER 2: UNDERSTANDING THE COMPETITION .................................................................................... 54

Academic Institutions ................................................................................................................................... 54

Private Test Preparation Centers ................................................................................................................... 55
Books and Practice Materials

CD / DVD Resources

Websites

CHAPTER 3: ATTRACTING STUDENTS TO THE PROGRAM

Demographics of the Target Customer

User Experience

Marketing the Program

The Online Marketing Mix

Marketing to students at the department of Physics, Case Western Reserve

Marketing to Students at Other universities in the US

Marketing to Students at Universities in the Developed Countries, excluding the US

Marketing to Students at Universities in the Developing Countries

CHAPTER 4: EVALUATING THE COMMERCIAL VIABILITY OF THE PROGRAM

Program Costs

1. Cost of Development and Delivery
2. Cost of Marketing
3. Number of Students Registered and Variable Cost
4. Revenues from the Program

Student Costs

Program Expectations and Outcome

Projecting Outcome & Financial Statements

Measuring the Quantitative Outcome – Program Income
LIST OF TABLES

Table 1 - Pricing Model for Phase 1 ............................................................... 102
Table 2 - Pricing Model for Phase 2 and Matured Phase ................................. 102
Table 3 - Transaction Costs for Phase 1 .......................................................... 103
Table 4 - Transaction Costs for Phase 2 .......................................................... 104
Table 5 - Transaction Costs for Matured Phase ............................................... 104
Table 6 - Registration Revenue for Phase 1 ..................................................... 105
Table 7 - Registration Revenue for Phase 2 ..................................................... 105
Table 8 - Registration Revenue for Matured Phase ........................................... 105
Table 9 - Advertisement Revenue for Phase 1 .................................................. 107
Table 10 - Advertisement Revenue for Phase 2 ............................................... 107
Table 11 - Advertisement Revenue for Matured Phase ..................................... 108
Table 12 – Summary of costs for individual users ............................................ 111
Table 13 – Projected Income Statement for 5-years as Phase 1 ......................... 113
Table 14 – Projected Income Statement for 5-years as Phase 2 ......................... 114
Table 15 – Projected Income Statement for 5-years as the Matured Phase ......... 115
Table 16 – Recommended Plan: 5-year Income Statement .............................. 116
Table 17 – Recommended Plan: 5-year Income Statement (out of pocket expenses) .. 117
Table 18 – Projected Cash Flow for Year 1 - Recommended Plan ...................... 118
Table 19 – Projected Cash Flow for Year 2 - Recommended Plan ...................... 119
Table 20 – Projected Cash Flow for Years 3 to 5 - Recommended Plan .............. 120
Table 21 – Projected Balance Sheet for Years 3 to 5 - Recommended Plan .................. 121
LIST OF FIGURES

Figure 1 – Growth in online distance education enrollment across colleges and universities in Illinois ................................................................. 14

Figure 2 – Revenues of 6 major standardized testing companies in 1987/88 .................. 17

Figure 3 - Levels of web use in education ................................................................................................................................. 21

Figure 4 - Americans online by age ................................................................................................................................. 25

Figure 5 – Summary of resources and responsibilities for the first two phases of the project ................................................................................................................................. 32

Figure 6 – Paypal Online Transaction Fee ................................................................................................................................. 39

Figure 7 - Princeton Review - Private Tutoring ................................................................................................................................. 55

Figure 8 – The 4P+P²C²S³ e-marketing mix model by Kalyanam and McIntyre ............ 72

Figure 9 – Information and Communication Technologies in various regions ............ 79

Figure 10 – Broadband users in various regions ................................................................................................................................. 80

Figure 11 – Internet use by location in various countries ........................................... 81

Figure 12 – User activities on the Internet various countries ........................................ 82
ACKNOWLEDGEMENTS

I would like to thank all my professors, particularly Prof. Caner for his continuous support and encouragement, Prof. Taylor for his guidance and direction and Prof. Brown, for helping me identify the best path towards my aims and for always being there for advice and inspiration.

I would also like to thank my wife, Anila Mithani, for being patient in my journey through the Masters program and to Audrey Todhunter, for being an exceptional friend and colleague.
The Development and Marketing of an Online Guided Study Program for the GRE Physics Exam towards an Understanding of Future Instructional Methodologies

Abstract

by

MURAD ALI MITHANI

Online Distance Learning has made it possible to use a large set of training resources customized to the users and the environment. The study identifies an effective approach for the development and marketing of a GRE physics online guided study program based on the available literature and the experience and materials developed by Professor Robert Brown at Case Western Reserve University. The findings conclude that the approach is cost-effective for the student, will serve approximately 30% of the 12,500 GRE physics candidates every year and will generate an annual income of $80,000 if continued as a university publishing project or more if transformed into an online training platform with multiple revenue streams. The program also serves as a proof of concept towards structuring future online instructional methodologies to position Case Western Reserve University and the Department of Physics at the forefront of learning technologies.
INTRODUCTION

Distance Learning

The medium of communication for humans has been evolving continuously; from cave drawings to printed materials and now, the electronic text. With the Internet, the pace and frequency of communication has increased. This has not only revolutionized the global knowledge and economic landscape, but has led to some very unique trends in education, making distance education even more convenient and effective.

Mood (1995) describes distance education to be a combination of the following four elements derived from Desmond Keegan’s five-point definition in The Foundations of Distance Education (1986):

1. The teacher and the learner should be geographically separated during most of the learning process
2. The education program should be influenced in some way by an organized educational institution
3. One or more media of communication are used to connect the teacher and the learner
4. There is a two-way communication between the teacher and the learner in order for the teacher to guide the learner and receive feedback on their performance.

---

The current study uses refers to these elements in order to transform a traditional course into a distance learning program. It however does not focus on live interaction between the teacher and the learner.

**History of Distance Learning**

The origins of distance education resembling its current form come from Correspondence Education, which started as soon as a reliable mailing mechanism was in place.  

The medium of communication has long been a significant element in the evolution of distance education, as identified by Mood (1995):

> An early recorded effort at using the new technology of regular mail service as an aid to education is seen in an advertisement in the Boston Gazette on Mar 20, 1728, in which teacher Caleb Philips offered to send weekly shorthand lessons to prospective students.

During the last few decades, there have been several advancements in the tools available for the dissemination of course materials online. Although there are differences in dates from various sources, Bates (2005) offers a good chronological summary of the deployment of technology in education.

The first table gives the various tools in education developed over the past three thousand (or more) years:

---

2 Terry Ann Mood, *Distance Education: An Annotated Bibliography*. (Libraries Unlimited, Inc., P.O. Box 6633, Englewood, CO 80155-6633, 1995), 1
<table>
<thead>
<tr>
<th>Development</th>
<th>Years in Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teacher</td>
<td>3,000</td>
</tr>
<tr>
<td>Printed Book</td>
<td>500</td>
</tr>
<tr>
<td>Postal Service</td>
<td>150</td>
</tr>
<tr>
<td>Telephone</td>
<td>90</td>
</tr>
<tr>
<td>Radio</td>
<td>60</td>
</tr>
<tr>
<td>Film</td>
<td>50</td>
</tr>
<tr>
<td>Television</td>
<td>20</td>
</tr>
</tbody>
</table>

Figure 1 – The development of new technologies in teaching up to 1980

And the following table gives the latest addition to educational technologies with the advent of the computer, particularly during the last 20 years:

<table>
<thead>
<tr>
<th>Audio-conferencing</th>
<th>Computer-based learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio-graphics systems</td>
<td>Cable TV</td>
</tr>
<tr>
<td>Viewdata/Teletext/Teledon/Minitel</td>
<td>Satellite TV</td>
</tr>
<tr>
<td>Laser video-discs</td>
<td>Video-conferencing</td>
</tr>
<tr>
<td>Coimputer conferencing</td>
<td>Compact discs</td>
</tr>
<tr>
<td>Internet</td>
<td>Electronic mail</td>
</tr>
<tr>
<td>World Wide Web</td>
<td>LCD projectors</td>
</tr>
<tr>
<td>Digital video discs</td>
<td>Search engineers</td>
</tr>
<tr>
<td>Fibre Optics</td>
<td>Mobile phones</td>
</tr>
<tr>
<td>Learning objects</td>
<td>Wireless networks</td>
</tr>
<tr>
<td>Portals</td>
<td>e-Portfolios</td>
</tr>
</tbody>
</table>
Simulations | Experts systems
Virtual reality

Figure 2 - The new technologies in teaching since 1980

Some of these technologies have came to be known as e-learning; however, as Guri-Rosenblit (2005)3 explains, e-learning is itself an educational methodology and can be part of either a distance learning program or a classroom based course.

Pittinsky (2003) mentions in his book “The Wired Tower: Perspectives on the Impact of the Internet on Higher Education” that the reason for Internet to quickly integrate with education in the US has been due to its capacity to add to the trends already taking shape in higher education. These include focus on pedagogical aspects of teaching, appreciation of technology as a driver for change instead of a medium of automation, and, the need to tap unique additional markets now possible with online education. As Barron (2004) explains, studies conducted so far have not been able to find any difference between the effectiveness of teacher based instruction in the traditional classroom compared to the newer media such as the Internet. He further mentions:

For instructional designers and teachers, this is good news – their repertoire of instructional classroom tools increased, and they could effectively teach remote students via radio, audiotapes/discs, and computers.

3 Sarah Guri-Rosenblit, “‘Distance education’ and ‘e-learning’: Not the same thing”, Higher Education (2005) 49: 467–493
It is now clear that this integration of technology and education is going to go beyond the possibilities envisioned at this time and it wouldn’t be surprising if pedagogical aspects of education start to be customized to fit around chosen technologies in order to gain the benefits of this combination.

**Distance Learning Statistics**

Distance education is now a major component of higher education. The Sloan Consortium survey of online education trends by Allen and Seamen (2007) found that over 3.48 million students in the U.S. studied online⁴ in the fall of 2006. The previous report by Allen and Seamen (2006) found that more than 96 percent of the very large institutions in the U.S. (with enrollments of more than 15,000 students) offered some form of online degree programs and/or courses (either completely or hybrid with traditional lectures). The projected growth in online enrollment is expected to be 20% per annum, which exceeds the overall expected growth for the entire higher education student population (Allen and Seamen, 2004). A good example is the enrollment growth in online distance learning courses and programs across colleges and universities in Illinois during spring terms from 2000 to 2007:

---

⁴ Sloan Consortium defines Online learning as a program with 80% or more of distance learning component
Over 200,000 online courses are offered at higher education institutes worldwide (Minielli and Ferris, 2005). Furthermore, 11 percent of the people worldwide were connected to the internet in 2003 compared to 4.5 percent in 1999 (Hesseldahl, 2005). The connectivity has facilitated the increase in emphasis for online education by users who find it difficult to attend the traditional classroom lectures due to geographical and various other limitations. An additional and perhaps though less common reason is that online learning environment is more supportive in terms of promoting reflection, intimacy, and community compared to the traditional lecture room environments (Barab, 2001).

In addition to the above, another advantage of making course materials available online includes the ease of its distribution and the eventual financial benefit to the student. As
found by the United States Government Accountability Office, college students at 4-year public institutions spend an average of about US $900 on texts per year, which is roughly a quarter of the annual costs for tuition and fees. For 2-year public institutions, the average spending for books is almost three-quarters of the cost of tuition (GAO 2005, p. 3-4).

**Teaching Physics through Distance Learning**

The experience of Adams (2004) in teaching the first and second year undergraduate physics through distance learning at Kentucky Virtual University (KYVU) has been very positive. The course offered a high quality learning experience for the students. Both lectures and labs were accessible online. With respect to the workload, Prof. Adams mentions:

> The amount of work required from the student appears to be approximately what that student would have to devote to taking a traditional section of the same course. The work required of the faculty is significantly greater, but as the process stabilizes, the work involved may settle to a lower level.

However, as observed by Gustafsson (2002), students find learning of physics through distance programs interesting but are not particularly motivated:

> As a distance student you cannot interact with other students or the university administration in the same way as when you are studying on the campus. If you have not studied at a university earlier it is even harder. This can cause stress
that alienates distance students and can put them close to the limit of quitting a course.

Continuous interaction with faculty and peers has been found to overcome this feeling of loneliness. Gustafsson (2005) identifies that cooperative work increases the productivity of students, particularly for male students:

The collaboration helps male students to rise from much lower throughput levels than female students when using individual-based methods to complete the course at the same level as female students.

**GRE Physics and the Online Guided Study Program**

Commercial coaching of standardized admission test has been in place for some time. In a 1978 study by the Federal Trade Commission, it was found that almost 50,000 students prepare for these exams every year spending almost $10,000,000 on commercial coaching courses. During the last 30 years the number of people going for higher education has substantially increased and so has the demand and expenditure for standardized testing and its commercial coaching, as found by annual sales for six major testing companies during 1987/88:
The current study identifies the steps towards development of a web based guided study program which can, as Belanger and Jordan (2000) define, be used to augment or replace traditional courses. The program aims to attract customers and sell services through the Internet as a for-profit venture. The program acts as a medium of instruction for students preparing for the GRE Physics aptitude test, conducted by the Educational Testing Service (ETS) worldwide. The test is taken by approximately 12,500 candidates every year and at the current fee, generates around $1.8 million only in registration fee. The students are typically studying at a level equivalent to the US junior and senior undergraduates in physics and are preparing for graduate studies in physics or astronomy. This test is mandatory for admission at most recognized US and Canadian schools and the requirements may vary for other such universities and institutions around the world. As described by ETS on its website:\(^5\)

Any accredited graduate, business or professional school, or any department or division within a school, may require or recommend that its applicants take the

---

\(^5\) GRE Website: http://www.ets.org/portal/site/ets/menuitem.1488512ecfd5b8849a77b13bc3921509/?vgnextoid=efc42d3631df4010VgnVCM10000022f95190R0RD&vgnextchannel=cf946f1674f4010VgnVCM10000022f95190R0RD (accessed Jun 30, 2008)
General Test, a Subject Test, or both. A non-accredited institution can receive test takers' scores if approved by the GRE Board.

A list of institutes currently affiliated with ETS to receive the scores directly for student applications is available, at the time of writing of this report, at http://ftp.ets.org/pub/gre/01736_iclist.pdf.

A basic version of the Program at the time of writing is available on the Internet at the department of Physics, Case Western Reserve University (CWRU):

http://ohm.case.edu/gre

The next step is to make it available as an independent professional venture that is preferred by the targeted students, is profitable and serves the example of a successful online instructional method.
CHAPTER 1: DEVELOPING THE ONLINE GUIDED STUDY PROGRAM

Identifying the Media and Other Communication Technologies

The students targeted by the program are dispersed throughout the world. This can be seen from the various locations around the world where GRE Physics is administered (http://www.greexplorer.com/Test-Centers.html). This does not include the regions where there are too few students for it to be economically feasible for ETS to administer the test. Such students usually travel to the nearest test center to take the exam.

The program is designed to develop and/or improve the skills for understanding and solving GRE physics type problems in a period of time that is more or less equal to a standard university semester (4 months). Based on the geographical spread of its target customers, the most practical solution is to make the training available through the Internet, making it part of the distance learning programs. On one hand, this narrows the list of tools available for the program, and on the other, makes it convenient to focus on the key technologies that form its structure. This is particularly helpful as the large number of tools available for distance learning usually make it very difficult to shortlist the technology portfolio. Bates (2005) gives a practical account of the three scenarios in the absence of strong criteria for the evaluation of technology in an academic setting:

1. Too many choices make it difficult and therefore no decision is made to offer a technology based educational program
2. Enthusiastic individuals try to initiate a program based on their understanding and ideas. The life of such an initiative is usually short because of its lack of acceptance throughout the institution.

3. Some external authority (such as government) tries to force its choice of technology, limiting the options available to the institution. The selected technology may not be the best, but people will have to live with them.

Mayer (2001) says that the key is to utilize the set of tools that not only are effective in communicating the educational materials, but also make use of the cognitive ability of the learners. As Bates (2005) mentions, the advantage of web-based teaching is the multiple possibilities it offers for the structure and organization of learning, extending the choices in designing an effective instructional program.

The current study attempts to position the training program somewhere between the web usage levels of 4 and 5 as identified by Harmon and Jones (1999), which include:

<table>
<thead>
<tr>
<th>Level of Web Usage</th>
<th>Termed</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 0</td>
<td>No web component</td>
<td>Implies no web use at all.</td>
</tr>
<tr>
<td>Level 1</td>
<td>Informational</td>
<td>Simple instructions online regarding classes and schedules. The web acts mainly as a notice board.</td>
</tr>
<tr>
<td>Level 2</td>
<td>Supplemental</td>
<td>Web acts as a platform for additional information (notes, presentations) and links to other resources.</td>
</tr>
<tr>
<td>Level 3</td>
<td>Essential</td>
<td>All critical information is made available through the web and it is an integral part of the course.</td>
</tr>
<tr>
<td>--------</td>
<td>-----------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Level 4</td>
<td>Communal</td>
<td>The online and classroom environment are extensions of each other. The schedule can easily be tailored to replace one for the other, as and when needed.</td>
</tr>
<tr>
<td>Level 5</td>
<td>Immersive</td>
<td>All communications and instructions take place online. This allows the highest level of intellectual freedom and resource structure for a truly interactive student learning experience.</td>
</tr>
</tbody>
</table>

Figure 5 - Levels of web use in education (Harmon and Jones, 1999: pp 28 – 32)

The advantages and disadvantages of a web-based program identified by Lee and Owens in their book “Multimedia-Based Instructional Design” (2004) are:

Advantages of Web Based Media:

1. Chat rooms – Allow live interaction between instructor and participants

2. Email boxes – Make it possible to query and pass instructions at other times

3. Member Space – Gives room for managing customized materials and references

4. File Sharing – Allows easy transference of data presentations to others

5. Audio and Video – Gives participants the ability to be in a virtual classroom with the presenter, and in case of video conferencing, interact face-to-face

6. Update – Easy for instructors to manage once everything is electronic and organized at one place

Disadvantages of Web based Media:

1. Preparation – More work required by the instructor or their team to organize materials and ensure the readiness of the technology and media
2. Additional Skills – Programming, web designing and hosting and other such skills may be required or contracted to make the course available

3. Security – Needs to be enabled and may be limited based on the platform and communication strategy of the program

4. User Interface – If not designed properly, may affect the learning process negatively

5. Audio and Video Compression – The compression algorithm and their speed can negatively affect the message, and sometimes these may be unsynchronized or badly fragmented.

Program’s Online Readiness

Belanger and Jordan (2000) mention that web based education has the benefit of reusability, geographic and temporal independence and convenience of scalability. However, the disadvantages may include low connection speeds, viruses and loss of student focus. They further suggest the screening of every course for its distance learning readiness by reviewing the following questions, where Y or Yes means a positive answer fulfills the criteria and N or No means a negative satisfies for the course to be offered through distance learning:

1. Is there a sufficient number of students interested in the course? (Y)

2. Does the course minimize physical risks associated with learning on their own? (Y)

3. Does the course require hands-on activities? (N)

4. Is there a need for specialized tools for the course? (N)
5. Can the course only be taught as a group? (N)

6. Is it necessary for both the instructor and the learner to be in physical proximity? (N)

Applying this to the GRE training program (ignoring question 2; not applicable in this case) we get the answers to be: 1.Y, 3.N, 4.N, 5.N, 6.N. This reflects that the GRE training program is suitable as a distance learning program.

**Multimedia Mix for the Program**

Illera (2004) and Mayer (2001) have identified the need to understand the combination of multimedia elements that maximize learning. However, at present, instructors experience and fluency seem to be the key factors in developing the ‘multimedia mix’ for an educational program. This has led to the development of the following tools for the purposes of this program:

1. Website
2. Video Lectures
3. Flash Cards
4. Notes (Long and Short)
5. Solved Examples / Questions
6. Practice Exams
7. Blog
Some of these tools are part of the basic version currently available; however, the remaining ones will be part of the next phase when a professional version is in place, and are discussed in further detail later in this chapter.

**Web – The Central location of the Program**

Liu et. al. (1997) describe how websites assist business activities of organizations in three areas: pre-sales, sales and post-sales (after-sales) activities. Since the GRE training program is only available online, the website will need to be able to perform all the functions (there is little planning for after-sales activities at this time and is one of the possible future opportunities discussed in Chapter 4).

The training program uses website as the central location for all the media and services. This limits its access to those who are connected to the Internet with sufficient bandwidth to view all of the content (such as video lectures). Currently, the number of people connected to the Internet in US is estimated at 208 million and around the world at 1 billion (more than 15% of the population). The list of countries and their population connected to the internet is available from the CIA World Factbook. Furthermore, the age distribution of users online in the US is given below. It shows that 80% or more of the people below the age of 40 have online access.

---


There doesn’t seem to be a reliable source of data for the age distribution of users worldwide, however it can safely be assumed that a majority of learners targeted by this program have access to the Internet. For example, in 2006 China had 10% of its population connected to the Internet. Of these, 70% were found to be under the age of 30 and in urban areas. Additionally, 30% of those online were students.8

With the target users of the program in the age brackets of 20 – 25, the fact that the world population online is already substantial and mainly includes the younger

---

generation makes it possible to consider the web-based initiative as an effective means to reaching the global market.

The users need to have a broadband Internet connection in order to view the lectures properly. It is assumed that the target users would access the program website either at their educational institute or at home (or in some case, at their workplace), identified from students applying for graduate schools in the US. Most educational institutes in the US have broadband connections and almost 42% of Americans aged over 18 have a broadband connection at home. This makes all students in the US preparing for the exam accessible to the program.

Most educational institutes around the world are getting connected to the Internet with broadband connection and as found by Kelly and Petrazzini (1997), higher education institutes are the first ones be connected to the Internet and act as the source of spreading it across regions. The online connectivity at home, as found by OECD, is assumed to range from 70% in Denmark (31.9% of its population) to 15% or below in countries such as Mexico (3.5% of its population). This certainly reduces the capacity of users from such countries (predominantly the developing world) to access all the online training content at their convenience. This is further discussed in Chapter 3.

Based on the low penetration of broadband connectivity in such countries, the primary

---

delivery mechanism for accessing users will be institute-based accounts, discussed later in detail.

**Program Development**

In order to explain the various components of the program and their development, Belanger and Jordan’s (2000) key steps for the development and delivery of distance learning are adapted to the requirements of the program. These include:

1. **Project plan; identifying individuals, resources, responsibilities and timeline**
2. **Course design; outlining the structure, media and technologies**
3. **Production; creation of the content and its platform**
4. **Evaluation; reviewing the performance and test outcomes**

**1. Project Plan**

**a. Outline of the development process**

The guided online study program for GRE Physics targets students around the world. The program gives access to the online resources for 4 months for a fee. The architecture is based on open source software and includes technology components such as video streaming, pdf files and on screen text. The site is being developed and launched in two phases; the present first phase includes a basic site developed by a graduate student in the supervision of Professor Brown. In the second phase, based on the feedback, the site will be turned into a professional online GRE Physics training portal.
b. Quality control

Phase 1
Currently there is no formal quality control structure in place and the modifications carried out are based on the feedback of users; who are given free access in order to assist in their preparation for the exam in return for their feedback for improvement.

Phase 2
This will include a more structured approach towards development and control, and therefore the team composition will include:

Content Development: Professor Brown, one graduate/undergraduate assistant

Technology and Web Development: professional software developer, one graduate/undergraduate assistant with the training support of staff at the Freedman Center

Quality Control: Professor Brown’s peers and selected students around the world getting free access in return for their service.

c. Resource requirements

Phase 1
No separate computer hardware, software and media were used as most elements were performed from existing resources available at the university and the Freedman Center.
Phase 2

It is assumed that a professional software developer will be hired on contract who will not need any physical premise or other resources from the program.

d. Personnel requirements

Phase 1

This includes two graduate students; one focused on the development of content including flash cards and the other, on the modification of the website and coordinating for the technology and media availability. Both the students have been paid for by the funding made available through the Freedman Fellows program for 2008 – 09.

Phase 2

It is assumed that with the basic structure in place, it will be easy to understand the user and entrepreneurial aspects of the site and therefore only one professional software developer would be required. His qualifications will include:

- Skills in PHP and MySQL
- More than 2 years of experience in developing websites with multimedia content
- Preferably an undergraduate in physics or mathematics
- Willing to work full-time on contract basis
Two undergraduate/graduate students are expected to work along during this phase, one to assist Professor Brown in developing additional content for availability on the web and the other, to coordinate and work as the system administrator for the site. The latter person is expected to ensure the uploading of content, coordinate with the Freedman Center (and Mediavision unit, if required), receive and reply to customers and act as a focal point for the program.

e. Training requirements

Phase 1

No formal training was necessary in the initial phase and as the program evolved, the roles evolved so that individuals found the necessary skills and tasks that applied to each situation (for example the development of flash cards by one graduate assistant, modifications at the website by the other graduate student, etc.).

Phase 2

Some very basic orientation of the program and its objectives will be required. This can be done by Professor Brown or any one of the existing students working on the program. The current document will serve as a source to all aspects of the program and will therefore be the key training and operations resource.
f. Responsibilities

Phase 1

This was more of a brainstorming and trial-run with people gradually moving into their preferred roles over time with the following eventual structure:

Content Development and Review: Professor Brown and Audrey Todhunter

Web Development and Content Upload: Murad Mithani

Phase 2

This structure and roles will be more formalized in this phase:

Content Development and Review: Professor Brown and one undergraduate/graduate assistant (CD)

Web Development and Content Upload: Professional software developer (hired on contract)

Site Administration: one undergraduate/graduate assistant (SA) as the focal point of the program with the responsibilities of coordinating with the team and the users

Quality Control Team: Professor Brown’s peers and selected undergraduate/graduate students receiving a free account

g. Additional outside support

Phase 1

This included the support of the Mediavision unit for the development and hosting of the streaming video lectures and the Freedman Center for the training and financial
support towards the other components of online training such as flash cards video clips, pdf protections, streaming versus downloadable content, etc. Both the Medavision and Freedman Center are part of the Case Western Reserve University System.

Phase 2

This will mainly include the skills training and technical support from the Freedman Center. However, Medavision will remain the source for hosting streaming video content through their servers and therefore will be consulted for technical support, as needed.

Phase 1

Jan – Aug 2008
Professor Brown
Audrey Todhunter
Murad Mithani

Review: CWRU Students

Phase 2

1 year (start date may vary)
Professor Brown
Graduate Assistant for Content (CM)
Graduate Assistant for Web (SA)

Review: Peers and Colleagues
Review: Undergraduate students

Figure 7 – Summary of resources and responsibilities for the first two phases of the project

The time for additional elements to the design is not included in the above and will vary based on the design layout and the skills of the developer. Comparing to other sites offering comparable services in the area of finance:

www.hockinternational.com/CMA/program.htm and www.bionicturtle.com
it is estimated that one person working full-time for an additional two months will give 4 – 5 web design templates. One of these can be deployed immediately and the others retained for the next round of updates. Although, based on the pace of changes taking place in technology, there if a greater chance that the other templates may never be used.

**Outsourced Development**

Another option during the second phase is to delegate the development of the project completely to a 3rd party software development house or course conversion expert. The advantage of this approach is that they have greater experience, more staff and better quality control and therefore are more reliable to ensure availability of the final product on time as per the requirements. This takes away the hassle of periodic review of performance of the hired contractor. However, the disadvantage of this approach come down to the cost, which is almost twice as much as an individual hired on contract.

Since the first draft of the website has been developed in-house, it will be easier to conclude after reviewing its response how extensive the professional version should be and the extent of funds suitable for investment into it.
2. Course Design

a. Access

*Phase 1*

Currently there is a simple login/password authorization which is made available to students at CWRU or other universities interested in the program.

*Phase 2*

Two different kinds of user accounts will be available:

a) Single User Account

   This will be particularly suitable for students preparing on their own.

b) Institutional Accounts

   This will be designed to take care of multiple users working through the course together as a university seminar class (like the one at CWRU). This will be more costly than the single user account but cheaper than paying for more than 5 individual users. It will expire at the same time for all students at the end of the period. The maximum number of students per account would be 20 with an additional administrator to post announcements and other information that will only be available to the group. The administrator will also have access to individual performances and group management tools.
b. Delivery

i. URL

The website’s domain or URL (universal resource locator) also requires attention. As Miller (2002) in his book “The Online Rules of Successful Companies: The Fool-Proof Guide to Building Profits”, mentions:

Make a list of possible names. Incorporate your business's name or some part of it if at all possible. Come up with a few others that don't use your business name, too. Shorter is better, but chances are you are going to have a minimum of 10 letters these days; most domain names shorter than that are taken.

The site is currently accessible through the following address for anyone connected to the Internet:  
http://ohm.case.edu/gre

This will be changed to a more commercial name sometime in the near future. An attempt is being made for the URL to be easy to understand, remember and type (avoiding mix of letters and numbers), keeping in perspective the ideas discussed above.

c. Content

Phase 1 – Development:

Most of the GRE Physics training materials have been developed over a period of time by Professor Robert Brown as class notes. They have been reviewed, modified for flash cards and compiled into a structured online program during this phase.
**Phase 2 - Periodic Update:**

The program will require periodic updates. This will mainly include incorporating student and faculty suggestions over the content of the notes and flash cards leading to the possibility of additional videos. This will require close supervision by Professor Brown for the initial period (1 – 2 years), however, after this time it will need relatively few changes and will be manageable by the site administrator until ETS revises the structure of the GRE exam itself.

d. Layout

**Phase 1**

1. Welcome page / Home page: A basic introduction to the program and details to the updated student resources

2. Student Resources: Topic-wise links to available resources in the program

**Phase 2**

1. Welcome page / Home page: Listing the program, its features and the updated list of student resources

2. Registration area: For students / institutions to fill their details and complete the registration by payment through a credit/debit card or a paypal account

3. Student area: Personalized area for students where they can access study resources and their personal information such as test scores from previous sessions,
remaining period of registration (total period less number of days passed), list of updates since their last login, the unread mails and blogs available at the site, etc.

4. General information and resources
   a. Course information including registration and fees
   b. Contact Information
   c. Recent news
   d. Links to other online resources useful for the preparation of GRE Physics and for admissions to the graduate programs in physics

3. Components for management information
   a. User logging and billing information
   b. Visitor counter

4. Testimonials, from
   a. students preparing for the exam or getting a good score by using the program
   b. professors endorsing the program as an effective tool for their students
   c. professors who are part of admissions committee at highly recognized universities in US and other countries verifying the potential of this program to contribute towards better preparation for students
### e. Core Functions

The main difference between the two phases is the availability of additional information related to the program and other online resources and the density of training resources available to the student. These are discussed in detail below.

### General Resources

**Phase 1**

There are no general resources available with the initial version.

**Phase 2**

As can be seen from the layout, this will including the convenience for users to register and access online resources and will include:

**i. Online Payment / Transaction Service**

The payment options for the customers will include a Paypal® plugin based on a Business Account that will allow online registration through Mastercard®, Visa®, or other credit/debit cards or through a paypal account. Paypal is preferred because of the ease of implementation and cost-effectiveness for smaller number of transactions:
<table>
<thead>
<tr>
<th>Service</th>
<th>Personal account</th>
<th>Premier/Business account</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open an account</td>
<td>Free</td>
<td>Free</td>
</tr>
<tr>
<td>Send money</td>
<td>Free</td>
<td>Free</td>
</tr>
<tr>
<td>Withdraw Funds</td>
<td>Free for bank accounts in the U.S</td>
<td>Free for bank accounts in the U.S</td>
</tr>
<tr>
<td>Add funds</td>
<td>Free</td>
<td>Free</td>
</tr>
<tr>
<td>Receive payments funded by PayPal Balance, PayPal Instant Transfer or PayPal eCheck</td>
<td>Free</td>
<td>1.9% to 2.9% + $0.30 USD</td>
</tr>
<tr>
<td>Receive payments funded by Credit Card, Debit Card or Buyer Credit</td>
<td>4.9% + $0.30 USD (limit of 5 transactions per 12 month period) for domestic or U.S. transactions</td>
<td>2% + applicable Fees for cross border payments</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4.9% plus $0.30 USD for card payments received using PayPal on Skype</td>
</tr>
<tr>
<td>Multiple currency transactions</td>
<td>Exchange rate includes a 2.5% fee</td>
<td>Exchange rate includes a 2.5% fee</td>
</tr>
</tbody>
</table>

Figure 8 – Paypal online transaction fee (www.paypal.com: August 14, 2008)

### ii. Customer Services

It is important for the users to be able to communicate with a human face when there is a need. This can include a need for more information than available on the website or marketing materials, problems with registration and cancellation, software issues and compatibility problems and other service level issues.

As Anton (2000) mentions, there has been an increase in the number of ways customers can get in touch with companies but the reasons for doing so remain the same: information request, order information, technical support or complaint resolution. Research by Wan (2000) indicates that while searching for books online, customers prefer to have the option to talk to a person in case of any problems. This therefore
makes it important for the program to have a human customer interface that satisfies such a requirement, whenever there is a need, from its users.

However, availability of a customer support executive is costly and in the initial phase, the site will make little revenue for the amount of work involved. To overcome this, the possibility of outsourcing the customer support function to a call center at a minimal fee can be looked into.

It will be cheaper to have the offline (email based) customer services to remain with the site administrator since the volume is not expected to be that high. Furthermore, the resolution of technical queries, transaction or content related problems will also remain the responsibility of the site administrator, since it may not be practical to outsource these critical functions to a third party.

f. Student Resources:

Phase 1

These currently include the following resources:

i. Video Lectures

Mayer (2001) says that the presence of audio and video (video lectures in this case) in a distance learning module highly increases its understanding by the students. Reisslein et al (2005) found no overall difference in students quality of learning using either the ITFS/cable TV video or the web streaming technology, although it seems that with
improvement in the quality of video, web streaming due to its additional control and maneuverability will eventually be the media of choice for students.

There are multiple advantages of a two-way synchronous real-time communication, such as immediate feedback, discussion over difficult concepts, etc., but considering the nature of the program, video conferencing may not be practical for multiple reasons:

a. The program is based on skills training and the key for its success is to record the standard tutorials and improve them by adding various learning and memorizing tools associated with the preparation. Repetition of the standard tutorials on real-time by an instructor will only make it an online version of a traditional seminar course

b. The global nature of program’s target market spread in different time zones requires 16 – 18 hours of instruction per working day, which is not possible by for a single instructor. With multiple instructors, the cost of the program increases substantially

c. The computing hardware and bandwidth required at both, the delivery (instructor) and the receiving (student) end increases substantially in case of web conferencing

Bates (2005) explains it by saying that synchronous teaching has a low fixed cost but high variable cost compared to asynchronous method, which has high initial cost and almost no variable cost.
It is therefore appropriate to make available videos of the tutorials so that students can view them at their convenience. It would be even more economical for them to download the lectures on their computers before viewing, particularly who cannot access or afford a broadband connection, as discussed later. This option has however been limited in order to avoid electronic duplication and distribution without permission. This acts as the key learning feature offered by the program. The videos comprise of two sets:

a) Video Lectures: A complete set of seminars for the course PHYS 339 at CWRU – by Professor Robert Brown. These have been possible by the Instructional Technology and Academic Computing Unit under their Mediavision Courseware research project at CWRU12

b) Flash Card Video Clips: A set of videos explaining the key equations that form the fundamentals of physics, by the students of PHYS 339. This is recorded from the funding and support of the Freedman Center, under the Freedman Fellows Award for 2008. At the time of writing, this is being developed and is not available at the website.

Freedman Center

The Samuel B. and Marian K. Freedman Center is located at the Kelvin Smith Library at Case Western Reserve University. It is a combination of digital library, language learning

and multimedia services center housed in 2,700 square foot of space\textsuperscript{13}. For the current program, the following services from the Freedman Center have been used:

a) Lending Services

Digital video cameras were borrowed from the center, including help from their expert in converting the resulting video lecture into digital format that could be easily broadcast over the Internet.

b) Media Workstations

The videos were copied from the camera and converted into digital format using their media workstations that are connected to DV tape players.

c) Customized Training

The staff at Media center was instrumental in training the team of undergraduate and graduate students for the part of the program related to flash card development and video recording.

\textbf{ii. Flash Cards}

These cards are an effective memorizing tool, and as expressed by Kassop (2003) particularly add to the total learning experience of students in a distance learning program. The cards also assist the learners to visually understand the relationship between different variables and how changes in one lead to a change in another quantity. As described by Sherin (2001) “Symbolic forms provide the vocabulary through which students understand existing expressions . . . having a deep

\textsuperscript{13} Details to the center are available at http://fc.case.edu (accessed July 9, 2008)
understanding of an equation involves being able to see that equation in terms of symbolic forms”.

The cards have been designed to include the complete set of equations that define the formal structure of physics and need to be understood and practiced in order to score well in the test. Small video clips of 10 – 30 seconds representing the concept of each of the cards are being made available, which will make it easy to understand the idea and memorize the theme of the card.

The cards will be updated once every year in order to improve and augment the training material. This will also make the program upgrade and avoid obsolescence over time. However, as found by Mellow (2005), it may not be convenient to carry them around or for some, may not be in line with their image to be carrying and memorizing these cards when they are at public places. Their solution was to make the flash card content available as SMS on cell phones (under the StudyTXT project: www.studytxt.com and has been discontinued since then) which counters both the above problems. This not only adds to the cost of the program but also for the users receiving the text. This may still be an option that could be explored in the future.

The flash cards are currently available as pdf files protected by a password from printing, in order for users to review. If students are interested in printed flash cards,
they can place an order with the program. This is currently used to measure the motivation of users towards flash cards.

iii. Notes

The notes highlight the fundamental concepts of physics explained with details and equations. The Notes make it possible for learner to understand the derivations and connections of concepts with various equations, assisting in the learning and integration of basic principles.

However, as found by Dalton et al. (2000), the retention from reading material available online is 30% less compared to the same material as a printed source. This may be more critical for students who are not exposed to computers as much as printed text. One way to minimize this effect is to allow the users to print the notes, if they choose to do so. The printing for these notes is therefore not restricted.

Phase 2

The additional student resources available in the second phase include:

i. Periodic Updates to Notes, Flash cards and Videos

Based on the regular feedback, all student resources, particularly the notes and flash cards will be updated to incorporate improvements as well as add to the simplicity of various concepts.
ii. Blog

With the increase in community developments online, blogs are becoming a popular tool to form online communities. Glogogg (2005) describe multiple ways in which blogging is helpful as an e-learning tool. Making a blog available at the site will allow its users and instructors to exchange problems, solutions and recommendations in addition to tips and other information that will make this site an even richer repository of information over GRE physics.

This feature will be available to all users and not restricted to its registered members.

g. Software Architecture

Phase 1

The site is currently developed from an older version based on php and is restricted to a very basic theme, adopted from the website for the department of physics at CWRU.

Phase 2

The future architecture will continue to be based on open source software in order to keep it cost-effective as well as easily upgradable with improvements in these tools. These include the commonly called LAMP set:

a) Operating System: Linux

b) Web Server: Apache

c) Database Language: MySQL

d) Website development Language: PHP
It is important to ensure that the architecture allows scalability in functionality and technology integration. As Belanger and Jordan (2000) explain, distance learning compresses the delivery time of the course because of the additional instructor preparation and its capacity for multiple modes of simultaneous communication given by:

\[ H_{CD} - [H_{CD} \times CF] = CH \]

\( H_{CD} \) = instruction time for a classroom based course (hours)

\( CF \) = distance learning compression factor (%age) - this is a function of technology used

\( CH \) = instruction time for a distance learning course (hours)

New and better technologies will simplify and improve the instruction methodologies by increasing the CF. This flexibility needs to be incorporated in designing the architecture.

h. Instructional Strategies and technology

The strategy is to focus on instructional elements that have the greatest power of communication, explanation and memory assistance. As discussed, this is currently based on the most feasible technology as well as the comfort factor of the team behind the program. However, this will need to be reviewed periodically in order to ensure the most effective technology platforms are incorporated.

i. File formats

The files available to the users will include:

- html: accessible through web browsers including Internet Explorer®
wmv/mov/swf: accessible through Windows Media Player®/Quick Time Player®/Flash Player®

pdf: accessible through the Adobe Acrobat Reader®

None of these require any special hardware or licensed software. However, as discussed, online connectivity and a broadband connection are necessary to fully experience the available content.

j. Media organization and Hosting

Phase 1

The current version includes the static content made available through a server retained at Professor Brown’s office. This will be moved to the one of the servers maintained by the CWRU IT department. This has multiple benefits such as no additional cost to the program (nor to the school as it’s hosted on available space in one of the servers), IT staff is trained to assist in case of problems and substantial bandwidth is already routed to these servers which makes it easily accessible to multiple users at any time. In addition, this comes in line with the mission of Case Western Reserve University to spread education worldwide and increase learning opportunities for all14.

The streaming content is made available through the streaming server with the Medivision department, which owns the specialized equipment for streaming of online content.

14 http://www.case.edu/about/mission.html (accessed August 9, 2008)
Phase 2

The Phase-1 arrangement will continue unless there is a need to change, for example IT unit or the Mediavision may restrict access to its resources for a commercial venture. In such cases commercial hosting\textsuperscript{15} and video streaming\textsuperscript{16} services can be used. The same budget will be sufficient for these resources.

3. Production

The production of components mainly includes the additional flash cards and associated video clips besides the typing, modification and conversion of text into pdf.

a. Producing digital content

Phase 1

The currently available set of resources have been digitized and made available at the site. As already mentioned, the conversion process included:

- Handwritten Notes: Scanned
- Flash Cards: Typed using MsOffice\textsuperscript{®} and Mathtype\textsuperscript{®}
- Video Lectures: Recorded and converted for digital streaming by Mediavision
- Video Clips: Recorded and converted for digital streaming with the help of Freedman Center (This is under process at the time of writing)

Phase 2

\textsuperscript{15} An example of a commercial hosting service with various hosting options include: http://www.godaddy.com/gdshop/hosting/shared.asp?isc=goohb200b (accessed August 15, 2008)

\textsuperscript{16} An example of a commercial video streaming service with estimated cost based on user connection is: http://www.cybertechmedia.com/charges.html (accessed August 15, 2008)
This will include the same technologies and support networks for all the additional and revised content.

b. Coding

Phase 1

The current coding is basic html compiled as on need basis with little planning for optimization or scalability.

Phase 2

This will need to follow the structure already outlined above with sufficient planning and agreement on software standards and user/instructor requirements.

c. Interactive applets

Phase 1

Currently there is no interactive content

Phase 2

In the future, additional features in future may include an interactive flash card player giving users the choice to select answers to one of the multiple-choice questions and then review their results. This will also be helpful for users when taking short exams that will be scored and retained for them to review their performance.
4. Program Evaluation

This is with respect to the effectiveness of various elements. The commercial aspect of this review is discussed in Chapter 4.

a. Content review

The content review will take place periodically once every year or upon receiving user feedbacks. Updates to the available content will also increase the attraction for newer students who might have received some materials from previous students registered with the site. In the first few years, as discussed earlier, this will include addition of problems and flash cards to the existing resource base.

b. Instructional effectiveness review

The effectiveness of communication and instruction methodology will be evaluated annually, usually after the feedback of users taking the exam between May to October. This will focus on the strategies that seemed to be ineffective or areas that need revision in order to reflect the gradual changes in the nature of problems in the exam.

c. Technical review

Periodic updates and regular maintenance of the site will become necessary once the students start registering for the exam, increasing the expectations and load on the website.

The review frequency will vary depending upon the features:
- Link problems: immediate review and problem resolution, as and when needed
- External Link additions: once every 6 months
- Security problems: immediate review and problem resolution, as and when needed.
- Security Review: Planned with the release of updates
- Technical modifications: once every 6 months to reflect improvements in technology (such as compression codec for video quality)
- Infrastructure problems: immediate review and problem resolution, as and when needed
- Infrastructure review: once every 2 years

**Intellectual Property and Copyright**

The website has all original content developed by Prof. Robert Brown. Some of the guidelines from Bates (2000, pp. 114 – 129) are incorporated, which include the following:

Copyright: The website will have a “rights statement” stating that the content of the site cannot be copied or duplicated, electronically or otherwise.

Disclaimer: Past GRE Exams exist on the public domain, which will be available through the links on the program site. The program does include the answers to these problems
and may mention similar example problems. However, this does not infringe upon the intellectual property of ETS.

In the future, close alliance with ETS is a possibility that may result into the site past exams and other associated data.
CHAPTER 2: UNDERSTANDING THE COMPETITION

There are four major sources of competition. These include the following and are discussed in detail:

- Academic Institutions
- Private Test Preparation Centers
- Books and Practice Materials
- Websites

**Academic Institutions**

There are various academic support systems that formally or informally help the student in preparing for the GRE exam. Foremost of these is the set of courses at academic institutions that in almost all cases are primarily responsible for students’ understanding of physics and other skills necessary for the test. It is the primary method that gives students the basic knowledge of the fundamentals of physics. However, these courses leave two major deficiencies in students’ preparation for the exam. The courses may not cover all the necessary topics in sufficient detail and students are generally not exposed to the style of studying or preparation that may be most effective for the exam. There are various complementary programs offered several universities to prepare students specifically for the GRE exam. Programs competing with the current study include official undergraduate level courses (such as those offered by Case Western
Reserve University as PHYS 339\textsuperscript{17} or at the University of Minnesota\textsuperscript{18}) or the resources made available by student associations at the departmental level (such as at Ohio State University\textsuperscript{19}). There may be other informal help groups at the institutions where there is no formal structure in place, and in some cases, a basic webpage giving some information for preparation and reference to available resources (such as at Massachusetts Institute of Technology\textsuperscript{20} or by the National Society of Physics Students at Stanford\textsuperscript{21}).

**Private Test Preparation Centers**

None of the large test preparation training institutes, such as Princeton Review or Kaplan organize formal GRE Physics training sessions. The Princeton Review arranges private tutoring sessions for interested students. This is done on case-to-case basis. The process is initiated when a student with a training need comes into contact with the institute, which then tries to identify an appropriate instructor. The three levels at which the institute tries to place the instructors and their respective fee is:\textsuperscript{22}

<table>
<thead>
<tr>
<th>Level</th>
<th>Instructor Experience (years)</th>
<th>Charge ($ per hour)</th>
<th>Length (hours)</th>
<th>Total Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premier</td>
<td>5</td>
<td>210</td>
<td>9</td>
<td>1,890</td>
</tr>
<tr>
<td>Master</td>
<td>2 – 5</td>
<td>160</td>
<td>9</td>
<td>1,440</td>
</tr>
<tr>
<td>Standard</td>
<td>&lt; 2</td>
<td>130</td>
<td>9</td>
<td>1,170</td>
</tr>
</tbody>
</table>

Figure 9 - Princeton Review - Private Tutoring

\textsuperscript{17} For more details, visit http://www.phys.cwru.edu/undergrad/desc.php (accessed July 9, 2008)

\textsuperscript{18} For more details, visit http://www.physics.umn.edu/outreach/reu/gre.html (accessed July 9, 2008)

\textsuperscript{19} For more details, visit http://www.physics.ohio-state.edu/undergrad/ugs_gre.php (accessed July 9, 2008)

\textsuperscript{20} For more details, visit http://web.mit.edu/uwip/gre.htm (accessed July 9, 2008)

\textsuperscript{21} For more details, visit http://www.stanford.edu/group/sps/PhysGRE.htm (accessed July 9, 2008)

\textsuperscript{22} Personal Contact through phone at 1.800.273.8439 (call received by Beachwood, OH office) – July 15, 2008, 5:10pm
At Kaplan, there is no formal or informal training program for GRE Physics. Upon contact, it was found they do not receive many requests for GRE Physics training and currently don’t have any support mechanism in place for such requests.²³

A number of paid tutors offer for-profit training to small groups or as one-to-one sessions, in many parts of the world. This kind of GRE physics training comes at the next level in the competition hierarchy. They compete for the individual users targeted by the program. These users only start looking for the training options when they have decided to pay for help outside of the academic institution. These tutors sometimes offer their services at small tuition or skills training centers, if not at home. However, none of these tutors or associated training centers has grown into a larger network or has developed a niche that can assist in its growth at multiple locations. There may be several reasons behind this:

a. The techniques and skills training offered by these tutors may be just be sufficient to meet the needs of the local community of students around them

b. There may not be enough students within a reasonable distance for them to consider this as a long-term business proposition

c. The test preparation requires so much customization for each student that no standardized practices have evolved by instructors that could be cost-effectively transferred into standard programs at multiple locations.

²³ Personal Contact through phone at 1.800.527.8378 – July 15, 2008, 5:30pm
This lack of a major competitor, on one hand, is a positive thing, but at the same time a question that needs to be kept in mind in order to ensure we are prepared to identify issues that may inhibit GRE physics training to become a mainstream profit center. This includes it being a small market that requires difficult to find expertise. However, as identified later, the way this program is structured, it requires little modification and involvement and generates profit based mainly on repeated delivery of services to new customers. This differentiation is based on its availability online which overcomes the geographical limitation and therefore makes it cost-effective to access students around the world.

**Books and Practice Materials**

The most universal approach towards preparation by students has been through books. Unfortunately, since the physics GRE was launched over 30 years ago, only two training have been in the market:

1. **GRE Physics - The Best Test Preparation for the GRE**
   
   By Joseph Molitoris, published by Research and Education Association, June 1991
   
   Price: $27.50 (Paperback)
   
   It includes reference concepts and formulae with four full-length exams.

   This is probably the most widely used GRE physics training reference. Although this is better than most other choices, it can improve a in a lot of areas. Some of these elements highlighted by a reviewer include questions harder than the real exam, requirement to use a calculator which is not allowed in the actual exam,
conceptual explanations lacking rigor and clarity, and no test taking tips or strategies. 24 Another reviewer highlights that, “There are lots of errors through the tests. Sometimes the questions are wrong, sometimes the choices are wrong, others the resolution is wrong. And believe me, there are cases where all three are simultaneously [sic] wrong”. 25

Students also found the treatment of topics not adequate or thorough enough to prepare them for the exam and the problems expecting memorization rather than understanding of the underlying physics. One reviewer identifies sever shortcomings in the discussion of thermodynamics, statistical physics, impedance and quantum mechanics. 26 Another reviewer, who went through this text before he took the exam and got back to it again when teaching a preparatory course on GRE for astronomy majors explains his frustration with the text by saying, “We went so far as to specifically warn our students against

---

25 Review by Rafael Coelho L de Sa (Rio de Janeiro, Brazil), a customer (October 4, 2006) at Amazon.com: http://www.amazon.com/review/product/0878918485/ref=cm_cr_dp_all_helpful?_encoding=UTF8&amp;coliid=showViewpoints=1&amp;colid=&amp;sortBy=bySubmissionDateDescending (accessed July 19, 2008)
26 Review by M. W. Dacey, a customer (Feb 6, 2006) at Amazon.com: http://www.amazon.com/review/product/0878918485/ref=cm_cr_dp_all_helpful?_encoding=UTF8&amp;coliid=showViewpoints=1&amp;colid=&amp;sortBy=bySubmissionDateDescending (accessed July 19, 2008)
A lot of students share the feeling the sentiment that “It’s an ideal book to demolish your self-confidence.”

2. GRE: Practicing to take the Physics Test (3rd Edition)

Published by Educational Testing Service (Editor), November 1997

Currently out of print.

It offers test taking tips and three full-length exams.

The students consider this helpful only to have a look at the retired exams from the past as it doesn’t offer any solutions or strategies for students to understand the most effective way to solve for these. As one reviewer mentions, “This book contains only problems and answers. When you think you are ready for the test, this is the book you want to use.” However, another student found it very useful as s/he describes, “I used this book to prepare for a test in early 2002 and was surprised at the amount of similar questions posed on the actual exam.”

3. Rudmans Questions and Answers on the GRE Subject Test in Physics

By Jack Rudman, published by National Learning Corp, January 2004

---

27 Review by a customer (May 26, 2004) at Amazon.com: http://www.amazon.com/review/product/0878918485/ref=cm_cr_pr_link_next_2?encoding=UTF8&pag eNumber=2&sortBy=bySubmissionDateDescending (accessed July 19, 2008)
28 Review by a customer (October 17, 2003) at Amazon.com: http://www.amazon.com/review/product/0878918485/ref=cm_cr_pr_link_next_3?encoding=UTF8&pag eNumber=3&sortBy=bySubmissionDateDescending (accessed July 19, 2008)
29 Review by a customer (February 16, 2003) at Amazon.com: http://www.amazon.com/Gre-Practicing-Take-Physics-Test/dp/0446396346/ref=pd_rhf_p_t_2 (accessed on July 19, 2008)
Price: $23.95 (Plastic bound) & $43.95 (Hardbound)

This is in the form of multiple choice question and their answers.

The book has mixed responses. Some believe that the depth of physics included in the text is not rigorous enough. Others mention that the lack of test solutions limits its use as a good preparation guide.31

4. GRE Physics Test Secrets - Study Guide

Published by Morrison Media LLC, 2008

Price: $39.95 (Paperback)

It gives test preparation tips and summary of relevant physics concepts.

The book has been released very recently and doesn’t seem to have penetrated the market at this time. The only review available at Amazon describes it as a text focused on GRE test taking tips with a scrambled collection of physics concepts without any kind of problems GRE exams.32

5. GRE Physics Test Practice Book

Published by the Educational Testing Service, 2004

Available free of cost upon registration for the GRE Physics exam (Paperback)

It is a complete guide for students planning to take this test and includes a full-length exam.

31 Customer reviews at Amazon.com: http://www.amazon.com/Physics-Graduate-Record-Examination-Gre-15/dp/0837352150/ref=sr_1_5?ie=UTF8&s=books&qid=1216510433&srs=1-5 (accessed July 19, 2008)
This is not a commercial publication but supplementary materials for students registering for the exams. It explains the test, the topics included and the modalities with respect to the test day and scores. It includes an exam from the past (100 questions) that prepares the students for what to expect in the real exam. However, it doesn’t give any solutions to the problems or any tips on how to solve the problems in a limited time.

6. Other Books

a. Review of Undergraduate Physics

By Benjamin F. Bayman and Morton Hamermesh, published by John Wiley & Sons, 1986

Price: $87.25

It is a comprehensive review of undergraduate physics with solved examples and problems, targeted towards students preparing for entrance examinations and the PhD qualifying exam.

Students find it a good source for the review of fundamental physics but not as a choice reference for GRE preparation. This is evident from the style and level of problems, which seem more appropriate for the graduate level.

b. Shaum’s Outline of Physics for Engineering and Science
By Michael Browne, published by McGraw-Hill, 1999

Price: $12.21 (Paperback)

It is a selected review of fundamental physics with solved examples and problems. It is targeted towards students preparing for entrance examinations and the PhD qualifying exam.

Many students find good review and practice materials in this book. However, the problems are not developed with the GRE exam in perspective.

**CD / DVD Resources**

Currently, there are no GRE Physics test preparation materials available on CDs or DVDs.

**Websites**

There are a significant of websites that are dedicated to the discussion (or grievance) of the Physics GRE. The following summary represents the sites popular with students offering exam problems, solutions and related information. They also include tips from faculty or successful students on what topics should be covered and how the test should be approached:

1. **ETS GRE Website – Physics**
   

   Foremost is the ETS website which makes available the GRE Physics Test Practice Book online free of cost. This includes a full-length practice test form the past.

2. **Preparing for the Physics Subject GRE Test**

   
http://www.physics.ohio-state.edu/undergrad/ugs_gre.php

It is currently the most important resource available for students preparing for the exam and includes sample tests and also lists the date of the next exam.

3. GRE Physics

http://grephysics.net

It lists exam problems and their solutions so that each of them can be directly accessed and viewed. In addition, each problem has a blog space where users share their views, tips and alternate solutions. It is a very basic site but does the job really well.

4. Physics GRE Yahoo Group

http://tech.groups.yahoo.com/group/physicsgre/#ans

This is a good community based platform for discussing problems and sharing solutions and maintains discussion threads since 2004.

5. GRE Guide


Gives basic information about the test, including its format and a the list of topics

6. Physics GRE Discussion Forum

http://www.physicsgre.com

Allows students to discuss problems with respect to preparation and concepts

7. The Physics GRE: a guide for undergrads

Contains basic information about the test, topics, preparation tips and links to other resources

8. GRE Information for Physics Students

http://www.grinnell.edu/academic/physics/resources/gre

Offers basic information about the test and when to take it during undergraduate studies

9. Advanced Physics Forum

http://www.advancedphysics.org/forum/showthread.php?t=8297

This is a discussion forum for physics and includes threads on GRE physics

10. Wikipedia: GRE Physics Test


Wikipedia has a good collection of explanation of the test, physics topics and links to resources

As clear from the above, there are sufficient GRE physics training resources available for the students but none of them approach the preparation in a structured fashion. It is clear from students’ comments that there is need for a program that builds up from the fundamental concepts in physics, integrating them as more layers fall into place. The tools and technique required for quick problem solving are sprinkled throughout the
program and reviewed in the end. This is what makes Professor Brown’s approach unique, practical and highly effective.
CHAPTER 3: ATTRACTING STUDENTS TO THE PROGRAM

Marketing the program

In addition to developing the product and making it available is getting the target customer to visit the site and convincing them to purchase it. This is generally referred to as marketing or selling. Although Drucker (1985) mentions, there are two ways for companies to market their products: first is the approach common with technical experts (also followed in this study), to start with the development of the product with an understanding of its utility and then define the market formally; the second, to identify a market and its need and then focus on the development of the product. Kotler (2008), however, explains that marketing goes beyond just attracting customers and penetrates all the functions of an organization, such as product development, human resources, etc.

The central role of marketing in an organization is further enhanced by its importance in the economy and the way organizations use it to differentiate themselves from competition. A good example comes from Blumenstyk (1999) who found that the growth in distance education is giving rise to greater marketing efforts from institutions. Zemsky and Massy (2004) from the Weatherstation Project; University of Pennsylvania and Thompson Corporation, say that simply making a website available is not enough to attract customers. It is therefore important to identify the key elements for marketing Internet based services.
Kotler (2008) elaborates that a prerequisite for the formulation of an effective marketing plan is defining the demographics of the target market. It makes it easier to focus on their behavior and purchasing and therefore helps filter the set of tools that shape the most appropriate marketing approach towards them.

**Demographics of the Target Customer**

As discussed earlier, the majority of the people taking the GRE exam are undergraduates. Some first year graduate students also take the exam in order to reapply for admission at other institutes or to gain a fellowship. These two segments form the target market. Their demographics include:

- **Age Group:** 20 – 25
- **Education:** Junior, senior or graduate student
- **Source of Income:** Usually parental support, student loans or graduate assistantships
- **Available disposable Income:** On as-needed basis, very little; usually $600 - $800. In case of assistantships, this can go as high as $2,000
- **Gender:** Majority male with less than 25% female

**User Experience**

Zeithaml et. al. (2002) states that for web-based services, the quality of user experience is more important than its marketing. The user experience is a combination of the following (not necessarily in the order of importance):

---

33 The female %age for the year ending Jun 2006 was 23%, available in ETS GRE subject report at: http://www.ets.org/Media/Tests/GRE/pdf/4_01738_table_2.pdf (accessed August 14, 2008)
1. Ease of access and completeness of information content
2. Security of user information
3. Ease of navigation
4. Quality and attractiveness of graphics
5. Functional reliability

The key for the success of this program is to include these elements into the site development. Although some, like ease of navigation, may be of less critical as users may spend most of their time on a certain webpage working through the solutions or viewing the lectures, it is still important to keep this in perspective. As discussed already in website development, functional reliability is the key success factor for this program. Another study, based on the surveys of online shoppers at B2C e-commerce sites had similar findings; Ranganathan and Ganapathy (2002) found that four elements are critical for customers shopping online: site’s content, layout and design, transaction security and privacy.

**Marketing the Program**

The ecommerce marketing strategies identified for online distance learning programs by Granitz and Greene (April 2003) highlight one approach towards marketing. This includes:

1. Personalization & Customization: Individualized space for users
2. Community: Arrangement for sharing information and ideas between users
3. Disintermediation: Reduction of intermediaries in the distribution channel

4. Reintermediation: Reviewing distribution channel for value addition

5. Consumer Tracking: Data on consumer behavior at the site

6. Enhanced Customer Service: Customer centered approach to service

7. Mixing Bricks and Clicks: Online and traditional presence

Some elements like ‘Reintermediation’ or ‘Mixing Bricks and Clicks’ may not be valid at this point. However, ‘Consumer Tracking’ is important since it gives a fair idea of the number of visitors, their frequency of usage as well as further details to their behavior at the site (time spent per page, items viewed). This is incorporated during the development of the site, as discussed earlier.

Some practical ideas adopted from Simerly’s Seventy-Five Tips for Avoiding Common Marketing Mistakes (1989) include:34

1. No cancellation penalties for users quitting the program and asking for refunds during the first few days

2. Immediate refunds

3. Ease of registration through bold display of phone number and website throughout all advertising

4. Making it quick and easy to complete the registration form

---

5. Keeping record of files of examples of marketing ideas that worked and those that didn’t

6. Keeping track of the marketing costs compared to the revenue

7. Attempt to convert inquiries into actual registrations. This is a communication skill expected from the customer service representative

8. Prompt acknowledgement of registration

9. Never to say no to any user request

10. Reply to all queries within 24 hours

11. Website and marketing materials should include testimonials

12. The pricing of the program should be appropriate to the services offered and the purchasing power of the target market

13. End-of-program user evaluations should be carried out, including comparison of scores of the users versus the average. These will act as a source of future marketing efforts

14. Periodic updates to the mailing lists

15. It is important to also get on to the competitors’ mailing list’s

16. Retention of the names and addresses of registrants who cancelled, in case it may be helpful to approach them through personalized marketing efforts

17. Retention of the names and addresses of all queries and respondents to any sales promotion
As mentioned by Mehrotra et. al. (2001), the strategies for marketing distance programs should emphasize the advantages of the product. In the context of this study, these include:

a) Flexibility of the program to surpass geographical limitations as well as give students the option to work at their own pace, and

b) This kind of program allows the instruction to be ‘student driven’ instead of ‘instructor driven’.

Furthermore, of the marketing elements identified by Mehrotra and his colleagues (2001), one of them links directly to this study:

Post a brief sample lesson from a course on the web site to give students a better idea of how a web-based or web-enhanced session works. If the course uses streaming video, then a brief sample of a lecture using the streaming video could be put on the web site . . . This helps students experience how the program works, promotes active learning, provides feedback at the end of each module, and allows students to interact with others.

The Online Marketing Mix

Kalyanam and McIntyre (2002) describe e-marketing mix for web-based products as a combination of 11 elements: $4P + P^2C^2S^3$ as shown below. This effectively captures the marketing elements of the program in a summarized framework:
The e-marketing mix framework applied to the program elements already discussed gives the following summary picture:

1. **Product**
   
   a. **GRE Physics Online Preparation Guide**

2. **Price**
   
   a. **Price for individual customers**
   
   b. **Price for institutional customers (used as classroom assignments)**

3. **Place**
   
   a. **Hosted at CWRU and available throughout the world via the world wide web**

---

**Figure 10 – The 4P+3P^2C^2S^3 e-marketing mix model by Kalyanam and McIntyre (2002)**
4. Promotion
   a. Priority result in searches at popular search engines
   b. Advertisements at popular online pages and search engines
   c. Video clips on youtube® and other educational video platforms
   d. Publicity through various online forums, news bulletins and blogs

5. Personalization
   a. Customized user accounts with chat history and emails
   b. Scoring on exams and quizzes attempted

6. Privacy
   a. Separate user access profiles
   b. Confidentiality of information and other user details

7. Customer Service
   a. 24 x 7 customer support during the first few months of the launch to ensure streamlined operation (online and phone). This can be outsourced to a 3rd party for about $500 per month.
   b. After the initial period, 9 – 5 (EST) customer support (online and phone) and email support in off-service hours

8. Community
   a. Online blog community (moderated by the site administrator)

9. Site
   a. Website with video lectures, flash cards, notes and other help
   b. Easy to remember URL
10. Security
   a. Security through Thawte® or other online security solution provider
   b. Encrypted passwords in central database

11. Sales Promotion
   a. Free limited time institutional access for selected schools
   b. Free limited access accounts for registered users (who have not paid for the service yet)

The model can be used to market to the four customer segments that comprise the target market:
   a) Students at Case Western Reserve University
   b) Students at Other US Universities
   c) Students in the Developed Countries
   d) Students in the Developing Countries

**Marketing to students at the department of Physics, Case Western Reserve University**

Targeting these students is comparatively easy because of the availability of PHYS 339 as a focal point for students and resource for GRE physics exam. In addition, since the program is housed at the school, it is easy for students to become familiarized with the resources available to them and to get in touch with professors and students working closely over this program.
Once the course is augmented / replaced with the online program, this will become an integral component of students’ undergraduate curriculum.

During the initial trials of making the video lectures available for these students, the online viewership was encouraging. The traditional seminar classes took place as usual and the video was made available in addition, particularly for those who could not make it to any of the classes. The following statistics reflect the response:

- The class had 17 students representing almost 70% of the eligible physics juniors for whom the class is designed
- Most of these students came to the traditional classroom lecture and missed very few classes, but 80% of the registered students who were absent at some time viewed every lecture they missed through this technology.
- Approximately 75% of the online visitors were not registered for the class
- The practice exams taken by the students showed improvement as good as or better than previous years.

**Marketing to Students at Other universities in the US**

The students studying at various other universities in the US can be targeted with the following few approaches:

a. **Marketing to the head of Undergraduate Program, Department of Physics:**

**Personalized Letter**
University professors are generally interested in improving the problem solving skills of their students. However, not all institutes organize formal GRE preparatory classes. A personalized letter from Prof. Brown sent to the head of the undergrad program at the department of physics will communicate the message to satisfy an existing need.

b. Marketing through University Associations / Internal Forums: Direct Marketing Material

As discussed earlier, a lot of universities not offering formal GRE training classes encourage availability of related information through student organizations. They can directly be targeted (even though a personalized letter may have already been sent to the department head) through direct marketing materials such as a brochure or flier.

c. Marketing through Search Engines: Prioritized Search Engine Results and Advertisements

There will be students who may have graduated a few years ago and may be interested in joining a graduate program and would be preparing for GREs. Others may be studying at schools where due to some reason the personalized letter or direct marketing material may not have reached. For them, the following two approaches are useful:

Improving the ranking of the website link in search results associated with the words “GRE Physics”, “GRE” and “Graduate Physics”

Sponsoring advertisements in addition to the search results for the above links.
d. Marketing through Youtube®

With the popularity of youtube and other such personalized free video viewing websites, they have also become an important communication and information platform. A good example is the videos available on youtube.com by Bionicturtle.com (www.bionicturtle.com) over regression and some other areas in statistics. It communicates the availability of a service provider, gives the users a sample of its services and encourages them to visit the company home page in order to find out more about the available programs.

e. Marketing through GRE® physics forums

Another good platform is the GRE forums discussed earlier. A lot of students preparing for the exam come to this website to find more resources and exchange ideas on problem solving. However, these forums are usually not open to advertisements from commercial ventures and therefore there is a need to find some way to encourage students at the site to generate positive word of mouth at these forums.

Marketing to Students at Universities in the Developed Countries, excluding the US

The developed countries generally have a higher percentage of students accessing the internet at high speeds [appendix], either from their home or at school. For students from developed countries besides the US who are interested in paid assistance for the preparation of the exam the search engine link, online advertisements, youtube and online forums are effective marketing tools. For places where English is not the
standard medium of instruction, it is assumed that they’ll be proficient in English at least to the extent of searching for materials online and preparing for the test, since the exam is conducted only in the English language.

Marketing to Students at Universities in the Developing Countries

Attracting students at educational institutes in the rest of the world is partly achieved through the tools used above; search engines, advertisements, youtube and the GRE Physics forums. However, the following barriers may still limit access to these students:

a. Language: A lot of students may not be completely fluent (or comfortable) with advertisements or preparatory materials in English

b. Connectivity: Most of the countries still do not have very high speed access available for large populations at economical costs

c. Environment and Culture: Another difficulty is the cultural orientation of these students. Since most of their professors and seniors have been preparing for the exam in a certain way, they may find it difficult to change the approach, particularly when there are other difficulties associated to accessing help online and Internet has still not become as acceptable a medium of support as it is in the developed world.

With most parts of the world accepting English as the main language for academic education and research, the language barrier will prove to be less of an obstacle in the years to come. Furthermore, as discussed earlier, the GRE exam is conducted only in
the English language, so it may cause more harm in student preparation if the website is made available in another language.

The connectivity barrier is critical and it will be some time before most parts of the world have access to high speed\textsuperscript{35} Internet at home, from its current penetration level:

![Graph showing connectivity in various regions](http://www.itu.int/ITU-D/ict/newslog/SearchView.aspx?q=individual%20use%20of%20computer (accessed August 19, 2008))

\textbf{Figure 11 – Information and Communication Technologies in various regions (ITU/BDT research, 2006)}\textsuperscript{36}

However, at the end of 2007, 50\% of all the Internet users have broadband connection\textsuperscript{37}:

\textsuperscript{35} High speed refers to large bandwidth suitable for uni-directional video streaming (server to client)
\textsuperscript{36} http://www.itu.int/ITU-D/ict/newslog/SearchView.aspx?q=individual%20use%20of%20computer (accessed August 19, 2008)
\textsuperscript{37} http://www.itu.int (accessed August 19, 2008)
This indicates that the broadband connectivity will not be a barrier for access to the program to most of the world. However, as shown below, a lot of users prefer use the Internet from home, which may limit marketing efforts and delivery to individuals in developing countries if they don’t have any institutional access to the program:

---

38 Ibid
<table>
<thead>
<tr>
<th>Level of development</th>
<th>Economy</th>
<th>Age</th>
<th>Home</th>
<th>Work</th>
<th>Place of education</th>
<th>Access to people’s home</th>
<th>Community Internet access facility</th>
<th>Commercial Internet access facility</th>
<th>Other phones</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developed countries</td>
<td>Japan</td>
<td>6-14</td>
<td>50%</td>
<td>34%</td>
<td>12%</td>
<td>4%</td>
<td>5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Iceland</td>
<td>16-74</td>
<td>92%</td>
<td>69%</td>
<td>20%</td>
<td>48%</td>
<td>30%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Norway</td>
<td>16-74</td>
<td>92%</td>
<td>50%</td>
<td>12%</td>
<td>12%</td>
<td>12%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Russia</td>
<td>16-74</td>
<td>92%</td>
<td>42%</td>
<td>12%</td>
<td>24%</td>
<td>12%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Canada</td>
<td>15-74</td>
<td>61%</td>
<td>26%</td>
<td>12%</td>
<td>40%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>United States</td>
<td>30-74</td>
<td>88%</td>
<td>26%</td>
<td>33%</td>
<td>12%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Australia</td>
<td>15-74</td>
<td>88%</td>
<td>40%</td>
<td>13%</td>
<td>24%</td>
<td>9%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>New Zealand</td>
<td>15-74</td>
<td>88%</td>
<td>26%</td>
<td>12%</td>
<td>24%</td>
<td>9%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transition countries</td>
<td>Azerbaijan</td>
<td>15-74</td>
<td>69%</td>
<td>26%</td>
<td>17%</td>
<td>11%</td>
<td>4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bulgaria</td>
<td>16-74</td>
<td>71%</td>
<td>28%</td>
<td>12%</td>
<td>6%</td>
<td>16%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Romania</td>
<td>15-74</td>
<td>67%</td>
<td>34%</td>
<td>21%</td>
<td>12%</td>
<td>9%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Serbia</td>
<td>16-74</td>
<td>86%</td>
<td>32%</td>
<td>13%</td>
<td>18%</td>
<td>6%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FYR Macedonia</td>
<td>15-74</td>
<td>82%</td>
<td>17%</td>
<td>19%</td>
<td>6%</td>
<td>54%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Developing countries</td>
<td>Morocco</td>
<td>15-74</td>
<td>28%</td>
<td>21%</td>
<td>5%</td>
<td>2%</td>
<td>21%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mauritius</td>
<td>15-74</td>
<td>73%</td>
<td>28%</td>
<td>23%</td>
<td>2%</td>
<td>9%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>China</td>
<td>15-74</td>
<td>95%</td>
<td>35%</td>
<td>13%</td>
<td>32%</td>
<td>3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cambodia</td>
<td>15-74</td>
<td>82%</td>
<td>61%</td>
<td>17%</td>
<td>12%</td>
<td>9%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hong Kong SAR China</td>
<td>15-74</td>
<td>91%</td>
<td>42%</td>
<td>14%</td>
<td>2%</td>
<td>1%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Macao SAR China</td>
<td>15-74</td>
<td>86%</td>
<td>26%</td>
<td>12%</td>
<td>8%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Republic of Korea</td>
<td>15-74</td>
<td>95%</td>
<td>32%</td>
<td>17%</td>
<td>7%</td>
<td>4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Singapore</td>
<td>15-74</td>
<td>88%</td>
<td>50%</td>
<td>21%</td>
<td>12%</td>
<td>6%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Taiwan, China</td>
<td>15-74</td>
<td>93%</td>
<td>26%</td>
<td>19%</td>
<td>5%</td>
<td>10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Thailand</td>
<td>15-74</td>
<td>98%</td>
<td>25%</td>
<td>17%</td>
<td>6%</td>
<td>1%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Brazil</td>
<td>15-74</td>
<td>58%</td>
<td>49%</td>
<td>26%</td>
<td>31%</td>
<td>20%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chile</td>
<td>15-74</td>
<td>50%</td>
<td>19%</td>
<td>25%</td>
<td>2%</td>
<td>28%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Costa Rica</td>
<td>15-74</td>
<td>82%</td>
<td>23%</td>
<td>19%</td>
<td>2%</td>
<td>46%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dominican Republic</td>
<td>15-74</td>
<td>27%</td>
<td>32%</td>
<td>4%</td>
<td>28%</td>
<td>8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Honduras</td>
<td>15-74</td>
<td>73%</td>
<td>32%</td>
<td>3%</td>
<td>28%</td>
<td>81%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mexico</td>
<td>15-74</td>
<td>52%</td>
<td>24%</td>
<td>15%</td>
<td>1%</td>
<td>42%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Paraguay</td>
<td>15-74</td>
<td>48%</td>
<td>26%</td>
<td>14%</td>
<td>11%</td>
<td>5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Uruguay</td>
<td>15-74</td>
<td>48%</td>
<td>35%</td>
<td>11%</td>
<td>3%</td>
<td>52%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 13 – Internet use by location in various countries (UIS, Unesco)\(^{39}\)

---

This is particularly relevant for educational activities by users, reflected in the 3rd column from the right:

<table>
<thead>
<tr>
<th>Country/Region</th>
<th>Europe</th>
<th>Americas</th>
<th>Africa</th>
<th>Asia</th>
<th>Oceania</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>Europe: Deutschland</td>
<td>39%</td>
<td>30%</td>
<td>22%</td>
<td>10%</td>
<td>42%</td>
</tr>
<tr>
<td>Europe</td>
<td>France</td>
<td>42%</td>
<td>37%</td>
<td>25%</td>
<td>10%</td>
<td>45%</td>
</tr>
<tr>
<td>Europe</td>
<td>Germany</td>
<td>40%</td>
<td>35%</td>
<td>26%</td>
<td>11%</td>
<td>43%</td>
</tr>
<tr>
<td>Americas</td>
<td>United States</td>
<td>49%</td>
<td>36%</td>
<td>23%</td>
<td>9%</td>
<td>46%</td>
</tr>
<tr>
<td>Americas</td>
<td>Canada</td>
<td>45%</td>
<td>32%</td>
<td>21%</td>
<td>8%</td>
<td>43%</td>
</tr>
<tr>
<td>Americas</td>
<td>Mexico</td>
<td>43%</td>
<td>30%</td>
<td>21%</td>
<td>8%</td>
<td>42%</td>
</tr>
<tr>
<td>Oceania</td>
<td>Australia</td>
<td>41%</td>
<td>30%</td>
<td>21%</td>
<td>9%</td>
<td>42%</td>
</tr>
</tbody>
</table>

For them, one approach is to target higher educational institutes offering physics programs as institutional customers. The other approach is to make the basic program available online with videos on CD / DVD interlaced with online continuation code so that a student accessing this video on CD can only do so after being connected online with a registered account at the site. This requires professional programming support.

For the time being, the former approach is preferred, that is to identify the list of institutes around the world which have substantial number of students taking the GRE

---

physics exam every year and who have high speed Internet connectivity. These can then be offered institutional accounts including a free trial period. It is important to note that the user activities on the Internet do not change much if the country is part of the developed or the developing world, which means that with the maturity of Internet and broadband in the developing regions, the user will be homogenized and eventually the marketing approach will may be standardized.

The environmental and cultural barrier will only subside once word of mouth is generated among the academicians in various parts of the world. Testimonials of students, professors from the developing countries and professors part of the admissions committee at popular US universities can stimulate the acceptance of this program and therefore should be a key part of ongoing marketing efforts.
CHAPTER 4: EVALUATING THE COMMERCIAL VIABILITY OF THE PROGRAM

Program Costs

Bates (2000) found that the estimated costs of the following three areas generally determine the financial feasibility of a distance learning program:

1. Cost of development and delivery
2. Number of students registered over a period
3. Fee charged to the students

In addition to the above, an important cost element for the program is:

4. Cost of Marketing

Bates further mentions that a critical element in developing web-based learning systems, rather than classroom systems, is their design. It not only reduces the cost of the program, but in many cases also improves its effectiveness. This is an important consideration that has been incorporated in planning the various elements, discussed in this chapter.

Also, the costs are discussed with respect to the various phases in development, launch and market penetration of the program. These include:
**Phase 1**

This includes the current phase where a very basic web presence includes certain important resources but the design and functionality is limited to the minimum.

**Phase 2**

This is the next phase which professionalizes the website, incorporating the various additional elements as well as an improved user interface.

**Matured Phase**

Although this phase does not include any major changes in the program offering, however, it assumes that marketing is necessary to make the program successful and available to its customers.

1. **Cost of Development and Delivery**

The cost of developing and delivering the program to the world wide audience requires consideration of further elements that include the following:

**Phase 1**

a. **Content**

These are the materials developed and made available by Professor Brown, who has not charged anything for the program. However, his equity serves as his return on
investment. In other words, the ownership of this venture serves as the payment for his contribution of the idea, content and supervision.

One graduate student assisted in the process of the development of this content (will be referred to as CM), has been paid the stipend from the Freedman Fellows Award. Although the cost has been reimbursed, it serves as an investment into the program.

Content Development Cost = $1,000

b. Web Application

The initial web application was developed for free and the graduate student made the necessary changes to make it available (will be referred to as WA). He has been paid through the Freedman Fellows Award. Again, the cost has been reimbursed, but it serves as an investment into the program.

Web Development Cost = $1,000

c. Materials and Resources

No equipment has been specially purchased for the program, however the depreciation of university resources need to be considered to come up with a fair estimate of program cost. This includes assuming that the process of content development and web development (CM and WA) used PCs (worth $1,000 each, depreciating in 5 years) for 100% of their time during the 10-week period in summer, which gives of $200 /52 weeks x 10 weeks = $38 into PC usage. For two people the cost is twice, i.e. $76. For
simplicity, it is assumed that the cost of connectivity and bandwidth is as much per person.

Material and Resource Cost = $152

d. Media and Delivery

The hosting server is based on a machine with Professor Brown. Although the machine has been through its useful life, its salvage value (assumed 5% of its purchase price @ $1,000) is included to account for its cost, which gives $50. Furthermore, during the trial phase the bandwidth required by the server is very low and we assume it to be equivalent to an average broadband connection at $20 per month.

The streaming server with Mediavision hosts multiple courses. It is assumed that the videos from this course are 1% of all the resources hosted by them and therefore with the cost of the hosting server at $10,000, this hosting cost of videos is $100. Although the traffic load is low, it has the potential to consume substantial bandwidth which is accounted by taking the cost to be equivalent to a heavy broadband connection @ $60 per month.

The annual cost of domain name is $10 that adds to the total

Media and Delivery Cost = $970 per year

Total Cost of Development and Delivery = $3,122
Phase 2

a. Content

This will include the continued efforts of Professor Brown. A graduate student will be assisting him for improvement of content as well as development of additional content. Assuming the student is spending 10% time from their research / teaching responsibilities on this project every year, where s/he gets an annual stipend of $20,000, gives $2,000 which serves as the financial investment into the program.

Content Management Cost = $2,000 per year

b. Web Application

It is assumed that a professional web developer will be hired on contract for a lump sum amount = $10,000 (inclusive of all costs and taxes) who is expected to use his/her own equipment and connectivity.

In addition, considering the site administration being done by a graduate student (SA), who spends 10% time from their research / teaching responsibilities on this project every year, where s/he gets a annual stipend of $20,000, 10% of this amount is $2,000 which serves as the financial investment into the program every year.

Web Development Cost = $12,000

Web Management Cost = $2,000 per year
c. Materials and Resources

Assuming 2 graduate assistants (CM and SA) use PCs worth $1,000 depreciating in 5 years for 10% of their time during the year, gives $20 per person per year. For simplicity, it is assumed that the cost of connectivity and bandwidth is as much per assistant.

\[
\text{Material and Resource Cost} = 80 \text{ per year}
\]

d. Media and Delivery

The costs associated with the hosting and delivery of the media is assumed to remain the same (ignoring the inflation factor at the moment).

\[
\text{Media and Delivery Cost} = 970 \text{ per year}
\]

\[
\text{Total Cost of Development and Delivery} = 15,050
\]

\[
\text{Total Cost of Web Management and Delivery} = 5,050
\]

*Matured Phase*

Once the site has been professionally developed, deployed and marketed, it can be considered to be mature in terms of the conceptual implementation. The costs associated with this phase include:

a. Content and Application Management

At this stage, the community would be acting as the main source of content development and feedback screening. The site administrator is assumed to be taking
care of all the content modifications, review and site management responsibilities and Professor Brown will take the role of entrepreneur with minimal involvement in the day-to-day operations and management of the program.

This would mean a greater amount of time from the graduate student. One graduate student spending 25% of their research / teaching time on the project is considered to be sufficient to manage the community input and gradual changes. We assume their annual stipend to be $20,000 (ignoring inflation).

Content and Application Management Cost = $5,000 per year

b. Materials and Resources

One graduate assistant (will be referred to as SA) using a PC worth $1,000 depreciating in 5 years for 10% of their time during the year, gives $20 per year. For simplicity, it is assumed that the cost of connectivity and bandwidth is as much.

Material and Resource Cost = $40 per year

c. Media and Delivery

The costs associated with the hosting and delivery of the media is assumed to remain the same (ignoring the inflation factor) as the previous phases.

Media and Delivery Cost = $970 per year
d. Customer Service

With the maturity of the website, it is assumed that more customer calls will need to be handled, most of them at a level much that will not require the expertise of SA. It is therefore assumed that such a function can be outsourced to a third party call center offering a shared inbound seat receiving calls 12 hours a day for the first year in order to ensure the highest level of service when the site is being marketed aggressively. However, once the site’s offerings have matured, it may not be required or feasible to sustain it any longer. The few calls or emails received from customers may be handled by the SA at no additional cost to the program.

There are multiple outsourcing companies that offer various budgets and level of services (such as multiple language support, dedicated phone number, etc.) and a median of the basic level of service is considered @ 400 per month. There would be an additional fee of around $1,000 to setup these operations (including the fee for an inbound number) and train the call center agents over standard customer service and troubleshooting queries. Upon the discontinuation of call center services, the inbound number can be routed to some phone at the university or the SA’s cell phone.

Customer Services Cost = $5,800 one year only

Total Cost of Development and Delivery = $11,810 1st year

Total Cost of Development and Delivery = $6,010 subsequent years
2. **Cost of Marketing**

The cost of marketing the program to various institutes and users around the world includes the following elements:

*Phase 1*

Currently, the program is being marketed through word-of-mouth to students and colleagues who already refer to Professor Brown for his expertise and notes. This is expected to continue, however all such contacts will be emailed about the program website in order to let them know about the availability of this service. The cost of email is insignificant and is therefore ignored.

Cost of Online Marketing = $0

*Phase 2 and the Matured Phase*

The marketing elements may be done simultaneously with the professional version of the website or once it is in place and free of all bugs. The phase where the website is stable has some traffic coming in and marketing increases the number of users is referred as the Matured Phase. The marketing efforts required include:

a. **Online Marketing**

i. **Search engine submission and optimization**

This includes the submission of the site and its details to all the search engines as well as improving its ranking in search results when users input the related key words. This can be done by the Site Administrator himself and/or using any of the many available
software, such as WebCEO.\(^41\) There are also individuals or web based service providers who can do this for a fee and guarantee the number of hits on the website\(^42\). One or a combination of such services can be used, particularly in the first few years at a frequency of once every six months and therefore an estimated annual lump sum amount is considered.

Search Engine Submission / Optimization Cost: $400 per year

ii. Advertisements on search engines

Google.com and Askjeeves.com are good examples of search engines having differentiation and a loyal customer base. They can be used to advertise the site. Not only will the prospective user be able to get the results upon search, they will be able to see the advertisement of the site (banner or text, depending upon the search engine and their browser) on the search results page. This allows more room for advertising text and a greater exposure to the customer. These sites have various rates, however for the keywords ‘gre’ and ‘physics’, various searches gave different sponsored links. These include:

1. Morrison Media selling GRE physics test techniques book - a general guide book on test strategy which does not offer any skills training in physics\(^43\)

2. Rapid learning Center offering 1\(^{st}\) year physics video tutorials for a non-calculus based course. It has nothing to do with GRE physics\(^44\)


\(^{42}\) Examples include the website at http://www.ineedhits.com (accessed August 10, 2008)

3. Kaplan Test Preparation and Admissions who only offer training in general GRE (discussed in Chapter 2)\(^\text{45}\)

There are many more sponsored links and these will probably increase over time, but none of the links at the time of writing have much to do with GRE Physics. There is therefore no competition on the attention of the user searching for the relevant program. This mode of advertisement should therefore be only considered when there is some competition that might divert the user before they go through the results at the site.

The cost of these advertisements is based on the number of users clicking on the link. A brief summary of cost for the words ‘gre physics’ at Google resulted into the following keyword suggestions and associated cost for the advertisement (in the order 1\(^{st}\), 2\(^{nd}\) and 19\(^{th}\) choices)\(^\text{46}\):

<table>
<thead>
<tr>
<th>Key words</th>
<th>Estimated advertisement position</th>
<th>Estimated cost per click (avg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>gre physics</td>
<td>1 – 3</td>
<td>$0.63</td>
</tr>
<tr>
<td>gre physics test</td>
<td>1 – 3</td>
<td>$0.51</td>
</tr>
<tr>
<td>physics gre ets</td>
<td>1 – 3</td>
<td>$0.05</td>
</tr>
</tbody>
</table>

Therefore even when 1,000 prospects click on this link (assuming 1.2 clicks per user) the total cost would be around $750, which is very cost-effective compared to the other major advertisement avenues.

Search Engine Advertisement: $756 as and when needed

iii. Advertisements on 3rd party websites

These include the advertisements placed at the relevant online sites such as www.physicsgre.com. Most of the sites discussing GRE Physics (except ETS) are individually operated as a public service program and therefore do not have any official tariff. The charges at these sites will therefore be very low compared to the commercial sites. A fixed amount is reserved for a number of these sites (and the number of clicks). Any remaining amount will add up to the bottom-line.

Online Advertisement Cost: $500 per year

Total Cost of Online Marketing: $900 per year + $756 on as-needed basis

b. Offline Marketing

There are multiple traditional marketing elements that are necessary to make this a widely acknowledge training venture:

Phase 1

At this point, since the program relies mainly on word-of-mouth marketing, there are no formal marketing materials included in this phase.

Total Cost of Offline Marketing = $0
Phase 2 or Matured Phase

i. Personalized Letters

This will include the personalized letters to department chairs, faculty, administrators and various associations. Focusing on targeted 1,000 letters every year @ almost 100 a month to people around the world, an estimated cost of $1.10 for printing and mailing (print and paper: $0.05 + envelope + address tag: $0.20 + stamp: $0.42 + average international addition: $0.40) will be sufficient for the first few years.

Cost of Personalized Letters = $1,100 per year

ii. Fliers (Direct Marketing Material)

Brochures and fliers will need to be designed and sized so that they can be easily placed at department notice boards and other locations frequently visited by students. To estimate the cost, 2,000 high quality brochure designed and printed at FedEx Kinko’s® is used as a reference, which amount to $1995.21\(^{47}\). It is assumed that each personalized letter will carry one of these fliers (3-folds 8.5” x 11”) with another 1,000 for other locations.

Cost of Fliers = $2,000 per year

Total Cost of Offline Marketing = $3,100 per year

3. **Number of Students Registered and Variable Cost**

The number of registered students is used to project the revenue as well as the variable costs of the program.

**a. Number of registered Students**

The starting point is the number of students appearing for the GRE Physics exam, which for the year ending Jun 30, 2006 =12,484\(^{48}\). The first-time full-time graduate student enrollment at US universities in physics and astronomy for 2006 was 2,613 which included 1,548 (60%) US residents and 1,065 (40%) international students, based on their visa status\(^{49}\). This shows that of the approximately 12,500 students taking the GRE Physics exam, only 2,600 (21%) enter as full-time students in US graduate schools.

The following assumptions are used in order to project quantitatively:

- 100% of the target market in around the world will be accessible to the program, either as institutional or individual accounts

  *This assumption is based on the worldwide Internet and broadband connectivity discussed in the Introduction and Chapter 3.*

  ⇒ Target Population: 12,500 candidates

- 28% of all candidates appearing in the exam are interested in a commercial preparation course


This is based on comparing the test to another standardized subject test; LMAT. For the period between 1991/92 to 1996/97; an average of 28% of candidates among all race groups were found to be relying on commercial test preparation centers (Thornton, Reese, Pashley; Law School Admission Council, 1998).

28% of 12,500 = 3,500 candidates

- 50% of the students will use institutional accounts and as many, the individual accounts.

Although students are found to perform better in personalized tutoring (Bloom, 1984), the advantages of working in a group through an institutional account leads to cost savings and group support. It is therefore assumed that only in the absence of an institutional account will interested students opt for individual accounts. However, very few institutes offering bachelors in physics or astronomy offer institutional support for students to prepare for GRE Physics and small class sizes may make this even more difficult. In the developing world, institute based access to this program will be the only way for most students, as discussed earlier. In 2001, 4,100 students graduated with a bachelor in physics from 750 departments across the US, giving an average of 5.5 students per department.\textsuperscript{50} For institutes with students less than this average, it may not be economical to offer an institutional account and these students will have to depend on individual accounts. For the other half of the institutes from the US

(with more than 5.5 students per department) and students from the developing countries (India and China being the bulk), it is assumed that they will be using institutional accounts. The profile for accounts from developed countries excluding the US is assumed to mainly include institutional accounts. This is because of the lack of available data and the revenue from institutional account being a conservative estimate compared to the individual account, which gives:

-\[ 3,500 \times 60\% \times 50\% = \text{individual users} = 1,050 \text{ one-time} \]
-\[ 3,500 - 1,050 = \text{institutional users} = 2,450 \text{ per year} \]

- Number of students preparing through an institutional account = 15.

This is based on UNESCO’s study of teacher-student ratio in tertiary education for selected countries (1999) where the average is 16.1.\textsuperscript{51} This is rounded for simplification.

- For 2,450 students = maximum 163 institutional accounts per year

- 100\% of the candidates will be interested in accessing the program if it is available for free = 12,500 per year

\textsuperscript{51} \url{http://www.uis.unesco.org/ev.php?ID=5317_201&ID2=DO_TOPIC} (accessed August 19, 2008)
Pricing Model

The fee charged by the program is $50 for individual users. It is the average for the resources currently available for the preparation of the exam ranging from $12 to $87 and is not substantial to be a barrier for students in the US. For the institutional users, it is $250 per year and for an average class size of 16.1 students (UIS, UNESCO), it will be absorbed into miscellaneous college costs. For some countries, it may require interested students to pool in their portion or invest substantial time and energy to convince the administration into offering them an institutional account. With the cost of the GRE physics exam at the time of writing being $150,\textsuperscript{52} it is expected that this will not come as a major additional expenditure to the students.

The elasticity of price is difficult to measure at this stage and may not be possible even later (Nagle and Holden, 2001). Based on its effectiveness in satisfying the need, the product is highly inelastic because it is critical for the success in the exam and easily accessible without any good substitutes, as discussed in Chapter 2. However, the reviews of people for various publications indicate that students are conscious of what they buy and how much does it cost. The launching price of $50 is therefore balanced by averaging the competition and charging the minimum that justifies the financial feasibility to the maximum that the students may be able to afford. The demand response at the launch will be a good measure of evaluation. If the feedback indicates that the product is cost-effective, than the best approach will be to raise the price with

\textsuperscript{52} https://orderpage.ic3.com/hop/orderform.jsp (accessed August 20, 2008)
each update of resources and structure. However, if the price feedback indicates the program to be overpriced, the strategy will be to offer discount promotions that apparently does not change the price but at the same time brings it into students’ budget while making them feel that have earned a bargain.

A 5-year projection of the number of users is done for the various phases of the program. The recommended approach and duration for each phase is discussed later. The growth is projected based on the following considerations:

*Phase 1*

User growth 100% of previous year (except for the 2\textsuperscript{nd} year when people outside CWRU start knowing about the program)

*The number of hits at the program website during the last few months is used to project a growth of 100% per year. This will probably increase over time; however, the current estimate suffices for the purpose of analysis.*

*Phase 2*

A growth of 50 users every year

*Due to the lack of industry data on growth profile of commercial coaching centers, this has been based on a snapshot of growth achieved by the sales of published standardized test materials at 17% (2004 over 2003)\textsuperscript{53} and growth in sales revenue of Princeton*

Review at 48% (1st qtr 2002 over 2001)\textsuperscript{54} and 17% (2005 over 2004).\textsuperscript{55} The growth of this program is therefore projected at 25%, decreasing to 15% as the revenues increase.

**Matured Phase**

A growth of 150 users every year

*This is based on the argument discussed above with the difference that the base figure for growth is higher (mature phase won’t start until the first few years).*

<table>
<thead>
<tr>
<th>Number of Users</th>
<th>Year-1</th>
<th>Year-2</th>
<th>Year-3</th>
<th>Year-4</th>
<th>Year-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individuals Users</td>
<td>50</td>
<td>500</td>
<td>1000</td>
<td>2000</td>
<td>4000</td>
</tr>
<tr>
<td>Growth</td>
<td>900%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>Institutional Users</td>
<td>5</td>
<td>20</td>
<td>50</td>
<td>100</td>
<td>200</td>
</tr>
<tr>
<td>Growth</td>
<td>300%</td>
<td>150%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 1 - Pricing Model for Phase 1

<table>
<thead>
<tr>
<th>Number of Users</th>
<th>Year-1</th>
<th>Year-2</th>
<th>Year-3</th>
<th>Year-4</th>
<th>Year-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individuals Users</td>
<td>200</td>
<td>250</td>
<td>300</td>
<td>350</td>
<td>400</td>
</tr>
<tr>
<td>Growth</td>
<td>25%</td>
<td>20%</td>
<td>17%</td>
<td>14%</td>
<td></td>
</tr>
<tr>
<td>Institutional Users</td>
<td>5</td>
<td>20</td>
<td>40</td>
<td>60</td>
<td>80</td>
</tr>
<tr>
<td>Growth</td>
<td>300%</td>
<td>100%</td>
<td>50%</td>
<td>33%</td>
<td></td>
</tr>
</tbody>
</table>

Table 2 - Pricing Model for Phase 2 and Matured Phase


\textsuperscript{55} http://sec.edgar-online.com/2006/03/15/0001206774-06-000437/Section6.asp (accessed August 22, 2008)
b. Transaction Processing Cost

These are the only variable costs for the program. All the other costs are almost independent of the number of users.

*Phase 1*

Currently the website is only offered to people as a proof of concept and therefore no registration is being charged and no intermediary fee is involved.

\[
\text{Cost of Transaction Processing} = \$0
\]

*Phase 2*

As discussed in the next section, it is estimated that an average of 400 students and 20 institutes will register to the program every year. The institutes will accumulate over the period of time while the number of registrations per student is estimated to remain the same. Taking the fee to be \$50 for individuals and \$250 for institutes with a transaction fee of 4%, we get:

<table>
<thead>
<tr>
<th>Transaction Cost</th>
<th>Year-1</th>
<th>Year-2</th>
<th>Year-3</th>
<th>Year-4</th>
<th>Year-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fee – Individual</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Fee – Institution</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Individuals Users</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Institutional Users</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
</tbody>
</table>

Table 3 - Transaction Costs for Phase 1
Phase 2 Professional website - No marketing - Reg Fee

<table>
<thead>
<tr>
<th>Transaction Cost</th>
<th>Year-1</th>
<th>Year-2</th>
<th>Year-3</th>
<th>Year-4</th>
<th>Year-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fee – Individual</td>
<td>$2</td>
<td>$2</td>
<td>$2</td>
<td>$2</td>
<td>$2</td>
</tr>
<tr>
<td>Fee – Institution</td>
<td>$10</td>
<td>$10</td>
<td>$10</td>
<td>$10</td>
<td>$10</td>
</tr>
<tr>
<td>Individuals Users</td>
<td>$400</td>
<td>$500</td>
<td>$600</td>
<td>$700</td>
<td>$800</td>
</tr>
<tr>
<td>Institutional Users</td>
<td>$50</td>
<td>$200</td>
<td>$400</td>
<td>$600</td>
<td>$800</td>
</tr>
</tbody>
</table>

Table 4 - Transaction Costs for Phase 2

Matured Phase Professional website - Marketing - Reg Fee

<table>
<thead>
<tr>
<th>Transaction Cost</th>
<th>Year-1</th>
<th>Year-2</th>
<th>Year-3</th>
<th>Year-4</th>
<th>Year-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fee – Individual</td>
<td>$2</td>
<td>$2</td>
<td>$2</td>
<td>$2</td>
<td>$2</td>
</tr>
<tr>
<td>Fee – Institution</td>
<td>$10</td>
<td>$10</td>
<td>$10</td>
<td>$10</td>
<td>$10</td>
</tr>
<tr>
<td>Individuals Users</td>
<td>$1,100</td>
<td>$1,400</td>
<td>$1,700</td>
<td>$2,000</td>
<td>$2,100</td>
</tr>
<tr>
<td>Institutional Users</td>
<td>$1,050</td>
<td>$1,300</td>
<td>$1,550</td>
<td>$1,800</td>
<td>$2,050</td>
</tr>
</tbody>
</table>

Table 5 - Transaction Costs for Matured Phase

4. Revenues from the Program

These mainly include the student and institutional registration fees. However, future opportunities for additional revenue are also discussed.

a. Fee from Students and Institutes

Phase 1

As already discussed, the website is only offered to people as a proof of concept and therefore no registration is being charged.

Revenue from Students and Institutes = $0
Phase 2

The student account will be charged $50 (assuming no increase in fee over the years) and the institutional accounts at $250 (other details discussed in Chapter 2):

### Phase 1

<table>
<thead>
<tr>
<th>Reg. Revenue</th>
<th>Year-1</th>
<th>Year-2</th>
<th>Year-3</th>
<th>Year-4</th>
<th>Year-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fee - Individual</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Fee - Institution</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Individuals Users</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Institutional Users</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
</tbody>
</table>

Table 6 - Registration Revenue for Phase 1

### Phase 2

<table>
<thead>
<tr>
<th>Reg. Revenue</th>
<th>Year-1</th>
<th>Year-2</th>
<th>Year-3</th>
<th>Year-4</th>
<th>Year-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fee - Individual</td>
<td>$50</td>
<td>$50</td>
<td>$50</td>
<td>$50</td>
<td>$50</td>
</tr>
<tr>
<td>Fee - Institution</td>
<td>$250</td>
<td>$250</td>
<td>$250</td>
<td>$250</td>
<td>$250</td>
</tr>
<tr>
<td>Individuals Users</td>
<td>$10,000</td>
<td>$12,500</td>
<td>$15,000</td>
<td>$17,500</td>
<td>$20,000</td>
</tr>
<tr>
<td>Institutional Users</td>
<td>$1,250</td>
<td>$5,000</td>
<td>$10,000</td>
<td>$15,000</td>
<td>$20,000</td>
</tr>
<tr>
<td>Total Reg. Revenue</td>
<td>$11,250</td>
<td>$17,500</td>
<td>$25,000</td>
<td>$32,500</td>
<td>$40,000</td>
</tr>
</tbody>
</table>

Table 7 - Registration Revenue for Phase 2

### Matured Phase

<table>
<thead>
<tr>
<th>Reg. Revenue</th>
<th>Year-1</th>
<th>Year-2</th>
<th>Year-3</th>
<th>Year-4</th>
<th>Year-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fee - Individual</td>
<td>$50</td>
<td>$50</td>
<td>$50</td>
<td>$50</td>
<td>$50</td>
</tr>
<tr>
<td>Fee - Institution</td>
<td>$250</td>
<td>$250</td>
<td>$250</td>
<td>$250</td>
<td>$250</td>
</tr>
<tr>
<td>Individuals Users</td>
<td>$27,500</td>
<td>$35,000</td>
<td>$42,000</td>
<td>$50,000</td>
<td>$52,500</td>
</tr>
<tr>
<td>Institutional Users</td>
<td>$26,250</td>
<td>$32,500</td>
<td>$38,750</td>
<td>$45,000</td>
<td>$51,250</td>
</tr>
<tr>
<td>Total Reg. Revenue</td>
<td>$53,750</td>
<td>$67,500</td>
<td>$81,250</td>
<td>$90,750</td>
<td>$93,250</td>
</tr>
</tbody>
</table>

Table 8 - Registration Revenue for Matured Phase

It can be seen that almost 200 institutional accounts will be able to generate revenue that is a little more than that from 900 individual users. In addition, the institutional accounts
accounts accumulate over time; an institute once registered will continue to buy the services every year, so even with fewer additional accounts per year, the revenue stream is steady.

b. Additional Revenues

These include revenues from non-core activities:

i. Advertisement Revenue

a. Fee from Students and Institutes

*Phase 1*

The website is only offered to people as a proof of concept. However, if it is not structured into a professional program charging for registration, there is expected to be high traffic at the site as the word travels. Organizations interested in advertising on the site may include Princeton Review and other institutes preparing for GRE general exam, institutes interested in prospecting physics students. Some marketing and contact may be necessary but considering the focused traffic at the site, it is assumed that Professor Brown or the student SA will be able to spare enough time to contact and process the deployment of advertisements and links:
Phase 1
Basic website - No marketing - No Fee

<table>
<thead>
<tr>
<th>Ad. Revenue</th>
<th>Year-1</th>
<th>Year-2</th>
<th>Year-3</th>
<th>Year-4</th>
<th>Year-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Users (Individual and Institutional)</td>
<td>125</td>
<td>800</td>
<td>1,750</td>
<td>3,500</td>
<td>7,000</td>
</tr>
<tr>
<td>Frequency of Visits per year (100)</td>
<td>12,500</td>
<td>80,000</td>
<td>175,000</td>
<td>350,000</td>
<td>700,000</td>
</tr>
<tr>
<td>Advertisement Clicks (5%)</td>
<td>625</td>
<td>4,000</td>
<td>8,750</td>
<td>17,500</td>
<td>35,000</td>
</tr>
<tr>
<td>Revenue ($0.05 per click)</td>
<td>$31</td>
<td>$200</td>
<td>$438</td>
<td>$875</td>
<td>$1,750</td>
</tr>
</tbody>
</table>

Table 9 - Advertisement Revenue for Phase 1

Phase 2 and the Matured Phase

With the site restricting access of training content to registered users, a lot of people will only visit it once or a few times and discontinue, while the registered users will keep on visiting later. The revenue generation profile through advertisements will therefore change in these phases:

<table>
<thead>
<tr>
<th>Ad. Revenue</th>
<th>Professional website - No marketing - Reg Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year-1</td>
<td>Year-2</td>
</tr>
<tr>
<td>Number of Users (Individual and Institutional)</td>
<td>275</td>
</tr>
<tr>
<td>Frequency of Visits per year (100)</td>
<td>27,500</td>
</tr>
<tr>
<td>No. of times users get interested in advertisements (5%)</td>
<td>1,375</td>
</tr>
<tr>
<td>Revenue ($0.05 per click)</td>
<td>$69</td>
</tr>
</tbody>
</table>

Table 10 - Advertisement Revenue for Phase 2
Student Costs

An important aspect of evaluation is to identify the costs to the student. If this is prohibitively costly, the site may find it difficult to attract the 25% of qualified individuals that have been assumed above as its paid customers in addition to the institutes.

It is assumed that the institutional accounts will already have the infrastructure and bandwidth and will only need to pay the registration charges. In addition, these services may be available to the students as per the institutional policy, which may vary, and is generally included in the IT fee. The following costs are therefore only projected for the individual accounts.

Most of these costs are assumed to remain the same, except for the cost of registration, which is applicable in the current phase. Only the costs directly related to the program
are considered. Other costs such as the opportunity cost for a person working through this program, installation of a suitable computer and connection are not included.

a. Program Registration

This is the primary direct cost that the student needs to pay to the site. It is a one-time cost that can be paid through a debit/credit card or a paypal account:

\[
\text{Registration Cost} = \$50
\]

b. Resources

i. Personal Computer

Most students around the world are expected to have a personal computer already at home as well as accessible at their educational institute. In case a student does not have it, it may be difficult for the student to get it just for the purpose of this program. However, to put up a cost of use we assume the use of a personal computer (desktop or laptop) for a period of 4 months dedicated to the training program, having a life of 5 years and a purchase value of $1,000.

\[
\text{Cost of Computer (depreciation)} = \$67
\]

ii. Printing (Flash Cards & Notes)

Assuming the student is allowed to print flash cards for themselves or order from the program, and understanding that most students find it convenient to get prints at institute, library, cyber cafes and other places offering the service @ $0.05 to $0.10 per
page (equivalent in respective currencies), we find that 250 flash cards will cost the student $25 either way.

Some students may also need to print other notes or materials and these may be another 100 pages @ $0.10 per page.

\[
\text{Cost of Printing} = \$35
\]

b. Connectivity

As the case with personal computer, most students in the developed countries may already have a connection. The quality of video will depend upon the bandwidth available. Most ordinary broadband connections offer a bandwidth greater than 1Mbps shared between 20 users who may all not be connected or downloading at the same time. This is generally suitable for the streaming video, but sometimes the Internet Service Provider (ISP) may undergo high user demand causing the screen to freeze or skip frames frequently\(^56\). As discussed earlier, this may not be possible for students from some regions because of the unavailability of such an infrastructure. Nevertheless the cost is included in order to arrive at the total program expenditure.

Most places offer the ordinary broadband connection (downloading speed around 1MB) also called DSL, Cable, T1, etc. for $20 - $30 per month. The cost is generally towards

the lower end for the developing countries. Taking the average cost @ $25 for 4 months.

Cost of Connectivity = $100

Total Cost for a Student = $252

<table>
<thead>
<tr>
<th>INDIVIDUAL USER</th>
<th>Month-1</th>
<th>Month-2</th>
<th>Month-3</th>
<th>Month-4</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registration Cost</td>
<td>$50</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$50</td>
</tr>
<tr>
<td>PC Depreciation</td>
<td>$17</td>
<td>$17</td>
<td>$17</td>
<td>$17</td>
<td>$67</td>
</tr>
<tr>
<td>Printing</td>
<td>$9</td>
<td>$9</td>
<td>$9</td>
<td>$9</td>
<td>$67</td>
</tr>
<tr>
<td>Connectivity</td>
<td>$25</td>
<td>$25</td>
<td>$25</td>
<td>$25</td>
<td>$100</td>
</tr>
<tr>
<td>Individual User Cost</td>
<td>$100</td>
<td>$50</td>
<td>$50</td>
<td>$50</td>
<td>$252</td>
</tr>
</tbody>
</table>

Table 12 – Summary of costs for individual users

For the student, who is paying $120 for the exam at the time of writing of this report, the apparent cost is $50 and the total impact may be as high as $252 as discussed earlier. However, keeping in perspective that typically students apply from 4 to 10 graduate schools[^57](http://web2.averett.edu/student-life/careerserv/graduate-school.html), where each application costs around $100 (application fee, transcripts, GRE general and subject scores, postage, etc.), this additional amount although is a burden but the students may still be willing to spend it because it is not a substantial cost for most students having access to other required resources and it can create a huge impact in the eventual outcome for their career.

Program Expectations and Outcome

The expectations from this venture can be reflected using Kirkpatrick's (1996) four-level model of training outcomes as generally defined as:

Level 1: Reaction - users take the program positively and use it frequently

Level 2: Learning – users learn some physics and problem solving methodologies from the program

Level 3: Behavior – users perform better while solving GRE physics type problems; better problem solving techniques and/or shorter time duration

Level 4: Results – users achieve a better score in the exam and the program achieves sufficient payback on the investment and resources

The initial trials have already given positive indications for outcome levels 1, 2 and 3 by the sample of students using it during summer 2008 at the Department of Physics, Case Western Reserve University. However, a clear test would be to see if Level 4 outcome for users and the program itself is achieved when a larger, geographically diverse user group prepares through the program. This can be measured periodically after every cycle of exams (yearly).

**Projecting Outcome & Financial Statements**

The quantitative outcome for the venture and the qualitative benefit to the student are discussed below that summarizes the costs and revenues discussed earlier.

**Measuring the Quantitative Outcome – Program Income**

As the tables show that the program is financially feasible once it starts charging for registration, until which it barely breaks-even:
### Phase 1
**Basic website - No marketing - No Fee**

<table>
<thead>
<tr>
<th></th>
<th>Year-5</th>
<th>Year-4</th>
<th>Year-3</th>
<th>Year-2</th>
<th>Year-1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Registration Revenue</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individuals</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Institutions</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total Reg. Revenue</strong></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Advertisement Revenue</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Ad Revenue</td>
<td>1,750</td>
<td>875</td>
<td>438</td>
<td>200</td>
<td>31</td>
</tr>
<tr>
<td><strong>TOTAL REVENUE</strong></td>
<td>1,750</td>
<td>875</td>
<td>438</td>
<td>200</td>
<td>31</td>
</tr>
<tr>
<td><strong>Transaction Cost</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individuals</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Institutions</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total Transaction Cost</strong></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Development Cost</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content Development</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1,000</td>
</tr>
<tr>
<td>Application Development</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1,000</td>
</tr>
<tr>
<td>Materials and Resources</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>152</td>
</tr>
<tr>
<td>Media and Delivery</td>
<td>970</td>
<td>970</td>
<td>970</td>
<td>970</td>
<td>970</td>
</tr>
<tr>
<td>Customer Service</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total Development Cost</strong></td>
<td>970</td>
<td>970</td>
<td>970</td>
<td>970</td>
<td>3,122</td>
</tr>
<tr>
<td><strong>Marketing Cost</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Search Engin Subm. &amp; Optm.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Search Engine Adverts</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ads on 3rd Party Websites</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Personalized Letters</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Fliers</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total Marketing Cost</strong></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3,122</td>
</tr>
<tr>
<td><strong>TOTAL COST</strong></td>
<td>970</td>
<td>970</td>
<td>970</td>
<td>970</td>
<td>3,122</td>
</tr>
<tr>
<td><strong>NET INCOME</strong></td>
<td>$ 780</td>
<td>$(95)</td>
<td>$(533)</td>
<td>$(770)</td>
<td>$(3,091)</td>
</tr>
</tbody>
</table>

Table 13 – Projected Income Statement for 5-years as Phase 1
### Phase 2
Professional website - No marketing - Reg Fee

#### Registration Revenue

<table>
<thead>
<tr>
<th></th>
<th>Year-5</th>
<th>Year-4</th>
<th>Year-3</th>
<th>Year-2</th>
<th>Year-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individuals</td>
<td>20,000</td>
<td>17,500</td>
<td>15,000</td>
<td>12,500</td>
<td>10,000</td>
</tr>
<tr>
<td>Institutions</td>
<td>20,000</td>
<td>15,000</td>
<td>10,000</td>
<td>5,000</td>
<td>1,250</td>
</tr>
<tr>
<td><strong>Total Reg. Revenue</strong></td>
<td><strong>40,000</strong></td>
<td><strong>32,500</strong></td>
<td><strong>25,000</strong></td>
<td><strong>17,500</strong></td>
<td><strong>11,250</strong></td>
</tr>
</tbody>
</table>

#### Advertisement Revenue

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Ad Revenue</strong></td>
<td><strong>400</strong></td>
<td><strong>313</strong></td>
<td><strong>225</strong></td>
<td><strong>138</strong></td>
<td><strong>69</strong></td>
</tr>
<tr>
<td><strong>TOTAL REVENUE</strong></td>
<td><strong>40,400</strong></td>
<td><strong>32,813</strong></td>
<td><strong>25,225</strong></td>
<td><strong>17,638</strong></td>
<td><strong>11,319</strong></td>
</tr>
</tbody>
</table>

#### Transaction Cost

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Individuals</td>
<td>800</td>
<td>700</td>
<td>600</td>
<td>500</td>
<td>400</td>
</tr>
<tr>
<td>Institutions</td>
<td>800</td>
<td>600</td>
<td>400</td>
<td>200</td>
<td>50</td>
</tr>
<tr>
<td><strong>Total Transaction Cost</strong></td>
<td><strong>1,600</strong></td>
<td><strong>1,300</strong></td>
<td><strong>1,000</strong></td>
<td><strong>700</strong></td>
<td><strong>450</strong></td>
</tr>
</tbody>
</table>

#### Development Cost

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Content Development</td>
<td>2,000</td>
<td>2,000</td>
<td>2,000</td>
<td>2,000</td>
<td>2,000</td>
</tr>
<tr>
<td>Application Development</td>
<td>2,000</td>
<td>2,000</td>
<td>2,000</td>
<td>2,000</td>
<td>12,000</td>
</tr>
<tr>
<td>Materials and Resources</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Media and Delivery</td>
<td>970</td>
<td>970</td>
<td>970</td>
<td>970</td>
<td>970</td>
</tr>
<tr>
<td><strong>Total Development Cost</strong></td>
<td><strong>5,050</strong></td>
<td><strong>5,050</strong></td>
<td><strong>5,050</strong></td>
<td><strong>5,050</strong></td>
<td><strong>15,050</strong></td>
</tr>
</tbody>
</table>

#### Marketing Cost

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Search Engin Subm. &amp; Optm.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Search Engine Adverts</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ads on 3rd Party Websites</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Personalized Letters</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Fliers</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total Marketing Cost</strong></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>TOTAL COST</strong></td>
<td><strong>6,650</strong></td>
<td><strong>6,350</strong></td>
<td><strong>6,050</strong></td>
<td><strong>5,750</strong></td>
<td><strong>15,500</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th><strong>$ 33,750</strong></th>
<th><strong>$ 26,463</strong></th>
<th><strong>$ 19,175</strong></th>
<th><strong>$ 11,888</strong></th>
<th><strong>$ (4,181)</strong></th>
</tr>
</thead>
</table>

**NET INCOME**

Table 14 – Projected Income Statement for 5-years as Phase 2
### Registration Revenue

<table>
<thead>
<tr>
<th></th>
<th>Year-5</th>
<th>Year-4</th>
<th>Year-3</th>
<th>Year-2</th>
<th>Year-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individuals</td>
<td>45,000</td>
<td>40,000</td>
<td>35,000</td>
<td>30,000</td>
<td>25,000</td>
</tr>
<tr>
<td>Institutions</td>
<td>51,250</td>
<td>45,000</td>
<td>38,750</td>
<td>32,500</td>
<td>26,250</td>
</tr>
<tr>
<td><strong>Total Reg. Revenue</strong></td>
<td><strong>96,250</strong></td>
<td><strong>85,000</strong></td>
<td><strong>73,750</strong></td>
<td><strong>62,500</strong></td>
<td><strong>51,250</strong></td>
</tr>
</tbody>
</table>

### Advertisement Revenue

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Ad Revenue</strong></td>
<td>994</td>
<td>875</td>
<td>756</td>
<td>638</td>
</tr>
<tr>
<td><strong>TOTAL REVENUE</strong></td>
<td>97,244</td>
<td>85,875</td>
<td>74,506</td>
<td>63,138</td>
</tr>
</tbody>
</table>

### Transaction Cost

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Individuals</td>
<td>1,800</td>
<td>1,600</td>
<td>1,400</td>
<td>1,200</td>
</tr>
<tr>
<td>Institutions</td>
<td>2,050</td>
<td>1,800</td>
<td>1,550</td>
<td>1,300</td>
</tr>
<tr>
<td><strong>Total Transaction Cost</strong></td>
<td>3,850</td>
<td>3,400</td>
<td>2,950</td>
<td>2,500</td>
</tr>
</tbody>
</table>

### Development Cost

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Content Development</td>
<td>5,000</td>
<td>5,000</td>
<td>5,000</td>
<td>5,000</td>
</tr>
<tr>
<td>Application Development</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Materials and Resources</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Media and Delivery</td>
<td>970</td>
<td>970</td>
<td>970</td>
<td>970</td>
</tr>
<tr>
<td>Customer Service</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total Development Cost</strong></td>
<td>6,010</td>
<td>6,010</td>
<td>6,010</td>
<td>6,010</td>
</tr>
</tbody>
</table>

### Marketing Cost

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Search Engin Subm. &amp; Optm.</td>
<td>400</td>
<td>400</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td>Search Engine Adverts</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ads on 3rd Party Websites</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>Personalized Letters</td>
<td>1,100</td>
<td>1,100</td>
<td>1,100</td>
<td>1,100</td>
</tr>
<tr>
<td>Fliers</td>
<td>2,000</td>
<td>2,000</td>
<td>2,000</td>
<td>2,000</td>
</tr>
<tr>
<td><strong>Total Marketing Cost</strong></td>
<td>4,000</td>
<td>4,000</td>
<td>4,000</td>
<td>4,000</td>
</tr>
<tr>
<td><strong>TOTAL COST</strong></td>
<td><strong>13,860</strong></td>
<td><strong>13,410</strong></td>
<td><strong>12,960</strong></td>
<td><strong>12,510</strong></td>
</tr>
</tbody>
</table>

### NET INCOME

<table>
<thead>
<tr>
<th></th>
<th>Year-5</th>
<th>Year-4</th>
<th>Year-3</th>
<th>Year-2</th>
<th>Year-1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>$ 83,384</strong></td>
<td><strong>$ 72,465</strong></td>
<td><strong>$ 61,546</strong></td>
<td><strong>$ 50,628</strong></td>
<td><strong>$ 33,153</strong></td>
</tr>
</tbody>
</table>

Table 15 – Projected Income Statement for 5-years as the Matured Phase
Recommend Approach

The recommendation approach is shown below, that under the given resources, optimally builds upon the revenue based on existing resources:

<table>
<thead>
<tr>
<th>Registration Revenue</th>
<th>Year-5</th>
<th>Year-4</th>
<th>Year-3</th>
<th>Year-2</th>
<th>Year-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individuals</td>
<td>32,500</td>
<td>25,000</td>
<td>17,500</td>
<td>10,000</td>
<td>-</td>
</tr>
<tr>
<td>Institutions</td>
<td>23,750</td>
<td>17,500</td>
<td>11,250</td>
<td>5,000</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total Reg. Revenue</strong></td>
<td><strong>56,250</strong></td>
<td><strong>42,500</strong></td>
<td><strong>28,750</strong></td>
<td><strong>15,000</strong></td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Advertisement Revenue</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Ad Revenue</strong></td>
<td>519</td>
<td>388</td>
<td>256</td>
<td>125</td>
<td>31</td>
</tr>
</tbody>
</table>

| **TOTAL REVENUE**     | **56,769** | **42,888** | **29,006** | **15,125** | **31** |

<table>
<thead>
<tr>
<th>Transaction Cost</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Individuals</td>
<td>1,300</td>
<td>1,000</td>
<td>700</td>
<td>400</td>
<td>-</td>
</tr>
<tr>
<td>Institutions</td>
<td>950</td>
<td>700</td>
<td>450</td>
<td>200</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total Transaction Cost</strong></td>
<td><strong>2,250</strong></td>
<td><strong>1,700</strong></td>
<td><strong>1,150</strong></td>
<td><strong>600</strong></td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Development Cost</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Content Development</td>
<td>5,000</td>
<td>5,000</td>
<td>5,000</td>
<td>2,000</td>
<td>1,000</td>
</tr>
<tr>
<td>Application Development</td>
<td>12,000</td>
<td>1,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Materials and Resources</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>80</td>
<td>152</td>
</tr>
<tr>
<td>Media and Delivery</td>
<td>970</td>
<td>970</td>
<td>970</td>
<td>970</td>
<td>-</td>
</tr>
<tr>
<td>Customer Service</td>
<td>-</td>
<td>-</td>
<td>5,800</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total Development Cost</strong></td>
<td><strong>6,010</strong></td>
<td><strong>6,010</strong></td>
<td><strong>11,810</strong></td>
<td><strong>15,050</strong></td>
<td><strong>3,122</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Marketing Cost</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Search Engin Subm. &amp; Optm.</td>
<td>400</td>
<td>400</td>
<td>400</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Search Engine Adverts</td>
<td>756</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ads on 3rd Party Websites</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Personalized Letters</td>
<td>1,100</td>
<td>1,100</td>
<td>1,100</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Fliers</td>
<td>2,000</td>
<td>2,000</td>
<td>2,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total Marketing Cost</strong></td>
<td><strong>4,000</strong></td>
<td><strong>4,000</strong></td>
<td><strong>4,756</strong></td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

| **TOTAL COST**         | **12,260** | **11,710** | **17,716** | **15,650** | **3,122** |

| **NET INCOME**         | **$ 44,509** | **$ 31,178** | **$ 11,290** | **$ (525)** | **$ (3,091)** |

Table 16 – Recommended Plan: 5-year Income Statement

The actual out of pocket expenditures will be less because there will not be any payments required for the resources made available through CWRU, and therefore the Income Statement may look as:
### Cash Flow

The cash flow for the program closely follows the income projection with the model closely reflecting a typical retail business with no credit. The exceptions are the costs of depreciation and media & delivery, which never result into any cash payout. The advance 25% of the cost of application development is paid out in this phase:
The cash situation is projected to turn positive with the maximum cash requirement of $9,000 being paid off by the end of this period (second year):
Once online and offline marketing is included, the user registration and cash generation increase substantially which for some time are consumed by the outsourced customer services and eventually stabilize to a monthly generation of $3,000 in year 4 (months 37 – 48) and to a little over $4,000 during months (49 – 60):
### Matured Phase

<table>
<thead>
<tr>
<th>Month</th>
<th>Month-60</th>
<th>Month-49</th>
<th>Month-48</th>
<th>Month-37</th>
<th>Month-36</th>
<th>Month-25</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BEGINNING CASH BALANCE</strong></td>
<td>105,353</td>
<td>59,044</td>
<td>55,945</td>
<td>21,857</td>
<td>20,415</td>
<td>4,556</td>
</tr>
<tr>
<td><strong>Registration Revenue</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individuals</td>
<td>2,708</td>
<td>2,708</td>
<td>2,083</td>
<td>2,083</td>
<td>1,458</td>
<td>1,458</td>
</tr>
<tr>
<td>Institutions</td>
<td>1,979</td>
<td>1,979</td>
<td>1,458</td>
<td>1,458</td>
<td>938</td>
<td>938</td>
</tr>
<tr>
<td>Total Reg. Revenue</td>
<td>4,688</td>
<td>4,688</td>
<td>3,542</td>
<td>3,542</td>
<td>2,396</td>
<td>2,396</td>
</tr>
<tr>
<td><strong>Advertisement Revenue</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Ad Revenue</td>
<td>43</td>
<td>43</td>
<td>32</td>
<td>32</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td><strong>INFLOW</strong></td>
<td>4,731</td>
<td>4,731</td>
<td>3,574</td>
<td>3,574</td>
<td>2,417</td>
<td>2,417</td>
</tr>
<tr>
<td><strong>AVAILABLE CASH BALANCE</strong></td>
<td>110,084</td>
<td>63,775</td>
<td>59,519</td>
<td>25,430</td>
<td>22,832</td>
<td>6,973</td>
</tr>
<tr>
<td><strong>Transaction Cost</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individuals</td>
<td>(108)</td>
<td>(108)</td>
<td>(83)</td>
<td>(83)</td>
<td>(58)</td>
<td>(58)</td>
</tr>
<tr>
<td>Institutions</td>
<td>(79)</td>
<td>(79)</td>
<td>(58)</td>
<td>(58)</td>
<td>(38)</td>
<td>(38)</td>
</tr>
<tr>
<td>Total Transaction Cost</td>
<td>(188)</td>
<td>(188)</td>
<td>(142)</td>
<td>(142)</td>
<td>(96)</td>
<td>(96)</td>
</tr>
<tr>
<td><strong>Development Cost</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content Development</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Application Development</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Materials and Resources</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Media and Delivery</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Customer Service</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>(483)</td>
<td>(483)</td>
</tr>
<tr>
<td>Total Development Cost</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>(483)</td>
<td>(483)</td>
</tr>
<tr>
<td><strong>Marketing Cost</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Search Engin Subm. &amp; Optm.</td>
<td>(33)</td>
<td>33</td>
<td>(33)</td>
<td>(33)</td>
<td>(33)</td>
<td>(33)</td>
</tr>
<tr>
<td>Search Engine Adverts</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>(63)</td>
<td>(63)</td>
</tr>
<tr>
<td>Personalized Letters</td>
<td>(92)</td>
<td>(92)</td>
<td>(92)</td>
<td>(92)</td>
<td>(92)</td>
<td>(92)</td>
</tr>
<tr>
<td>Fliers</td>
<td>(167)</td>
<td>(167)</td>
<td>(167)</td>
<td>(167)</td>
<td>(167)</td>
<td>(167)</td>
</tr>
<tr>
<td>Total Marketing Cost</td>
<td>(333)</td>
<td>(333)</td>
<td>(333)</td>
<td>(333)</td>
<td>(396)</td>
<td>(396)</td>
</tr>
<tr>
<td><strong>OUTFLOW</strong></td>
<td>(521)</td>
<td>(521)</td>
<td>(475)</td>
<td>(475)</td>
<td>(976)</td>
<td>(976)</td>
</tr>
<tr>
<td><strong>NET CASH FLOW</strong></td>
<td>$ 4,210</td>
<td>$ 4,210</td>
<td>$ 3,099</td>
<td>$ 3,099</td>
<td>$ 1,442</td>
<td>$ 1,442</td>
</tr>
<tr>
<td><strong>TEMPORARY INVESTMENT</strong></td>
<td>-</td>
<td>-</td>
<td>$ -</td>
<td>$ -</td>
<td>$ -</td>
<td>$ -</td>
</tr>
<tr>
<td><strong>ACC TEMPORARY INVESTMENTS</strong></td>
<td>$ -</td>
<td>$ -</td>
<td>$ -</td>
<td>$ -</td>
<td>$ -</td>
<td>$ -</td>
</tr>
<tr>
<td><strong>ENDING CASH BALANCE</strong></td>
<td>$ 109,563</td>
<td>$ 63,254</td>
<td>$ 59,044</td>
<td>$ 24,955</td>
<td>$ 21,857</td>
<td>$ 5,998</td>
</tr>
</tbody>
</table>

Table 20 – Projected Cash Flow for Years 3 to 5 - Recommended Plan

The temporary investments considered in the analysis can be from:

- Professor Brown; in which case, it may be treated as a loan and will need to be returned through periodic small payments or as a lump sum amount as shown above

- University Funds reserved for learning projects and developments (such as the Freedman Award); these may not require to be paid back, reducing the liability
- Overdraft Facility; which will incur bank charges for the period, ranging from $15 to $50 and have been ignored.

Program Assets and the Balance Sheet

Over the period of time, the program acquires the asset base of intellectual content and user accessibility, both of which are difficult to project for their value at this time. For accounting simplicity, the online training platform is treated as having a fixed value in time, which in reality decreases rapidly and may not even have the value once purchased (customized software are important for the first owners and are rarely required in the same form by others). As discussed earlier, the content contributed by Professor Brown is not quantified and therefore not reflected in the balance sheet:

<table>
<thead>
<tr>
<th></th>
<th>Matured Phase</th>
<th>Phase 2</th>
<th>Phase 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year-5</td>
<td>Year-4</td>
<td>Year-3</td>
</tr>
<tr>
<td>Bank Balance</td>
<td>109,563</td>
<td>59,044</td>
<td>21,857</td>
</tr>
<tr>
<td>Prepaid Expenses (Long Term Inv)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Online Training Software</td>
<td>9,000</td>
<td>9,000</td>
<td>9,000</td>
</tr>
<tr>
<td>TOTAL ASSETS</td>
<td>$118,563</td>
<td>$68,044</td>
<td>$30,857</td>
</tr>
<tr>
<td>Loan / Overdraft</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Income</td>
<td>44,509</td>
<td>31,178</td>
<td>11,290</td>
</tr>
<tr>
<td>Equity and Retained Earnings</td>
<td>68,044</td>
<td>30,857</td>
<td>13,556</td>
</tr>
<tr>
<td>CWRU Contribution</td>
<td>6,010</td>
<td>6,010</td>
<td>6,010</td>
</tr>
<tr>
<td>TOTAL LIABILITIES AND EQUITY</td>
<td>$118,563</td>
<td>$68,044</td>
<td>$30,857</td>
</tr>
</tbody>
</table>

Table 21 – Projected Balance Sheet for Years 3 to 5 - Recommended Plan
The physical resources and employee time all belong to CWRU are treated as its contribution towards equity. As discussed in detail under the heading University Project or Independent Venture, this amount may be treated as university contribution for the project and made a part of the general equity or, it may be considered a liability in case future university regulations require a commercial activity to repay all costs borne by the university.

**Measuring the Qualitative Outcome – Benefits to the Student**

As discussed earlier the sample of students exposed to the website during spring 2008 at CWRU used it in addition to the seminar lectures. This needs to be evaluated and measured in detail. A good measure would be the traffic that the current basic version generates through word of mouth during the next 1 year. It is therefore important to take a cautious approach towards further investment (Phase 2) except for the content, in order to see students’ dependence on this resource and its spread through word of mouth. At the same time, it is important to immediately move towards a more professional version once it is clear that students are eager to use this as a resource. A delay towards the next phase will not only cost revenue but also make it difficult to start charging a fee once the program is available without any cost for a long time.

Another aspect of the program that needs to be evaluated periodically is student retention. Although, the program is much different from traditional distance learning courses offered by various institutes around the world, and therefore the retention
ratios traditionally prevalent in such programs may not be a good reference for comparison, it is still worthy to evaluate how it is over a period of time. Simpson (2003) suggests evaluation of retention through analysis of the following four classes of activities: recruitment, retention, retrieval and reclamation.

With the increase in efforts over the development of a website in the next phase, there would be enough tools and a stronger connection with the student that both the above aspects; quality of program for the student and its capacity to make the them stick to it will be better measured and will be important in order to further improve the effectiveness of the program.

**University Project or Independent Venture**

The program currently exists as a small project at CWRU, managed by Professor Brown. Its status is similar to a textbook development project handled by a faculty at CWRU in terms of its intellectual property (IP) rights. The university expects the faculty to acknowledge its support and encouragement without any share of the financial proceeds or ownership.

The project can continue in this form or made into an independent entity on its own. If its taken out of the university and made an independent venture, the following elements will change:
a. The depreciation and media delivery costs included in the above analysis are not payouts but used as a bookkeeping device to identify the expenditures. These will be incurred as lease or rental costs. Although this change will not affect the profitability, but will change the cash flow and realized income.

b. This process will include formation of an independent firm, defining its ownership structure, declaration of directors, and other details. This will incur the cost of registration with the government and may include legal costs.

c. As an independent venture, the project will need to be housed at a separate space. This will increase the costs further by the amount for the costs associated with renting space, utilities, etc.

d. The access to graduate students sharing some part of their time from another project may not be possible, since they have a contract with the university. The cost of hiring an SA (or content developers) part-time will be twice or more. Furthermore this will also limit Prof. Brown’s involvement with the venture, as physical separation will limit the time available to be spend on this project. Furthermore, the university guidelines for faculty involvement in outside commercial activities will need to be reviewed.
In the process of making this an independent venture, the process will include the modalities of technology transfer by licensing of the university/faculty IP. This may include such things as legal documentation, financial charges, equity/revenue sharing considerations and more. This will have some inherent delays associated with the processing of these steps. Even more, this will include additional costs for the venture, such as one-time processing costs, periodic costs for payments to the university, etc.

The above elements add substantially to the costs, time and involvement necessary to make it a workable solution. Based on the revenue and income projections, including the above costs will reduce the residual income substantially and may even make it negative. It may also lose its credibility in the eyes of its users and may retard its growth.

Keeping the above in perspective, the following considerations identify situations when the independent venture will be more beneficial than a university project:

a. Increase in the Registration Fee

As more users get used to the project and it becomes an integral component of student preparation tools, the registration fee can be substantially raised to bring it at in line with what is offered at the commercial coaching centers, discussed in Chapter 2. Although, the program cannot charge comparable to the services offered by a personal
tuition instructor, it can align closely with it based on the portfolio of services and past user satisfaction.

b. Additional Training Programs

The venture has the potential to map its current offering to other subject tests that do not have a framework for training available for students and is in high demand. This will lead to more products, higher revenue and possibly require the involvement of more subject specialists and a greater time from the site administrator. The additional revenue stream will be able to justify the additional costs by sharing the resources and the platform.

c. Limitations from Operating the Platform at CWRU

Another reason can be legal or other such limitations that may restrict the venture from operating at the university. These may arise, for example, with a change in university policy for in-house commercial projects or a change in the government or higher education policies restricting such arrangements.

d. Greater Opportunities for Sales from Independence

Some prospective users may believe that universities should not be charging for training services which lead to profit generation. These entities may not be happy from buying these services if they know that these are available through CWRU. In such a situation, it would be better to somehow make the venture independent of the university.
However, this will only be justified if the additional revenue from independence will be comparable to the additional costs associated with such a move.

**Future Possibilities**

The program not only offers a source of revenue, but also a platform to test ideas and experiment with a structure that is flexible to be taken beyond its focus on a single test. The following serve as the various possible directions current efforts can be taken towards:

1. **Replace seminar course at CWRU and other universities**

   As discussed earlier, one of the aims of this program is to offer it as a hybrid component with the traditional seminar course PHYS 339 at CWRU and if successful, to eventually replace the classroom based course. Not only will this reduce the workload of the faculty responsible for GRE training (currently Professor Brown) but it will also serve as an example to other departments and faculty members that course primarily focused on skills training can be successfully migrated to online programs that can reduce faculty load (after an initial period of adjustment) for other assignments. Belanger and Jordan (2000) term this as a ‘total DL (Distance Learning) conversion’ offering increased customer base, wider access of experts and tools, greater sharing between participants and instructors, reduction in traveling costs.
2. Program Components as Learning Objects

With the growth in tagging multimedia components as learning objects, reusable in multiple training programs, the various resources in the program (video, notes, etc.) can be used for multiple other projects by Professor Brown, the faculty at CWRU or other faculty around the world. This would require these objects to be structured in the standard format and made available to a wider audience. With the quality and effort behind every component, these will serve as high quality content for any physics or related multimedia program, assisting their development substantially.

3. Model for Distance Learning Certification

The program is comprehensive not only in terms of the resources compiled and made available to the student, but also towards understanding and measuring the various elements that are critical for an effective distance learning program. With the increase in the number of online learning opportunities, there will soon be a need for some sort of quality benchmark that verifies that an online offering fulfills the minimum requirement for effective multimedia. This will not be the accreditation of the program or its content, but an approval that the technology deployed has been found appropriate and effective for distance learning and is in line with the content and objectives of the program.
4. Buy-out Offer to ETS

A financially based but important option upon program’s success is to offer it to ETS as a training component for its users registering for the GRE Physics exam. The value that ETS pays may depend upon the success of the program and how it fits into its overall mission. Powerprep® software offered to the students registering for the general GRE (for free) is one example of how this program can fit into ETS’s offering.

5. Extension of model to other subject tests

With the success of the concept, the same structure can be replicated on the website to offer any subject test guided study program, such as for mathematics or biology, which is in high demand and few resources for students to prepare from. This will be easy, although requiring subject specialists, but also quickly in penetrating into the market using existing institutions as distribution channels.

Another avenue could be preparing for the physics section of standardized tests such as MCAT. Although the preparation required in physics for MCAT is not as intensive as the GRE physics exam,58 it has a greater revenue generation potential; almost 70,000 students take MCAT every year which is required by all medical schools in the US and a number of them in Canada.59 This market is however highly competitive because of the large number of students preparing for the exam, higher amount spent per student for preparatory training, comparatively low level of expertise required to develop and train

students and the length of time since this test has been available. As an example, MCAT coaching is one of the leading products offered by Kaplan and its revenue for 2006 was $1.7 billion.\textsuperscript{60}

6. Post Purchase (After Sales) Services

One the ventures is successful, more products and services can be as additional revenue streams. With the data of students accumulating every year, much focused products can be offered to them, which may include but not limited to the following:

a. Graduate School Short-listing Help: assisting individuals to refine their aims and match with available research choices at various universities\textsuperscript{61}

b. Graduate School Application Assistance: help on writing a good essay\textsuperscript{62}, research proposal, resume, etc.

c. Career counseling service: specially useful to students who don’t score well in the exam and need someone to make them think through their options\textsuperscript{63}

d. Student Laptop: advice and tips for students to identify what kind of laptop configuration they should look into when they are headed for the graduate school

e. Student Mentorship: link students admitted to a university in another country to the students already there who are interested in acting as mentors.


\textsuperscript{61} A closely related example is: www.gradschoolshopper.com

\textsuperscript{62} Example include: www.admissionsessays.com/graduate_school.html (accessed on August 14, 2008)

\textsuperscript{63} Example include: www.careerplanner.com (accessed August 14, 2008)
RISKS AND LIMITATIONS

As with every venture, there are risks and limitations for the program. These include:

Remodeling of the Exam by ETS

The program focuses on the samples and approach that has been found effective over the years. It is structured on the topics currently included in the exam. It may not be possible to drastically change the content or methodology of the exam that makes the training program completely inadequate. However, some revisions and therefore additional costs may be involved is bringing it up-to-date that have not been considered in the financial projections. Furthermore, any changes in the exam will take a few years of teaching and discussion with students to identify the pattern more effective to that approach.

Registration Fee being Too High

The fee may be affordable to some but others may find it very high, especially in countries where the per capita income is significantly smaller than the US. Even though they may be interested in the program, they may not be interested in registration.

Compromise of Website Security

There will always be some people interested in exploring the loopholes in site security. With the minimum resources utilized by the program, it is possible that some students
may be able to get through and distribute the fake logins and passwords. Although this can be taken care of by disabling these accounts, if students are able to convert the video streams into downloadable video and duplicate the available documents into an easily transferable document, the only choice left would be to drastically update the site with new content. Even then, a lot of students would be happy with the freely available content instead of paying for $50 for content that is new but can only be viewed online.

**Online Training Inappropriate for the Preparation of GRE Physics**

Although online training is becoming popular and some academic areas have several websites dedicated to online training (as discussed earlier), there may be a lot of students who feel more comfortable using one media (paper) instead of two (computer screen and paper) when working through problems. Although increased proficiency in using computers is making it easier for students to integrate both, students may still find it takes some focus and energy away.

**Change in Competition**

Currently, there is no direct competition for the approach and content available with the program. However, once it is widely available there will be a lot of individuals and organizations that will adapt and modify the approach and deliver a program that may be better marketed and more customized. Although both of these things require extensive efforts, they also offer higher payoffs. For the organization that already has resources dedicated to development and hosting, it may not be as cost intensive as
someone hiring a contract staff for the purpose. The financial projections do not include the presence of a strong competitor in the future.
CONCLUSION

The document highlights the various components required for the development and launch of an online GRE physics guided study program, in the light of research on online education and marketing. It further builds on the experience of Professor Brown from teaching the seminar-based GRE physics for several years and the recent experiment with a hybrid program including online video lectures at CWRU, in addition to utilizing the materials that he has developed over this time.

The students benefit from the program by making use of a rich set of training resources and a platform for community interaction that offers a diverse set of tools and information that simplify the steps necessary for a better score in the exam. These resources cost the students the average of the prices of texts currently available, which offer significantly less value compared to the program.

The venture will be profitable through advertisements, registration fees, and possibly many other products sold to its users based on its training and coaching expertise. The program offers an effective approach towards the development of new teaching and training models and the framework for certifying successful training practices.

If, for some reason, the venture fails to generate sufficient revenue, the investment can be capitalized by making the registration free for all students. This will on one hand
fulfill the university’s mission to “strengthen its impact in education”\textsuperscript{64} and on the other, make a great source of learning for online training programs which have the potential to develop into future educational systems. As found by Mood (1995), most of those involved with correspondence education in the beginning were entrepreneurs, whose success and determination brought in organized educational efforts. Standing at the dawn of further advancements in online education, the current program is in a great position to impact its future.

\textsuperscript{64} http://www.case.edu/about/mission.html (accessed August 14, 2008)
APPENDIX A

Format and details of GRE Physics Test, available at ETS® GRE® Website

- The test consists of approximately 100 five-choice questions, some of which are grouped in sets and based on such materials as diagrams, graphs, experimental data, and descriptions of physical situations.

- The aim of the test is to determine the extent of the examinees' grasp of fundamental principles and their ability to apply these principles in the solution of problems.

- Most test questions can be answered on the basis of a mastery of the first three years of undergraduate physics.

- The International System (SI) of units is used predominantly in the test. A table of information representing various physical constants and a few conversion factors among SI units is presented in the test book.

- The approximate percentages of the test on the major content topics have been set by the committee of examiners, with input from a nationwide survey of undergraduate physics curricula. The percentages reflect the committee's determination of the relative emphasis placed on each topic in a typical undergraduate program. These percentages are given below along with the major subtopics included in each content category. In each category, the subtopics are listed roughly in order of decreasing importance for inclusion in the test.

- Nearly all the questions in the test will relate to material in this listing; however, there may be occasional questions on other topics not explicitly listed here.

---

65 ETS GRE website: [http://www.ets.org/portal/site/ets/menuitem.1488512ecfd5b8849a77b13bc3921509/?vgnextoid=ef952d3631df4010VgnVCM10000022f95190RCRD&vgnextchannel=6ef946f1674f4010VgnVCM10000022f95190RCRD](http://www.ets.org/portal/site/ets/menuitem.1488512ecfd5b8849a77b13bc3921509/?vgnextoid=ef952d3631df4010VgnVCM10000022f95190RCRD&vgnextchannel=6ef946f1674f4010VgnVCM10000022f95190RCRD) – accessed June 9, 2008
1. CLASSICAL MECHANICS: 20%
(such as kinematics, Newton's laws, work and energy, oscillatory motion, rotational motion about a fixed axis, dynamics of systems of particles, central forces and celestial mechanics, three-dimensional particle dynamics, Lagrangian and Hamiltonian formalism, noninertial reference frames, elementary topics in fluid dynamics)

2. ELECTROMAGNETISM: 18%
(such as electrostatics, currents and DC circuits, magnetic fields in free space, Lorentz force, induction, Maxwell's equations and their applications, electromagnetic waves, AC circuits, magnetic and electric fields in matter)

3. OPTICS AND WAVE PHENOMENA: 9%
(such as wave properties, superposition, interference, diffraction, geometrical optics, polarization, Doppler effect)

4. THERMODYNAMICS AND STATISTICAL MECHANICS: 10%
(such as the laws of thermodynamics, thermodynamic processes, equations of state, ideal gases, kinetic theory, ensembles, statistical concepts and calculation of thermodynamic quantities, thermal expansion and heat transfer)

5. QUANTUM MECHANICS: 12%
(such as fundamental concepts, solutions of the Schrödinger equation (including square wells, harmonic oscillators, and hydrogenic atoms), spin, angular momentum, wave function symmetry, elementary perturbation theory)

6. ATOMIC PHYSICS: 10%
(such as properties of electrons, Bohr model, energy quantization, atomic structure, atomic spectra, selection rules, black-body radiation, x-rays, atoms in electric and magnetic fields)

7. SPECIAL RELATIVITY: 6%
(such as introductory concepts, time dilation, length contraction, simultaneity, energy and momentum, four-vectors and Lorentz transformation, velocity addition)

8. LABORATORY METHODS: 6%

(such as data and error analysis, electronics, instrumentation, radiation detection, counting statistics, interaction of charged particles with matter, lasers and optical interferometers, dimensional analysis, fundamental applications of probability and statistics)

9. SPECIALIZED TOPICS: 9%

Nuclear and Particle physics (e.g., nuclear properties, radioactive decay, fission and fusion, reactions, fundamental properties of elementary particles), Condensed Matter (e.g., crystal structure, x-ray diffraction, thermal properties, electron theory of metals, semiconductors, superconductors), Miscellaneous (e.g., astrophysics, mathematical methods, computer applications)

Those taking the test should be familiar with certain mathematical methods and their applications in physics. Such mathematical methods include single and multivariate calculus, coordinate systems (rectangular, cylindrical, and spherical), vector algebra and vector differential operators, Fourier series, partial differential equations, boundary value problems, matrices and determinants, and functions of complex variables. These methods may appear in the test in the context of various content categories as well as occasional questions concerning only mathematics in the specialized topics category above.
# APPENDIX B

Data on video lecture access for Hybrid version of PHYS 339 during Jan – May 2008

<table>
<thead>
<tr>
<th>User</th>
<th>Logins</th>
<th>Page Hits</th>
<th>E.T.S (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15</td>
<td>40</td>
<td>138.9</td>
</tr>
<tr>
<td>2</td>
<td>16</td>
<td>79</td>
<td>7.9</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>55</td>
<td>425.8</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>5</td>
<td>0.1</td>
</tr>
<tr>
<td>5</td>
<td>10</td>
<td>71</td>
<td>113.4</td>
</tr>
<tr>
<td>6</td>
<td>13</td>
<td>83</td>
<td>66.7</td>
</tr>
<tr>
<td>7</td>
<td>16</td>
<td>101</td>
<td>45.7</td>
</tr>
<tr>
<td>8</td>
<td>3</td>
<td>12</td>
<td>0.2</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>5</td>
<td>8.7</td>
</tr>
<tr>
<td>10</td>
<td>3</td>
<td>24</td>
<td>19</td>
</tr>
<tr>
<td>11</td>
<td>4</td>
<td>11</td>
<td>34.7</td>
</tr>
<tr>
<td>12</td>
<td>2</td>
<td>18</td>
<td>13.7</td>
</tr>
<tr>
<td>13</td>
<td>2</td>
<td>7</td>
<td>0.3</td>
</tr>
<tr>
<td>14</td>
<td>15</td>
<td>141</td>
<td>383.3</td>
</tr>
<tr>
<td>15</td>
<td>1</td>
<td>3</td>
<td>0.2</td>
</tr>
<tr>
<td>16</td>
<td>6</td>
<td>40</td>
<td>33.1</td>
</tr>
<tr>
<td>17</td>
<td>2</td>
<td>22</td>
<td>360</td>
</tr>
<tr>
<td>18</td>
<td>29</td>
<td>143</td>
<td>24.7</td>
</tr>
<tr>
<td>19</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

1,676.3

Video Access Information

- **Total Requests:** 702
- **Total Disk Usage:** 7.384 GB
- **On Campus Requests:** 618
- **Off Campus Requests:** 75
- **Flash Requests:** 162
- **Quicktime Requests:** 3
- **Real Media Requests:** 0
- **Windows Media Requests:** 528


Dalton, J., “Online Training Needs a New Course”, Forrester Research, Massachusetts, August 2000


Guri-Rosenblit, S., “‘Distance education’ and ‘e-learning’: Not the same thing”, Higher Education 49, 2005, 467–493


