

# Incorporating Entrepreneurship Topic into a Mobile Computing Program

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**Abstract**— Mobile learning represents exciting new frontiers in education and pedagogy. Webster University has recently started offering courses for Mobile Computing. The designed curriculum focuses on practical experiences, which includes designing, creating, and testing mobile applications on mobile devices. In this paper, we report the curriculum designs, teaching strategies and tools applied; Major feedback also showed students were able to learn programming skills necessary to become more proficient in developing mobile applications.

## 1. Introduction

Mobile computing has been one of the fastest growing segments of the IT industry and will continue to have a significant impact on how people interact with information and perform their daily activities. A simple search on job recruiting website showed a dramatic increased demand in employment in mobile app development, mobile architecture, mobile design, or other mobile technology related field. A demand of education in mobile technology area has never been higher.

The Department of Computer Science at Webster University has recently started to offer a new B.S. degree in Mobile Computing. Students in our Mobile Computing major focus on applying their technical skills to design, create, and test mobile applications. They will learn skills to be qualified to analyze, design, implement and test mobile applications as well as develop the required skills to maintain and update existing mobile applications.

The unique mobile computing program in Webster University was evaluating existing standard curriculum in an appraisal of the careers on which young programmers embark, and the ways in which both they, and the companies which employ them, wish to develop their capabilities. In the main, findings from the evaluation indicated that students were graduating with a traditional software programming based theoretical degree, which reduced their flexibility to work in different areas of the organization. This resulted in the program approaching the department of management to design a module for their students, which would encourage lateral thinking and the development of initiative. Other reasons,

perhaps more fundamental, included the development of skills and knowledge base, to create improved job opportunities, and allow individuals with ideas to transfer them into viable projects, an emphasis on creating market compatible apps.

Clearly, integrating this wide range of aspects and topics in a subject on entrepreneurship for computer science students requires contributions from several disciplines: engineering, computer science sciences, management sciences, marketing knowledge and communications. Entrepreneurship is not new, and during the past number of years it has gained increased interest and research. This increased interest has emerged for a number of reasons, namely the recognition of the contribution of the small firm sector to economic development and job creation. Much of the economy's, ability to innovate, diversify, and create new jobs comes from the small business sector.

Entrepreneurship education has been intensified in universities during the past four decades. In recent years fostering entrepreneurship has become a topic of highest priority in collegiate education. Entrepreneurship, development of personal skills, social and economical aspects of computer technology are of increasing concern for programmers and therefore also for computer and mobile computing education.

This paper will discuss some initial effort of course development, assessment, lessons learned in incorporating entrepreneurship content to the mobile computing program. Detailed data and future work will be provided.

## 2. Background

Mobility's potential in recruitment is strong. Technology companies are aggressively bolstering their mobile services, with businesses generating 466,000 new jobs in mobile application development since 2007.[1] Mobility has also infiltrated career fairs and is a major focus of recruiters [2]. Mobile learning represents exciting new frontiers in education and pedagogy. Although the mobile systems market is large and the career opportunities for students are excellent, relatively few universities offer mobile computing courses, much less teach mobile systems programming.[3]

The following are the most commonly cited objectives of entrepreneurship education and training programs:

- to acquire knowledge germane to entrepreneurship;
- to acquire skills in the use of techniques, in the analysis of business situations, and in the synthesis of action plans;
- to identify and stimulate entrepreneurial drive, talent and skills;
- to undo the risk-adverse bias of many analytical techniques;
- to develop empathy and support for all unique aspects of entrepreneurship;
- to devise attitudes towards change;
- to encourage new start-ups and other entrepreneurial ventures. [4]

Analysis suggests that a policy aimed at encouraging science-based entrepreneurship should focus on strengthening individual incentives for human capital investment and entrepreneurial behavior both within universities and in business. Key policy areas include attractive tax rates on entrepreneurial income, a tax structure that is not overly progressive, reasonably deregulated labor markets, and a university system characterized by decentralization and competition [5].

Entrepreneurship education has been intensified in universities during the past four decades. In recent years fostering entrepreneurship has become a topic of highest priority in public policy. This trend is due to the widespread recognition that business start-ups are a driving force of economic growth and significant job creation [6]

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One of the implications of the shift towards business units is that unit management requires a larger involvement of more people in running a company and a shift from top-down in the direction of bottom-up. Engineers and scientists could no longer focus only on engineering activities, but also have to deal with 'make or buy' decisions, marketing, finance, and managerial affairs. This calls for other skills in addition to the regular engineering skills.

Nowadays, science-based entrepreneurship looms large in the public policy arena. This is quite natural given the recent 'scientification' of technology; in particular, the most rapidly growing and wealth-creating industries such as biotechnology, computers and telecommunications are progressively more science based. But why does such entrepreneurship flourish in some countries, especially the United States, while there seems to be so much less of it in other countries? The purpose of this paper is to attempt to identify some key institutional factors that are crucial determinants of science-based entrepreneurship. Particular

attention will be paid to one important subset of science-based entrepreneurship, namely, academic entrepreneurship. This involves the variety of ways in which academics go beyond the production of potentially useful knowledge and take some sort of leadership role in ensuring successful commercialization.

The first strategic choice facing an individual takes place in high school when the young individual decides whether to enter the labor market or to proceed to the university. Given that the individual enrolls at the university, there is a choice between science and technology-based disciplines and other areas, notably the social sciences. At the point of graduation the natural science graduate can again choose between employment and graduate studies with the aim of getting a Ph. D.

Keeping in mind that we focus on the emergence of science-based entrepreneurial ventures such ventures are highly dependent on academically trained and motivated individuals. When talking about academic entrepreneurship, one primarily thinks about university faculty taking an active entrepreneurial and ownership role in these ventures. However, focusing exclusively on this connection is not justified. In addition to university faculty, there are several other important sources for recruiting people to science-based entrepreneurship: From the pool of individuals with either a graduate or an undergraduate exam, and from individuals with that educational background working in other firms.

The study illustrated that entrepreneurship programs are a source of trigger-events, which inspire students (arouse emotions and change mindsets). Inspiration is the program-derived benefit that raises entrepreneurial attitudes and intentions. The insignificant relationship between intention and nascence at the end of the program could be attributed to the well-documented time lag between entrepreneurial intention and behavior, especially concerning undergraduates. [7]

New interdisciplinary programs use faculty teams to develop programs for the nonbusiness students, and there is a growing trend in courses specifically designed for art, engineering, and science students. In addition to courses focused on preparing future entrepreneurs, instructional methodologies are being developed for those who manage entrepreneurs in organizations; potential resource people (accountants, lawyers, and consultants) used by entrepreneurs; and top managers who provide vision and leadership for corporations that must innovate in order to survive [8].

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progressive, reasonably deregulated labor markets, and a university system characterized by decentralization and competition [5].

Entrepreneurship education and training programs are frequently of very short duration compared to other educational programs concerned with helping people embark on a major career. Some researchers, such as Gibb[17], Sym and Lewis[18] and Curran and Stanworth[7], have found that most small business entrepreneurship programs last as little as a few days, though a few extend over longer periods.

Globalization has given rise to design-produce-service engines with electronically linked elements located across the globe. These virtual entities provide the capacity to produce a wide range of products and services at high quality levels and low costs, but rely heavily on a high volume and steady flow of innovative new concepts to feed the front end of these engines. [9]

### 3. Program Framework

The program was initially designed for students who want to pursue a degree in mobile computing, mobile app designs, or mobile development. The program was technical based.

#### 3.1 Program learning outcome

After a careful review of some fundamental requirements of a traditional computer science and information technology program, and proposed the following learning outcomes for our unique mobile computing program:

1. Demonstrate critical thinking skills in the field of computer science.
2. Demonstrate the ability to solve problems related to the program content.
3. Demonstrate an understanding of the concepts and principles of software systems.
4. Analyze, design and document a system component using appropriate computer science techniques and models.
5. Make a formal presentation of a software system project including the demonstration of a working application.
6. Demonstrate an in-depth knowledge of advanced mobile computing and development techniques.

The program was proposed in early 2012, and approved later that year. Three introductory to mobile courses in various levels were offered in the first semester (Fall 2012). Program reviews and feedback collected showed students were able to acquire technical aspects of mobile computing. However, some constructive feedbacks were:

- Many students mentioned they need guidance in terms of mobile marketing

- Some needed specific industrial examples of how to market/advertise mobile apps
- More students are interested in the possibilities of working for a mobile app development company. Some even mentioned they want to lead a group of developers.

After a careful review of all comments and the existing courses contents, we made an initial effort of incorporating entrepreneurship content to an existing introduction to mobile computing course. Our effort is supported by the Coleman Fellowship Program, which intend to help university professors to advance entrepreneurship education across campuses.

This pilot course is offered to undergraduate students. The targeted audiences were mostly mobile computing or computer science major; but soon it attracted a wider range of students with different background. Currently the course is offered in an eight-week format as an elective to all students with different background. Enrollment is approximately 15-18 each session. The course not only focuses on teaching students fundamentals of mobile computing techniques, but also has topics on mobile market and mobile entrepreneurship.

Specifically, the course aims to:

1. Identify opportunities that exist in the mobile technology marketplace
2. Demonstrate the tools available to build mobile applications
3. Discover and utilize existing development environments for mobile technology
4. Explain the marketplace for the leading mobile devices
5. Develop a plan of action to start a mobile technology business.

#### 3.2 Course content

In the beginning, the course focuses primarily on mobile technology and computer software programming skills. Students with less computing and mathematics background mentioned they have a difficult time connecting technology terms with market; while students in technology related field asked if there is a professional in the business field who can offer them more guidance in the app market.

Each semester, the course begins with an introductory module creating awareness and understanding of entrepreneurship. It provides the very necessary theory which assist as in the successful development of a new business. This class consists of non-business students, which allows the instructors to customize the module to meet the students' specific needs in terms of prior knowledge and exposure to entrepreneurship.

The second module consists of action learning, where students apply in a very practical basis the knowledge that they have learned in module one. During the module, students develop ideas and project plans. This generates valuable learning experience for all students, as it provides them with an insight into how the various functional areas of a business procedure would benefit their software development processes. A new topic on mobile computing will be introduced in each week. Mobile marketing will be introduced briefly during the first lecture session. Topics include but not limited to: mobile platforms and targeted market, mobile app deployment, mobile developer’s initial costs. Invited lecture on mobile entrepreneurship takes place during the seventh week. The lecture consists of introduction, discussions, and students’ questions. To keep the students abreast with the progress of the lectures, they are urged to discuss their application of the topic at the next lecture.

During the eight weeks of the course, the students met for a nominal four hours of instruction per week during a regularly scheduled class meeting time. In addition to using this time to convey logistic information, the instructors of the course also sought to introduce some of the important background material. These meetings will be described below.

Lectures were delivered to the class on the following topics:  
 \_Financial Reporting and Accounting—Lectures offered by a course instructor as well as by a guest instructor from either Webster University faculty or local companies.

- New mobile product development—Founder/CTO of a local mobile computing start-up company.
- Factors in developing mobile applications, Development strategies—Course faculty.
- Mobile business models—Entrepreneur, professor of entrepreneurship, Webster University Faculty.
- Mobile web and Mobile applications—Course faculty
- Mobile information architecture, Communications via network and the web —Course faculty.
- Device testing—Course faculty
- Future of mobile—Mobile market and Mobile technology Entrepreneurial Plan--Local entrepreneurs, course faculty

An example of a week of teaching plan is shown below:

<b>Week 7</b>	Topics: <ul style="list-style-type: none"> <li>• Putting It All Together</li> <li>• Future of mobile</li> <li>• Mobile market</li> <li>• Mobile technology Entrepreneurial Plan</li> </ul> <p style="text-align: center;">Quiz Assignment</p>
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### 3.3 Course assessment

Students clearly showed tremendous interests in entrepreneurship topics. Questions and discussions carried out during and after the invited guest lectures. Module assessment is conducted based on students’ assignment, in class discussion and projects. With a few rare exceptions, majority of the students were able to complete both a satisfactory project and a set of assignment within a week. More than half of the students showed interests in taking additional business and entrepreneurship courses in the future. A few inquired about possibilities of deploying their in-class project as an app to the market.

Weekly assignments are project based. Students are required to complete a term project during an eight-week term. After the seventh week’s lecture on mobile entrepreneurship, students will be asked to submit a short report on how entrepreneurship topics affect their project design and deployment. A paragraph of a sample assignment is shown below:

A paragraph of a sample assignment from the first week is shown below:

**Your Task 2: (10 pts)**

Think about the project(s) you’ve done, and think about the topics we discussed in class today. How would you improve your project in terms of marketing and entrepreneurship? Please using the terminologies discussed in class. Please write your answer in 500 words.

### Your Task 3: (30 pts)

Think about a project(s) you plan to do for this semester. Identify the following in a few words:

1. Your potential customer.
2. A short description of your app
  - a. Draw a basic interface design
  - b. Describe your app's basic functions
  - c. Name five other similar existing apps
  - d. How does your app differ from the existing apps
3. Predict the price of your app
4. Where would you deploy your app?
5. Name some possible external resources needed for your project. Include but not limited to: the development platforms, number of hours you plan to spend.

Next to the project results (business plans and presentations), it is interesting to focus on the learning results of the students. Clearly, different kinds of learning results can be expected.

All past participants of the course have felt that the integration of the computer science and non-computer science students into a business team is an essential part of the learning experience for both parts of the group. It is not the case that the computer science students carry all of the technical aspects and the non-computer science students the business side of the projects; there is significant crossover in both directions.

We believe, in a long term, this work will advance the understanding of engaging students into new degree programs, in order to prepare students for today's rapidly growing and changing computer technological jobs. The teaching materials and methodologies developed will help improve the students' problem solving skills. The project and the research will generate data and materials that can be beneficial to other universities with a similar degree program.

There were also some practical considerations. One such consideration was that offering a large number of lectures on the subject would take more space in the curriculum than was available. Furthermore, the existing internship in a computer software company was primarily devoted to doing research for the company. Past practice had shown that describing and analyzing the organization would, in general, come down to copying existing organization schemes without any reflection.

In general, students consider it more difficult than expected due to, for instance, the economic viewpoint and the

multidisciplinary nature, but they have accepted the subject and learned to deal with it. The course modules as well as the mobile computing education were new to all departments of the university; a number of issues arose which affected the implementation of the teaching materials and methods. The main issues related to the non-computer science students having difficulties in adjusting to the less numeric and less precise descriptive subject areas. Lack of resources and facilities caused problems at the early stages as they curtailed student progression with projects.

## 4 Conclusion

The program is still under refinement, in the near future, we hope to address all issues sequentially therefore carry out a more successful program. In the near future, we hope to incorporate the content of entrepreneurship to the entire program of mobile computing. More specifically, we hope this effort can benefit fellow educators in the field of computer science.

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