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# App Development and Store Publication as a Way to Attract and Retain Students Majoring in Technology Disciplines

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## Abstract

A large survey Management Information Systems course required of all business major included a project where students designed, developed and published (in a real online store) one or more mobile apps using no-code tools. Extra credit was offered for publishing multiple apps, improving/updating the published apps, and several other activities relating to the online store community. Student attitudes about technology majors before and after the project were measured. Results indicate that the real-world nature of the project and online store community interaction resulted in high satisfaction with the project and positively changed perceptions and intent to pursue technology career paths in more than twenty-five percent of the participants.

**Keywords:** App Development, Mobile, Enrollment, Peer Learning, Learning Communities

## 1. INTRODUCTION

Most survey business courses such as accounting, management, and human resources give students experiences that accurately depict processes, tools, skills and activities relating to the discipline. These courses are useful in helping students choose careers that align with their interests and aptitudes. Survey Management Information Systems (MIS) courses unfortunately focus primarily on teaching content that complements other career paths, and do not provide much, if any, interesting insight into Computer Information Systems (CIS) careers.

We have been piloting the use of a mobile app development project in survey MIS courses that all business majors are required to take. In these projects students develop real apps that are published into online stores. Students learn concepts of app marketing and design, and use a browser-based tool that does not require programming knowledge. Students are encouraged to help each other with the "how-to" aspects of the project which increases enjoyment and ultimate success.

App development has shown to be very appealing to a broad spectrum of students, particularly women. Many students express

increased interest in pursuing CIS as a major or minor after completing the project. Using a combination of quantitative and qualitative measures, we show that app development is effective in teaching important business skills and influencing them to consider CIS as a major or minor.

## 2. MOTIVATION

Survey MIS courses are typically a required course in undergraduate business majors. The students enrolled in these courses learn concepts of office automation and enterprise computing. Key skill components are Microsoft Excel and Access, which are prerequisites for subsequent business courses. Other projects may include designing a simple web page or a short paper on an emerging technology trend.

Our experience over the course of many years has been that this course does little to attract students to CIS as a career or retain those that were pursuing the major. The recent availability of no-code app development tools has created an opportunity for students without programming knowledge to make simple, but high quality apps.

Building and publishing an app gives students real-world experience in most of the software development processes within the scope of a single project requiring approximately ten to twenty homework hours for most students to complete. Students find the context of a consumer-focused project much more understandable than enterprise concepts. In addition, the marketing aspects of the project give students a way to apply a broad-range of business skills in a real-world scenario where they are able to get feedback from both the store vetting processes and consumers who use the app store.

Since their experience is "real", it provides successful students with a significant experience to put on their resume which is an important differentiator with recruiters. More importantly, students are able to experience a number of dimensions of software development including design, art, testing, development, iteration, publishing and marketing. When experienced in a live, integrative experience students learn that software development can be engaging, fulfilling, important and impactful; personally, professionally, and even societally. Experiences like this change student perceptions of technology careers and influence a significant

number of them to consider changing or augmenting their college majors.

## 3. PRIOR RESEARCH

The belief that computer programming and the creation of technology artifacts should not be the sole domain of a few with arcane skills and training has been shared by educators for decades (Papert, 1980). In practice however, attempts to bring programming to the masses has tended to refute this belief; with male "nerds" and "geeks" being stereotypes for a special class of individuals with high intelligence but lacking social skills; an unfortunate-but-necessary trade-off required to be successful in programming.

While early efforts to teach programming to elementary school children were enthusiastically and broadly received (Papert, 1980), today most computer literacy efforts focus on the computer as a facilitator to accomplishing other tasks such as writing papers or producing presentations and multi-media. Papert (1980) describes three reasons why early interest in wide-spread programming education has waned: early programming languages were difficult to use and learn, programming activities were focused on logic and algorithm creation rather than subjects that broad populations of students were interested in, and programming was often introduced in contexts where there was little help if things went wrong or to encourage deeper exploration when things went right.

In higher education, computer science (CS) courses for non-majors frequently feature traditional languages such as Java or C++ but with less depth or complexity. These courses have proven to be unsuccessful in meeting the needs of a majority of students enrolled in them (Guzdial, 2003). Goldweber et al. (2013) identified that traditional CS projects seem to focus on trite or childish themes or problems and result in many students leaving the CS major to do things that seem to them to be more important and impactful (i.e., "that have the power to do good and make a difference").

In recent years attempts to create programming environments that are exciting and entertaining to larger student audiences have seen some success (Resnick et al., 2009). However, even though students find these tools and courses that use them fun and fulfilling, they continue to fail in convincing most students to seriously consider technology majors and careers (Davies,

2008). The programming environments are not felt to require or lead to career-level skills or represent important work or what “real programmers” do.

A new paradigm is emerging now that adds a social dimension to technology creation. Through online communities of developers, young people are finding an additional social “hook” to encourage continued programming skill development and career momentum (Monroy-Hernandez & Resnick, 2008). Monroy-Hernandez et al. (2008) suggest these communities have four types of member roles: passive consumer, active consumer, passive producer, and active producer. In this study, we identify the retail mobile device “app store” as such a community and identify parallel member roles such as the passive consumer, active consumer, and active producer. In fact, we posit that the retail app store provides app developers with similar levels of engagement, feedback and personal satisfaction as the developer-focused communities such as Scratch Online Community or App Inventor communities (Honig, 2013). Kulkarni et al. (2013) describes the “design studio” where public visibility provides a richer, more nuanced feedback and learning both from self and peer’s work. This type of feedback has proven to be valuable in courses where each student is required to create a unique product and where a highly structured grading rubric is too coarse to assess quality. Similarly, Christudason (2003) found that “Research indicates that peer learning activities typically result in: (a) team-building spirit and more supportive relationships; (b) greater psychological well-being, social competence, communication skills and self-esteem; and (c) higher achievement and greater productivity in terms of enhanced learning outcomes.”

Lave & Wenger (1991) suggest that learning is fundamentally a social process, and learners start at the periphery and move towards closer relationships to practitioners as their skills improve. We concur and posit that a public “app store” provides much of the same source of nuanced feedback to its contributing developers, including student developers. Stokes (2013) suggests that failure is an essential part of learning, and that app stores provide a real medium where failure is normal and expected (due to the many rules and tests), a place where errors are accurately and quickly identified in a non-partisan manner (“failing fast”), and are just as quickly remedied, providing a rich learning environment for students.

#### **4. COURSE DESCRIPTION**

The course that was the subject of this study is offered at a large state college with a wide range of demographics and student preparation. The course teaching app development is a required, ten-week 300-level course typically taken by students with sophomore and junior standing. Fall enrollments may be as high as 450 students with Winter/Spring enrollments slightly lower. The course is taught in a large lecture-hall setting with up to 75 students per class. Class periods are 110 minutes twice per week and tend to focus on textbook content.

The CIS department does not have a dedicated lab, and public labs do not have the software typically used for app development. Most students have access to personal computing devices, of which approximately 60 percent are PC’s and 40 percent Apple/Mac products. The college has eight business concentrations, of which Computer Information Systems is one of the smaller concentrations. A variety of popular textbooks have been used over the years and the textbook currently being used is widely known.

#### **5. THE MOBILE APP DEVELOPMENT MODULE**

The app development project was taught as a formal one-week module within the course with additional time outside of class for students to complete their projects, pass store submission processes, make revisions and get customer feedback. Two lectures complement the hands-on app development project. One lecture demonstrates how to make an app along with app marketing and store strategy. In addition to the formal classes, special proctored “lab hours” are offered where students can work on their apps with help readily available. The live presentations were supplemented with a set of detailed “how to” videos covering every aspect of app development and submission. Most students took advantage of the videos or asked colleagues in class for help rather than coming to the office hours and labs.

For the hands-on project, students used browser-based tools to create a basic app with either custom content they provided (pictures or text) or they curated real time data feeds from blogs, web-searches, YouTube, Flickr, Pinterest, Facebook, and Twitter. Students used photo-editing tools to create icons, backgrounds, logos, and marketplace images. Students had to create a publisher account in the store and write the marketplace description of their app applying

the strategies and techniques covered in the marketing and store strategy lectures.

Completed apps were submitted to the store and had to pass the store certification requirements. If the app failed certification, students had to correct the issues and resubmit. At its simplest, students could make an app in under an hour. Creating the art assets for their marketplace and writing the description took at least another hour. We observed that many students got caught up in the project and spent more than the minimum amount time fine-tuning images and their description. On average, students spent about six hours, but that average had a pretty broad curve.

Successfully certifying an app in the store was required to get full credit for project, and they had approximately ten days to complete the assignment. They could earn extra credit up to an amount equal to the original assignment for completing a number of follow-on tasks such as upgrading their app and having the second release certified, making a second app either in the same store or publishing the same app into a different store, getting a certain number of downloads, or earning a certain amount of money. Many students who missed the deadline for the first app took advantage of the extra credit in order to protect their grades and a few had enough interest that they completed some or even all of the extra credit activities even though they didn't need it. At the conclusion of the project students were given the option of presenting their apps to the class, including their store analytics. This presentation session added yet another dimension of realism to the project as students discussed download trends, countries and age demographics of their users, and even their marketing strategies.

For this project we used Microsoft's phone store and Windows app store since they provide students free developer accounts, and our campus has local reps that helped with technical issues in real time while the project was being formally completed. Microsoft has an easy-but-powerful app development tool (App Studio) that does not require programming knowledge, which worked well for the project. The local Microsoft rep was able to contact the team who developed the tool, making problem-solving more likely than other platforms that did not engage on campus locally.

## 6. RESEARCH METHODOLOGY

The data for this research was obtained through anonymous surveys given to students via the Blackboard Learning Management System and offered as part of the project workflow in one MIS course with 71 students. Participation in the survey was strongly encouraged by the instructor but was not graded. Even though the survey was anonymous, Blackboard can indicate who has taken the survey. All survey results are reported in summary format so individual answers are not identified. Two surveys were given, one after the first week of the project (before the final deliverable was due) and one after the students had apps certified and in the store with a chance to submit revisions.

Over 95% of the students (68 out of 71) opted to fill out the surveys. Interpretation of the data was aided by observation of students during class, labs, office hours and the final presentations. Students were asked about their college majors and career interests, their propensity and attitudes towards programming and app development, positive and negative experiences in completing the project, and their attitudes about technology careers before and after the project.

## 7. STUDENT PARTICIPANT DEMOGRAPHICS

<i>College of Business Administration Majors</i>	<i>Number</i>
Management and Human Resources	22
Accounting	14
International Business Management	9
Marketing Management	8
Finance, Real Estate, and Law	7
Computer Information Systems	6
Technology Operations Management	0
Ebusiness	0
Not a Business Major	2
<i>Total</i>	<i>68</i>

**Table 1.** Breakdown of business majors in class

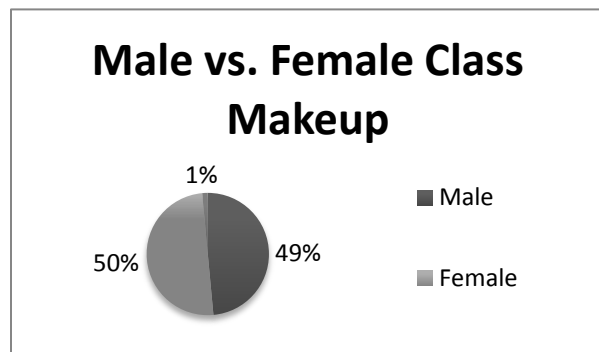
### Majors

The makeup of any class has an impact on the results generated from a project such as this. The students were surveyed to determine their

major and if they had minors. Of the 68 students surveyed, 59 (87%) did not have a minor. Table 1 below illustrates the distribution of the business majors represented in the class.

**Female/Male Makeup**

Female representation in CIS related jobs has declined over the last two decades. Ashcroft and Blithe (2009) note that in 1991, 36% of the IT workforce was female and in 2008 it was down to 25%. In the academic environment, Soe, Guthrie, Yakura, and Hwang (2012) noted a decline in female enrollment in CIS-related majors. Soe et al., (2012) stated that in Fall 2009, female enrollment in the CIS program at California State Polytechnic University, Pomona was 16% and fell to 11% the following year. Figure 1 represents the gender of students enrolled in the MIS course.



**Figure 1.** Gender Makeup of Students

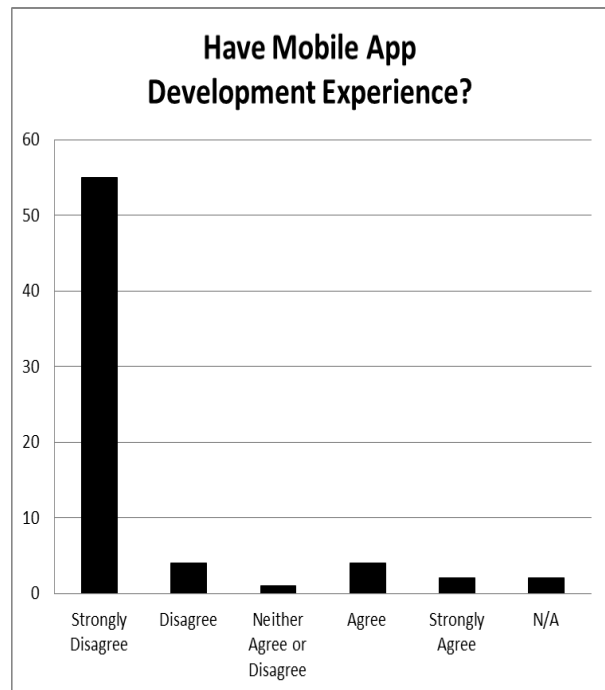
**Mobile App Development Experience**

Figure 2 shows the mobile app development experience of students enrolled in the course. As you can see, the majority of students (55 out of 68 (81%) stated they strongly disagreed they had mobile app development experience prior to taking the MIS class.

**8. OBSERVATIONS FROM THE DATA**

Our sophomore/junior level MIS class is required of all business majors. Over 91% of the students were outside of Computer Information Systems major. In addition, the class was close to being 50% Male and 50% Female which is not indicative of traditional Computer Information Systems based classes. Regardless of gender, the majority of students did not have experience with mobile app or Windows app development.

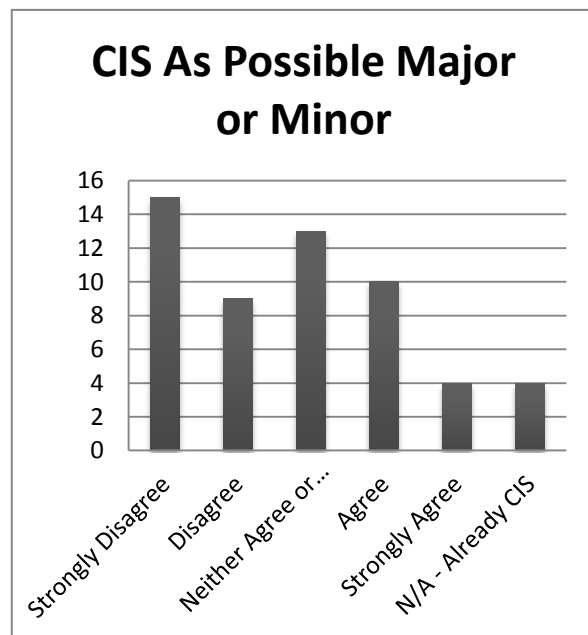
Prior to this project the students in this class could be considered mobile app users rather than developers/creators of apps.



**Figure 2.** Mobile App Development Experience

**9. RESULTS**

**CIS Major/Minor Consideration**



**Figure 3.** Considering CIS Major or Minor

Figure 3 shows whether students considered CIS as a major or minor after completing their first mobile app. Please keep in mind that only 9% of the students were CIS majors. Of the remaining students, 27% either strongly agreed

or agreed that they were considering CIS as a possible major or adding a CIS minor after completing the mobile app project.

**Career Implications**

Figure 4 illustrates the career goal impact the project had on students. Regardless of whether they wanted to change their major or add a minor, 51% either strongly agreed or agreed that creating a mobile app changed their perception of the potential of app development in helping them meet their career goals.

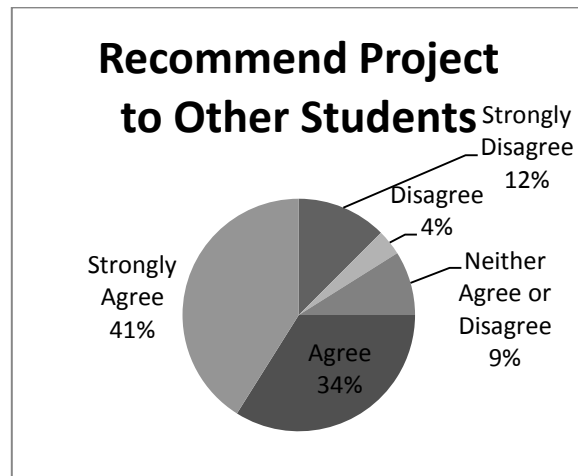


**Figure 4.** Career Goals Impact

**Project Recommendation**

Figure 5 shows whether students would recommend the project to others taking a future MIS course. Seventy-five percent of students either strongly agreed or agreed that they would recommend the mobile app project to other students. This coupled with the 51% stating that it helped with their career goals indicates the usefulness of mobile app development in a course required for all business majors.

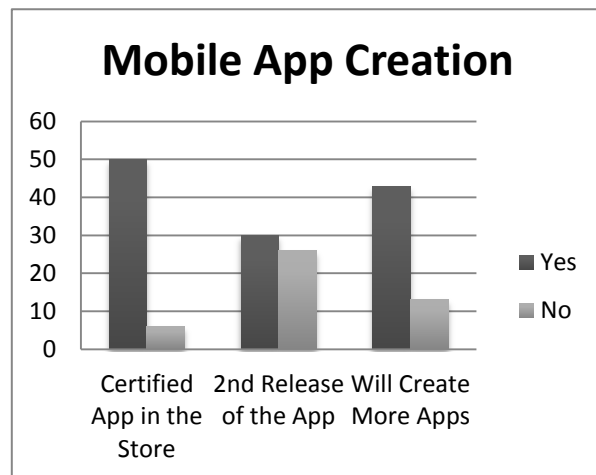
At one time or another, business professionals will be involved in stating their needs, determining whether the product created meets their needs, and the effectiveness of the product once it has been deployed to the marketplace. The mobile app project encapsulates all those activities.



**Figure 5.** Project Endorsement

**Project Requirements Met**

Figure 6 shows the progression of the mobile app development by students. The base project requirement was to certify an app and place it in the store. Extra credit was awarded to those students that issued a second release of their app in the store of which 30 (60%) did. Even with the difficulties encountered when creating the app, 71% of the students are more inclined to create additional apps in the future.



**Figure 6.** Mobile App Development Progression

**Reviews Received**

Figures 7 and 8 demonstrate the impact that app reviews both in number and content had on students in the course. The project provided extra credit opportunities if students reviewed two other apps. Of the 25 students whose apps were reviewed, only 12 (48%) felt the reviews motivated them to submit a second release of their app. Students mentioned that some reviews were from students who did not even

test their app because they just wanted extra credit and therefore reviewed it generically as a "good app".

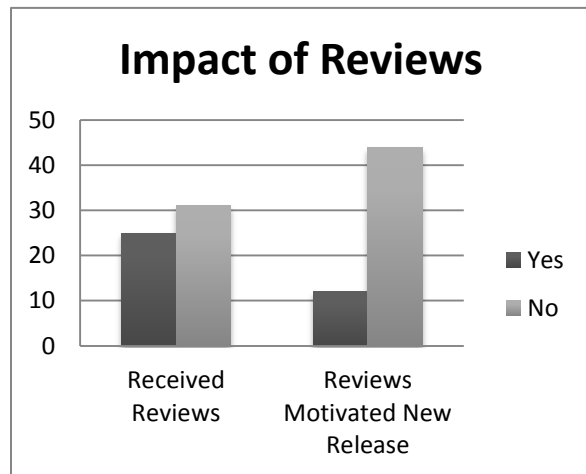


Figure 7. Impact of App Reviews

old daughter. Like most students in the class, she had no experience developing a mobile app. In fact, she did not own a smartphone. With her four-year old daughter in tow, the student came to the office hours being held in a computer lab to discuss beginning the project. The discussion did not initially start with the technology that would be used but rather what topic/subject would be fun to focus on when developing her app. The student was having difficulty on what was fun with her stressed home, work, and school life. Her daughter overheard the conversation and suggested something on "My Little Pony" (an animated television show for children). Her daughter proceeded to explain what was fun about "My Little Pony", which inspired her mother to create a Windows Mobile app using content from "My Little Pony" videos.

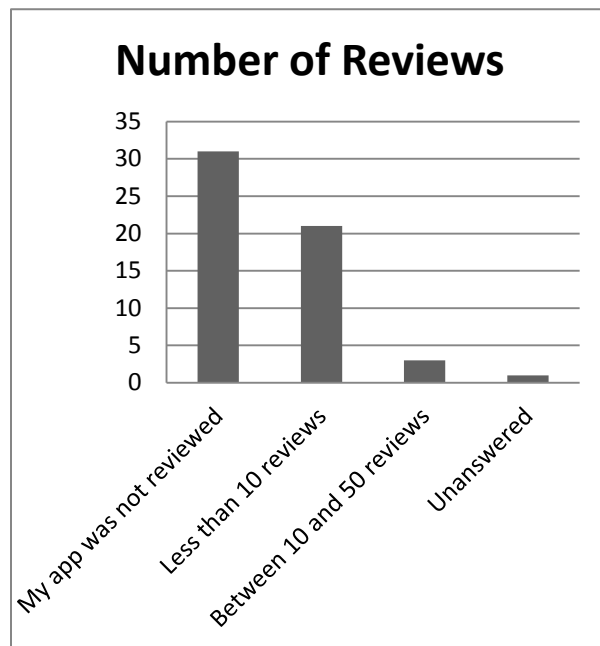


Figure 8. Number of Reviews Received

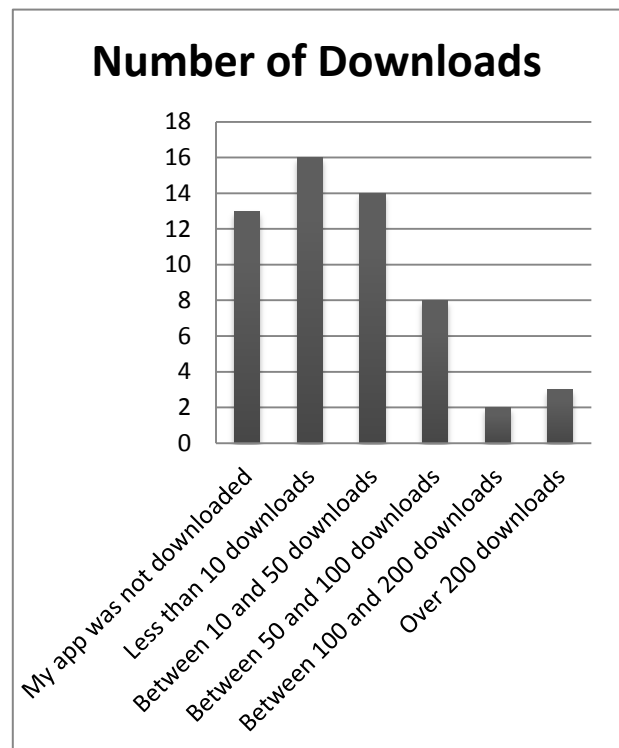


Figure 9. Number of App Downloads

### App Downloads

Having downloads was not part of extra credit for the project. Figure 9 shows that only 23% of the apps were not downloaded while 54% had less than 50 downloads within a two week period. One student had over 2,000 downloads in that same time period.

One student that experienced a high number of downloads could be attributed to her four-year

### Peer to Peer Learning

An unexpected outcome to the mobile app project was the peer learning aspect where students learned from and with each other. Figure 10 shows the students that sought help on their project with another student and the number of students that helped others.

In class, students seemed to be supportive of each other's app by discussing difficulties they

had with their app and how they resolved them. Students would come to office hours to help other students. Some students applied suggestions from the app marketing content and offered to exchange rating and reviews in order to drive downloads.

According to Peer Learning by Alice Christudason (2003), "Research indicates that peer learning activities typically result in: (a) team-building spirit and more supportive relationships; (b) greater psychological well-being, social competence, communication skills and self-esteem; and (c) higher achievement and greater productivity in terms of enhanced learning outcomes." We observed all of these processes during this project.

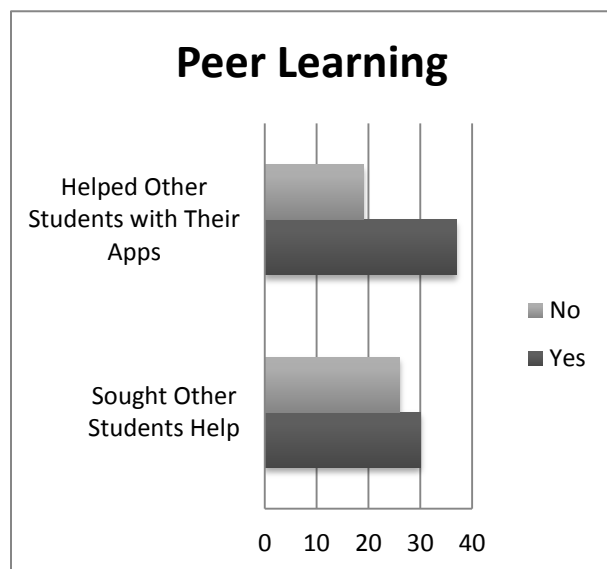


Figure 10. Peer to Peer Learning

### 10. QUALITATIVE OBSERVATIONS

As part of the survey, one of the open-ended questions students were asked was "what did you enjoy most about this project?". Almost every respondent, with no external prompts, used the words "creative" or "creativity" in their positive responses. A sampling of verbatim responses is:

"Coming up with the idea of something I enjoyed doing and then figuring how to link it to sites and videos that I visit."

"Getting to think of what app I wanted to create, and making it into a reality."

"I enjoyed the freedom of creativity that was involved with the project. There were no limitations on what we could or couldn't do, so

that made it much easier to be interested and involved in the success of this project."

"I really enjoy the opportunity to create a web app and find out ways of making your app successful."

"I really liked the designing of the app the most. I also enjoyed thinking about this project as one starting a company."

"I thought that the project was a new experience and it is something I found extremely useful. In the world of technology today creating a mobile app can be a great skill that you can apply to a job. "

"The creative aspect of making your own app, the process of learning it, and seeing your creation come to life."

"Watching the project come to life."

Another open-ended question was "What did you enjoy the least or find the most frustrating with this project?". Two dominant themes were evident in the answers: one related to the short deadline for the first project, and the other to getting through store certification.

The short deadline was imposed because our experience shows that no matter how much time you give students, most will wait until there is just enough time before starting. We wanted the students to get through the certification process early so they could have time for user feedback and to submit updates.

The second set of frustrations related to the store certification processes, some of which was not the students' fault. During the project the Microsoft Windows stores were going through rapid and significant redesigns, and at times certain browsers weren't supported, or there were unexplained file upload issues. Some quality issues existed with respect to the human testers not providing detailed feedback. While all of these were eventually resolved, it did understandably cause students frustration. In some cases it appeared that students were not used to being accountable to an unsympathetic third-party's rules and requirements that in their mind were trivial, such as the requirement to not have any visible borders on screen capture images.

A sampling of verbatim responses is:

"Getting a certified file caused me the most frustration. The error messages didn't have a clear solution and it was extremely hard because I had a Mac. I think that the project is



unfair in that sense because people with Mac are not able to do as much as those with Windows, especially when it comes to extra credit opportunities.”

“Not knowing if my app was going to get certified or not. Waiting time.”

“The certification part caused me frustration. I hated waiting 3-5 days for my app to either be approved or denied certification. The Microsoft tester was not clear on what was wrong with my app.”

“The certification process was annoying, because I kept getting denied and the errors it would give me were not specific enough for beginners to understand where the problem needed to be fixed.”

### **11. DEVELOPER COMMUNITY ROLES**

As suggested by Monroy-Hernandez et al. (2008) and Lave & Wenger (1991), we observed students forming into communities of practice and evolving through a variety of role stages.

#### **Passive Consumers**

Initially most students start as passive consumers. We encouraged this role by having students browse the app stores to see what is out there and to identify aspects of successful apps.

We also encouraged students to seek out apps that potentially do what they are thinking about doing and thereby identify potential competitors and ways in which they could improve upon existing apps.

#### **Active Consumers**

We don't see the active consumer role come into play until a bit later. Once students started publishing their apps, we invited them to rate and review each other's apps both to help drive downloads and as a show of mutual support. We incited this behavior by offering extra credit for giving a certain number of ratings and reviews.

#### **Passive to Active Producers**

Students become passive producers when going through the process of building their app for the first time. As they are struggling to figure things out, they may not feel like they know enough to share, and may be frequently reaching out to others when they get stuck or have questions.

Once students successfully publish their app, we see many of them moving into the active producer role where they want to share what

they have learned and help others. In some cases, we've seen students coming to the lab on their own time (skipping work and other classes) after their project was completed just to help others.

In several extreme cases, numerous students had made several apps on their own but helped fellow students make theirs. These self-appointed Teaching Assistants became close friends and continued their association in other aspects of their lives.

Once a student has their app certified, then their community shifts to include the store consumers that download their apps. This shift is even more noticeable as the developer starts receiving comments, ratings and reviews on their apps suggesting fixes, improvements and additional features. In this "store" community, the users of the students' apps participate in development by first downloading (passive consumer) apps, but as they comment and suggest new features they become active consumers. It is the existence of this active consumer role held by retail consumers that makes an app published in a formal store more like a service and less like a product (Marks, 2014).

### **12. CONCLUSION**

The app development module has proven to be of high interest to many of the students enrolled in survey Management Information Systems courses, even among those who are not planning on pursuing a CIS major or minor. While there is the potential for friction when dealing with developer store processes and certification, students learn valuable lessons when they are accountable to an inflexible commercial app store. The students' real-world experiences give them valuable insights into the benefits of a technology career, and start developing skills in software design, development, marketing and strategy that add value to their personal resumes and portfolios.

We have found that most courses have room for the addition of a high-value, two week project, and in many cases it can replace other projects that have become dated and less relevant. As we continue to refine the way we manage and assess app development, we also expect the tools and processes to become easier to use. There is every indication that mobile apps are going to be an increasingly important technology going forward. Providing students with hands-on experiences in the survey MIS course imparts

critical and useful knowledge for students in every concentration of the business major.

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