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**Mobile Technology in Secondary Education: Utilizing the Android
Development Environment to Teach Texas Paleontology**

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**Mobile Technology in Secondary Education: Utilizing the Android
Development Environment to Teach Texas Paleontology**

by

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Report

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Abstract

Mobile Technology in Secondary Education: Utilizing the Android Development Environment to Teach Texas Paleontology

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The University of Texas at Austin, 2011

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The purpose of this project was to create an Android phone application that could be used to teach Texas Paleontology in a secondary school classroom. Since experienced teachers have reported that many students who do not have personal computers at home still have their own cell phones, the concept of using mobile devices for science education is very attractive to educators. In order to test out this idea the project had to include not only a mobile app, but also a webquest to help seamlessly integrate that app into Earth Science curriculum.

To begin the project, I developed the Texas Paleontology webquest as a frame for the cell phone integration. In this activity the students are required to create their own field trip to explore relevant paleontological locations in Texas. They are required to document their field trip using Google Maps. These field trips could eventually be used to enhance the Android Application.

The development of the Android Application represents the majority of this project. It was designed to be an app that can either stand alone or work with the Texas Paleontology webquest. In order to create this application I had to learn the XML and JAVA programming languages and become familiar with the Eclipse Integrated Development Environment and the Android Software Development Kit. The results of the project can be downloaded from the Android Market by searching for “Texas Paleontology.”

This report not only includes a description of how the application could be integrated into the classroom, but also an instruction guide for how to create an Android Application in a similar

way. As cell phone technology becomes even more prevalent it is likely that more educators will want to utilize mobile application development in their own classrooms. This report provides a starting point for accomplishing this integration.

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Chapter 1: Introduction

The focus of this project was to develop an Android phone application that could be used to explore the paleontological history of Texas. The goal was for the resulting application to display a map of Texas that the user could tap at different locations in order to pull up the paleontological history of each area. Once I began the project and the development process continued, this idea grew into a more in-depth application complete with an interactive geological time scale, maps of continental drift, and several other features to help the user understand the natural history of Texas. As a method for integrating the application into the secondary classroom I also designed a webquest to encourage students to research and create a paleontological field trip of their own. Both the webquest and the Android application were specifically designed to be used either together or independently. This report represents the culmination of the project as well as my experience with the UTeach Summer Masters program.

In accordance with the UTeach guidelines that were issued to the 2011 cohort, this report is organized into four main chapters. This first chapter, the introduction, provides a general overview of the project. The second chapter is a review of the literature surrounding mobile phone technology use in public schools. Chapter three lays out the methods used to develop the Texas Paleontology application and can serve as a guide to anyone who wishes to create an Android application for him or herself. Finally, the fourth chapter describes how the lessons I learned throughout the UTeach Summer Masters program will be applicable to my career in education.

Chapter 2: Review of the Literature

General Overview

The advances in technology over the past twenty years have predictably influenced the way students learn in the classroom. Since students spend so much of their personal lives either playing video games, surfing the internet, communicating with mobile phones, or using any other of the myriad of technologies available to them, it is not realistic to expect the traditional paper, pencil, and textbook tools to be sufficient for educating this new generation of what is now being called the “digital natives” (Jing, 2009). Consequently, the use of technology in secondary classrooms has dramatically increased and as a result, teachers have had to adapt to the computer integration.

This classroom technology revolution has taken many forms over the past decade. Teachers who once relied on textbooks, paper-and-pencil quizzes and tests, and worksheets now can use Skype to help students speak with people around the world to learn about different topics or to speak another language. Students regularly take exams online and have immediate access to their grades and which items they missed. In many classrooms, paper quizzes have been replaced with clicker devices that provide immediate feedback and ensure student participation. This computer integration has been overwhelmingly beneficial to both students and educators.

While the personal computing revolution has brought a wealth of change to teaching practices, the widespread use of mobile phones has not been integrated into secondary curriculums with any frequency. In fact, most United States high schools either restrict cell phone use or ban their presence altogether (Obringer, 2007). By attempting to eliminate the use and/or presence of mobile devices, school officials are fighting a very difficult battle due to the complete integration of cellular technology into lives of American adolescents. As school districts struggle to determine appropriate policies regarding cell phone usage, a number of

educational researchers are contemplating how they might be used to enhance classroom learning. There are already tools available such as polleverywhere.com, which enables teachers to conduct assessments using student cell phones as clicker devices, other possibilities are likely surface for using cell phones for projects and research. Since the presence of these devices will likely become increasingly difficult to fight, it makes sense to instead figure out new ways to integrate them for the benefit of secondary learners.

The integration of open-source technology in mobile operating systems makes it more likely that educators can use smart phones to enhance instruction. By creating mobile applications that are tailored to a particular curriculum, educators might successfully utilize cell phones to enhance learning while reducing the likelihood of negative consequences such as cheating, harassment, and overall misuse. With appropriate supervision it student cell phones could serve the educational community the same way personal computers have come to do so.

Trends in Districts' Mobile Phone Policies

Across the United States the vast majority of school districts have policies either limiting cell phone usage during the school day or banning them from campus altogether (Obringer, 2007). These policies are necessary not only in wealthy and middle class districts. Cell phones have spread so rampantly through our culture that students from all levels of the socio-economic spectrum regularly carry them. There are administrators at the high school level that see a conflict between this policy limiting mobile technology and the current push to educate the next generation. Laurelyn Arterbury, the Associate Principal of Stony Point High School in Round Rock, TX, says "I don't like the fact that when students come to school we enforce turning off headphones, turning off cell phones, etc. I don't like that you have to 'power down' to come to school and then you use that technology when you leave. I think that if we truly are going to

incorporate technology seamlessly into our instruction we have to allow students to use this technology that they have.” However, despite this shared discomfort on the part of many administrators, school districts currently see no choice other than to ban the devices outright in order to maintain the learning environment.

This trend presents potential community relations issues since most parents want to be the sole controllers of their students cell phones, rather than allowing the schools to police the devices for them (Johnson, 2007). When a student’s use of mobile technology causes a classroom disruption the teacher often has no choice but to enforce district policy and confiscate the device. Parents are often forced to pay a small fine in order to get their student’s phone back, another source of tension between the school officials and the public. If this technology can be controlled and utilized for its learning potential, it would not only alleviate the public relations problems, but also benefit student learning as well.

Advantages to Technology Integration

Up to this point the integration of technology into the classroom environment has been beneficial for student learning. Educators who have access to computers have more options at their disposal for students to apply knowledge, practice new concepts, and demonstrate mastery of content. While accomplishing these curriculum-oriented tasks, technology usage also performs another critical function, which is to ensure that students from all walks of life have the skills needed to compete in today’s marketplace.

Students who have access to computers at home are understandably more likely to feel comfortable using them, and therefore more likely to master technology-related skills. By incorporating computers into classroom curriculum on a regular basis, educators can provide these skills to students from all walks of life instead of simply limiting the skill set to those who

can afford personal computers of their own. As the technology revolution continues and classroom computer usage increases it will be even more essential to ensure access to all students through educational technology.

Challenges of Mobile Technology

The educational community may have embraced the personal computing phenomenon as a part of curriculum enhancement, but the same has not been true for cell phone technology. The majority of school districts in the United States do not allow student use of cell phones during the school day. There are a number of good reasons for this trend. One such reason is the disruption that improper usage causes to the learning environment (Gilroy, 2004). When a cell phone rings right during a teachable moment, or a student is distracted by a text message, it interferes with classroom instruction not only for the student whose cell phone was the culprit, but also for the rest of the class as well.

Furthermore, the fear of high-tech cheating makes the banning of mobile phones seem like a necessity. Since students are able to send texts quickly enough to escape a teacher's notice, it is possible for them to pass answers to one another during an exam. Even if students do not text answers to an exam, they can also take pictures of an exam as a means to cheat. Both of these possibilities can be used to justify the complete exclusion of cell phones from classrooms, but one could also argue that cheating was been an issue long before wireless technology and therefore is not to blame for academic dishonesty (Gilroy, 2004).

Additionally, cyber-bullying and the inappropriate use of cameras in locker rooms add additional difficulties (Obringer, 2007). Students are so proficient at hiding their technology use that it has resulted in cell phones turning into instruments of harassment. Many districts have

banned cell phone usage in locker rooms, restrooms, and wherever else students have an expectation of privacy. Unfortunately, instances of cyber-bullying still exist.

A major reason why student misuse of cell phone technology in the classroom is so difficult to restrict is the fact that they are not district-owned devices. When laptop computers are provided by the district, school officials can control what websites are restricted and are able to monitor all activity on the machines in order to ensure that they are used for educational purposes. Due to this lack of school control and the consequences that may result from it, many districts want to simply ban the devices from campuses, but this only creates a population of angry parents who insist that the phones are necessary for safety reasons (Johnson, 2004).

There is also an argument that the presence of cell phones jeopardizes the safety of students, which might seem counterintuitive. After the Columbine massacre and 9/11, many parents insist that their students carry cell phones because it makes them feel that their children are safer. Unfortunately, the opposite may be true. Approximately 68 percent of police officers who are assigned to schools believe that if such a tragedy occurs, so many students placing calls at the same time could jam the available phone lines (Obringer, 2007). Since any curricular advantage to cell phone use is not worth sacrificing student safety, this concern would need to be properly addressed in order to make fair use of the available technology.

All of these aspects complicate the idea of allowing students to utilize their cell phones. Nevertheless, there is significant benefit available if the educational community can overcome these challenges and learn to use the technology that cell phones offer.

Opportunities for Curriculum Enhancement

Although many other new pieces of technology once produced some form of concern when they were applied to education, it is understandable why cellular phones are unique. After

all, they are not simply used for math the way calculators are and they are not large and difficult to conceal the way laptop computers are. On the contrary, they are small, portable, and increasingly integrated into almost every facet of our lives. However, it is these differences that also present the possibility for much greater benefit if we do manage to make cell phones fit into our instruction.

Since people personalize phones with skins, ringtones, backgrounds, and just about anything else to make the devices an extension of themselves. For adults and adolescents, cell phones are becoming a way to express our individuality. Therefore, using them for instruction could create a learning tool that engages students in a much more personalized way (Roberson, 2008). A demonstration of how cellular technology can enhance a student's learning could make a significantly more profound impact than any of the current marketing tools being used to stress the importance of an education, which include future salary and occupations.

Another unique and valuable advantage cell phones might offer to the learning experience is the opportunity for students to contribute to the curriculum. Teachers often strive to make content relevant to the students' own lives, and a mobile camera phone might allow them to upload photos from home that could encapsulate whatever material they are currently studying (Hartnell-Young, 2008). Similar assignments might include recording interviews with family and friends, videotaping interesting events, and any number of future capabilities phones might someday include. By using cell phones for collecting real-life content that is relevant to the classroom, teachers can transform homework from a typical repetitive exercise to a discovery process, making the curriculum more applicable and therefore more memorable for the student.

Conclusion

Up to this point, the majority of the literature has concentrated on the challenges involved in the presence of mobile technology in secondary classrooms. The majority of educators view the devices as a problem to be contained rather than a tool to be used to enhance curriculum. However, there was a time when teachers were afraid to incorporate calculators into mathematics classrooms for fear that students would no longer learn basic addition, subtraction, multiplication, and division. Today they are not a problem, but a tool to teaching higher level math to students who otherwise might not understand it. Since, like calculators, cellular phones are not going anywhere, it would behoove us educators to learn to use the technology for the benefit of our students instead of trying to ban the devices.

Chapter 3: Methods

Learning the Android™ Development Process

In the beginning of this project, while facing the seemingly monumental task of creating an Android™ application for the first time, the idea of learning the development process seemed impossible. After all, I am not a computer programmer and other than simple html (hypertext markup language) I had never before worked with any computer language. However, I reflected that as an educator I routinely have asked students to learn material that did not come naturally to them. With that in mind, it seemed that learning something that seemed so intimidating to me could be an excellent way to put my own instructions into practice. This process ended up giving me a skill that I hope to share with others who are similarly interested but intimidated. More importantly, stepping back into the shoes of a novice has given me perspective to take back to the classroom as an educator.

The process of learning how to create an Android™ application the first step I took, predictably, was to purchase several books on the topic. Although the majority of those books were incomprehensible to me in the beginning, one publication was simple enough for a novice like me to understand, and that was “Sams Teach Yourself Android™ Application Development in 24 Hours.” The time frame mentioned in the title is a bit deceptive, since it took a lot longer than 24 hours for me to complete the book’s activities and even then I still had a lot to learn. Nevertheless, it gave me a solid knowledge base for expanding my skills. Without that book, I would likely still be sitting at my computer staring at code that made no sense to me. It was with that knowledge that I moved on to other Android™ development books and began to acquire a skill set that had seemed unobtainable only weeks before.

As the weeks progressed and I continued to develop my Texas Paleontology application, I occasionally encountered bugs in the programming that were difficult to fix with my textbook resources. In these cases, the World Wide Web became my greatest tool. Thanks to open-source technology, thousands of programmers routinely communicate through online forums to post help each other with programming, including™ Android programming. Websites like “stackoverflow.com” and “cornboyz.com” were indispensable for solving several problems, particularly with the Google Maps part of my application. I quickly learned that I was never the first person to encounter any of my problems, and there was always a tutorial or blog to help me solve them. Through this process, the internet provided me with access to the lessons experience of more knowledgeable programmers than I, which reinforced my belief that classroom technology access is essential for the educational environment.

Setting Up the Android Development Environment

The first step in creating an Android™ application is setting up the development environment on one’s personal computer. One reason that Android™ development is so popular is the low start-up costs for accomplishing this task. If one wants to create an iPhone application then he or she must purchase an Apple® machine complete with the appropriate operating system. Android apps, on the other hand, can be developed on a Windows®, Apple®, or Linux operating system. In this case, I created the “Texas Paleontology” application using a Dell Latitude D830 laptop with the Windows XP operating system.

No matter which operating system is used, the first step in creating setting up the development environment is to visit www.eclipse.org/downloads to install the Eclipse. Eclipse is an integrated development environment, or IDE. It makes life much easier for a programmer by catching errors as they are typed as well as provided a debugging environment. Once at the

eclipse download site, click to install the Eclipse IDE for Java EE Developers, as shown in Figure 1.



Figure 1

Once the Eclipse IDE is installed it is time to install the SDK, which can be found at <http://developer.android.com/sdk/index.html>. There are a number of packages from which to choose depending on one's operating system. In my case, I installed the recommended Windows package indicated in Figure 2 below.

Platform	Package	Size	MD5 Checksum
Windows	android-sdk_r11-windows.zip	32837554 bytes	0a2c52b8f8d97a4871ce8b3eb38e3072
	installer_r11-windows.exe (Recommended)	32883649 bytes	3dc8a29ae5afed97b40910ef153caa2b
Mac OS X (intel)	android-sdk_r11-mac_x86.zip	28844968 bytes	85bed5ed25aea51f6a447a674d637d1e
Linux (i386)	android-sdk_r11-linux_x86.tgz	26984929 bytes	026c67f82627a3a70efb197ca3360d0a

Figure 2

Next, your computer needs the Android Development Tools (ADT) package. I found the most detailed instructions for this step at the following website:

<http://developer.android.com/sdk/eclipse-adt.html#installing>. After the ADT plugin has been

installed, it simply needs to be configured so that it will run on the Eclipse IDE. Instructions for this can be found at the website listed above as well. In addition to these web resources, many detailed video tutorials can be found at www.cornboyz.com, including “Android Tutorial and Lessons 1: Installing Eclipse and SDKs.”

Creating a Basic Layout

Once the Eclipse IDE and Android SDK and ADT have been installed, you are ready to begin creating an Android Application. The first step to this process is to click on the Android Project Wizard icon, indicated in Figure 3 below.

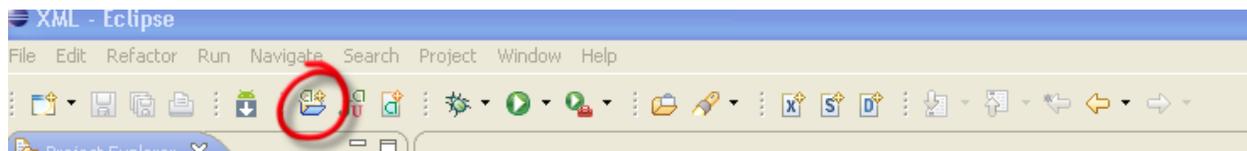


Figure 3

Once the Android project wizard opens, you will need to fill in your project name, build target, and application properties. Your build target is the version of the Android operating system for which you are programming. Since Android frequently pushes out operating system updates you have wide range of targets from which to choose. Under Application Properties, your Application Name is what eventually will appear under your screen icon when customers download your app. The package name is extremely important and requires three identifiers. I chose com, android, and texas1. Therefore my package name is com.android.texas1. Finally, you must choose your activity name. To do this you should follow the Java protocol for naming files. Every new word is capitalized with no spaces in between. In this case, Texas Paleontology Activity has become “TexasPaleontologyActivity.” When you are done, click finish.

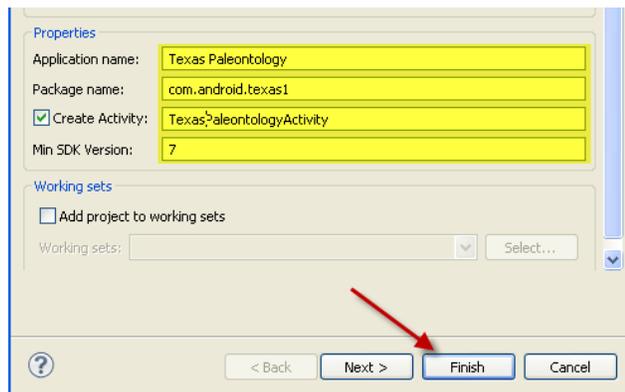
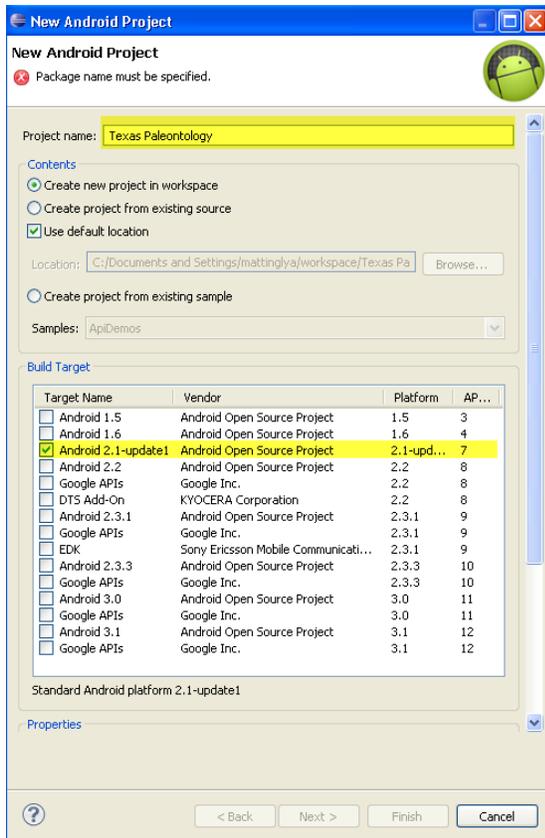


Figure 4

Figure 4

You will see to the left in the Package Explorer an expandable file called “Texas Paleontology.” Expand that file and you will see what is displayed in Figure 6.

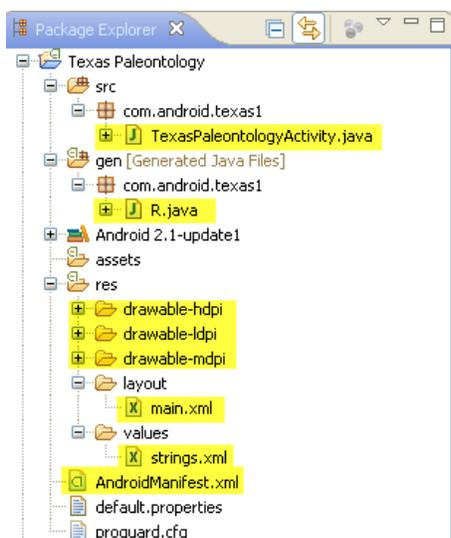


Figure 5

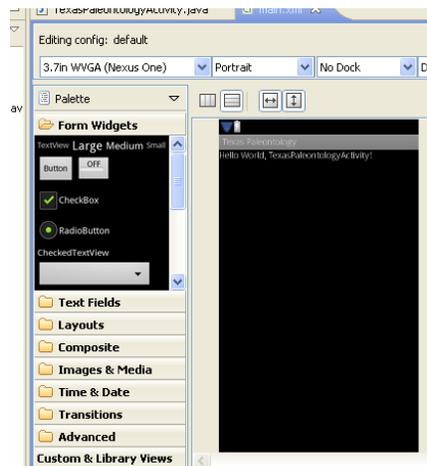


Figure 7

Under the source file (src) you will find the java file “TexasPaleontologyActivity.java.” This is your main java “class” that will be called up when your activity starts. Every time you alter any java class there will be automatic changes applied to the R.java file, highlighted under the Generated Java Files, or “gen.” Do not ever make any changes to the R.java file on your own; they will simply be undone automatically by the Eclipse program. Under the Resources file, abbreviated “res,” you will find three drawable files: drawable-hdpi, drawable-ldpi, and drawable-mdpi. Any image you use in your application must be copied to all three of these files.

Within the layout folder you see the file “main.xml.” The xml files that will accumulate in the layout folder are the graphic part of your application. It is within these files that you design the appearance of your app, as opposed to the java files where you will enter code for how the app will behave. The “strings.xml” is a file where you store any text that will appear in your application. Finally, the Android Manifest is a sort of master file that must store all intents (such as links) and permissions (such as internet access or GPS) that you choose to incorporate.

If you open the file called main.xml, you will see a screen like the one in Figure 7. You can choose a new background color using the hexadecimal color code used in html. One website you might visit is http://www.theodora.com/html_colors.html. It has a large selection of color codes from which to choose.

Once you have chosen a color, click on “Linear Layout” and select “Properties” in the lower panel. Enter your chosen hexadecimal code and press enter to change the background color, as shown in Figure 8 below.

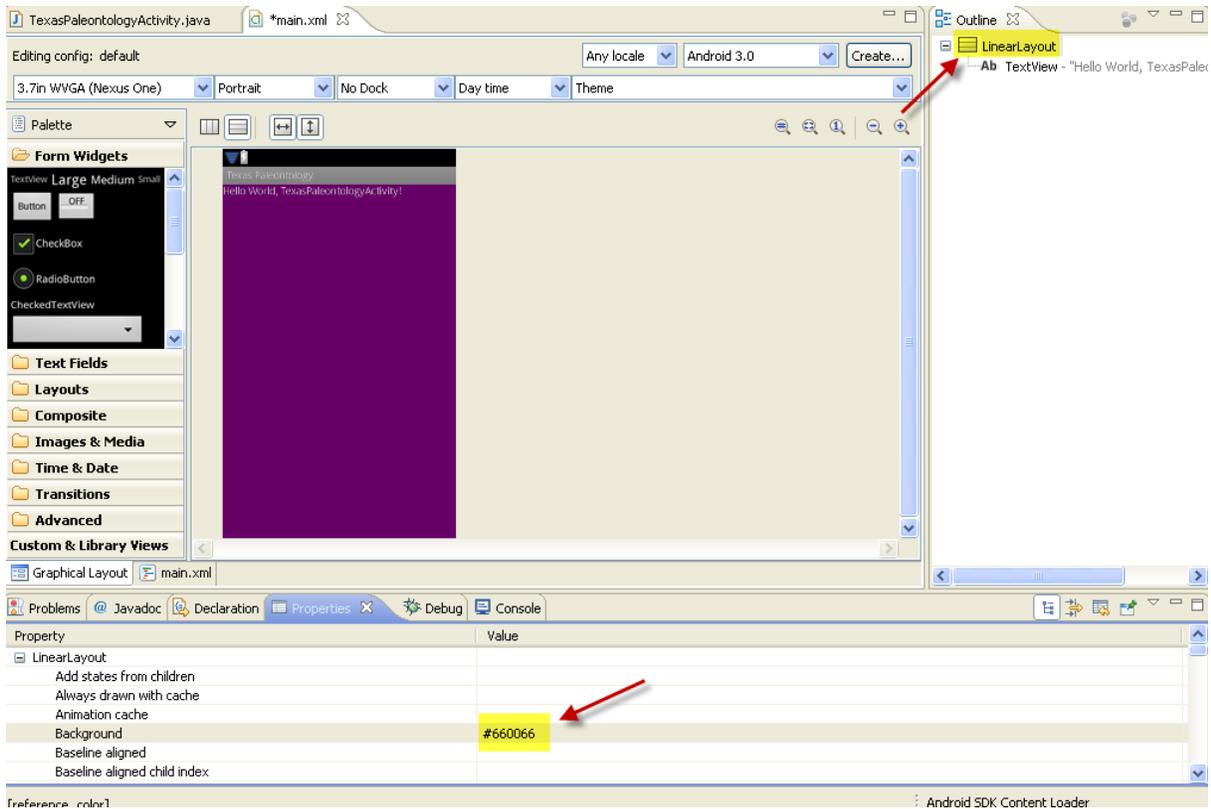


Figure 6

Similarly, you can also choose to use a picture for a background by pressing the button on the right side as shown in Figure 9. Once you do, a dialogue will appear for you choose from the drawable files which picture you would like to choose. Whichever file you choose will appear as the image background, as shown in Figures 10 and 11.

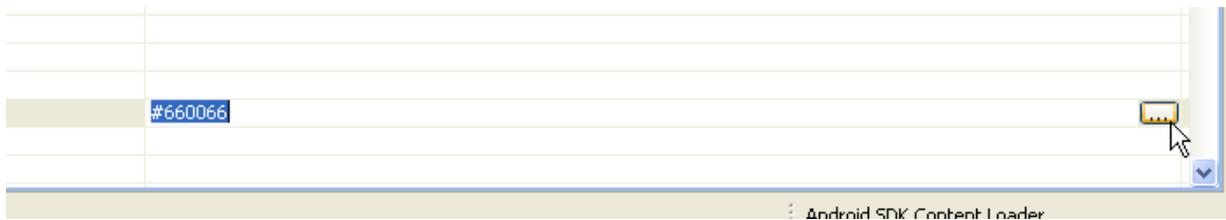


Figure 7

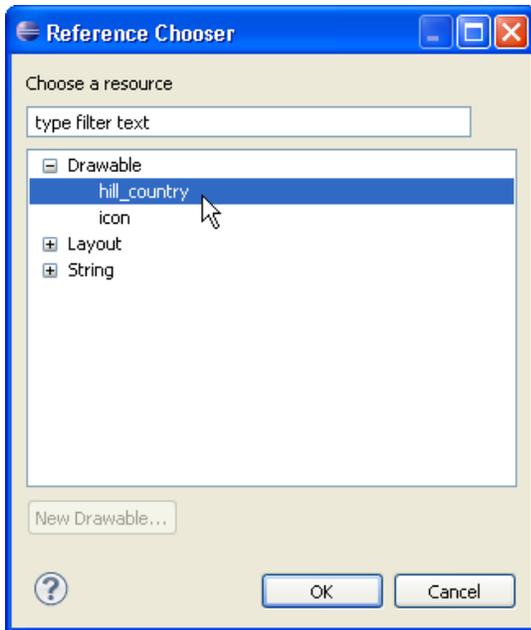


Figure 8



Figure 11

In order to change the title you must first create a string for the text you want. Open the strings.xml file and select the strings.xml tab at the bottom to reveal the code view.

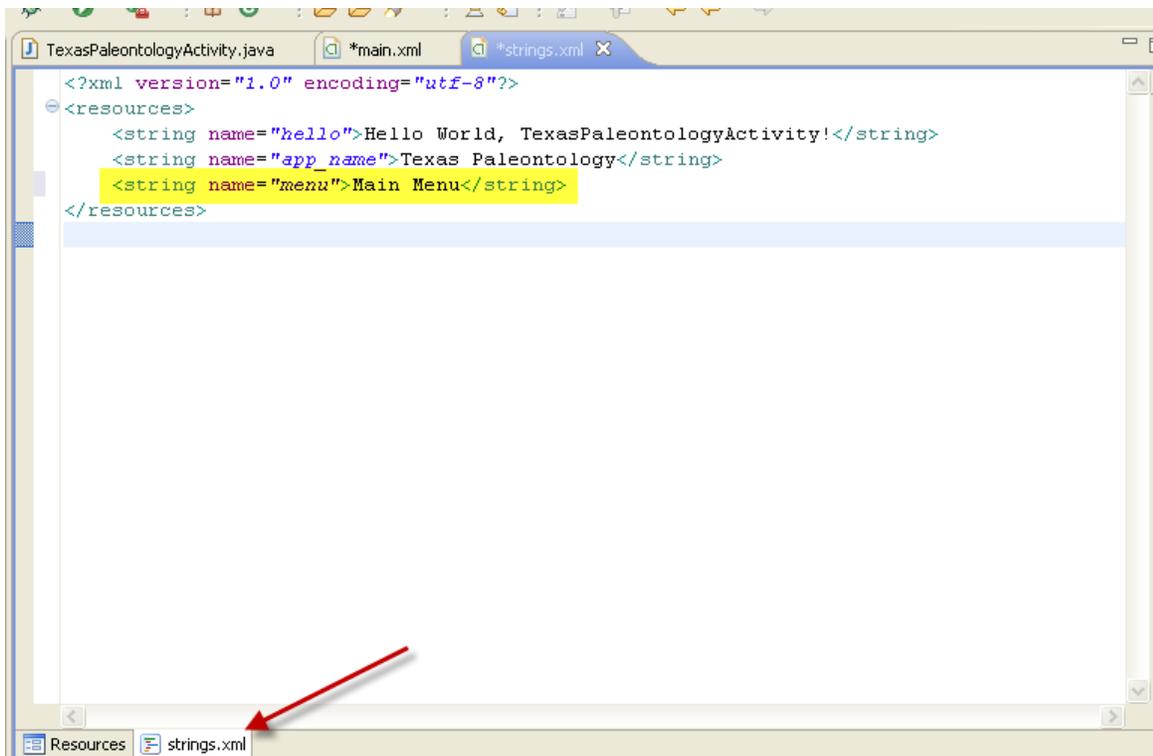


Figure 9

In order to create a string, follow the following format:

```
<string name="titleofstring">Type whatever you want your text to say here.</string>
```

Figure 12 shows how it will appear in your Eclipse program. Make sure to save your strings.xml file. Next, return to your main.xml file and choose TextView in the outline tab on the right. In the properties tab below, scroll down to “text” and click the icon on the right. This will allow you to choose the string that you just created.

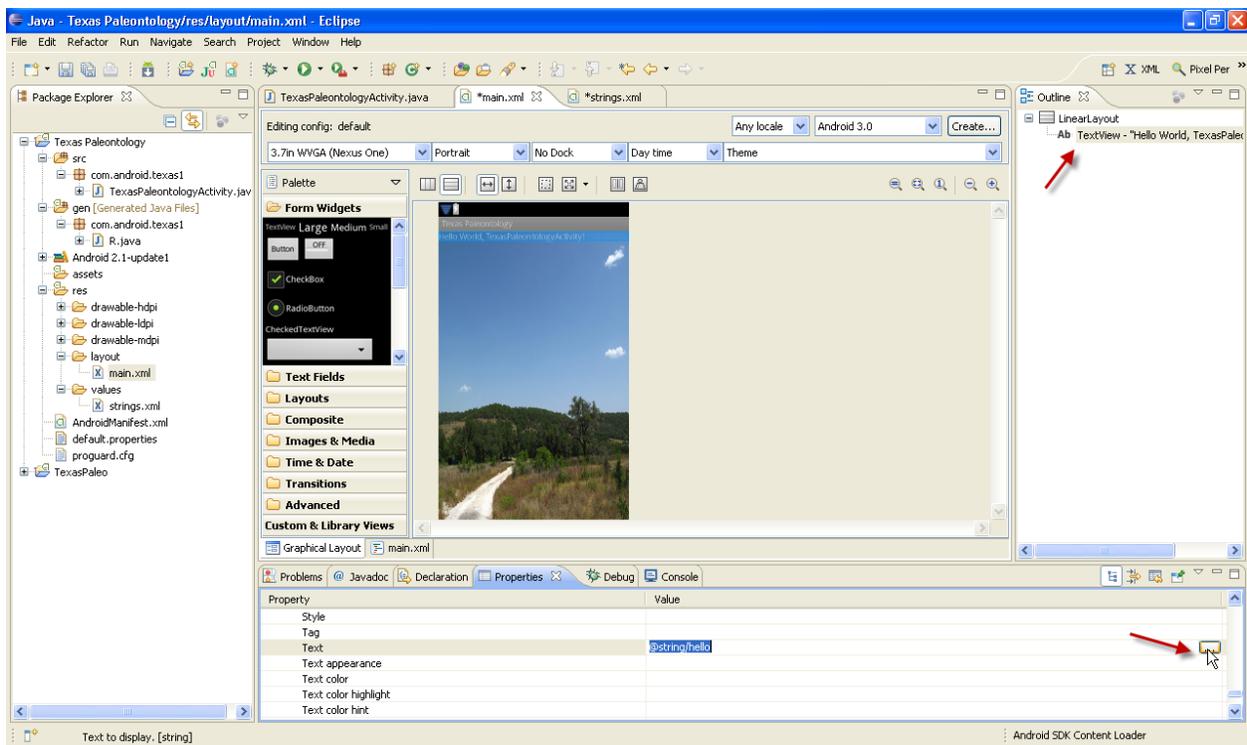


Figure 10

Figure 11

Once you have chosen the appropriate string, you can use the icons above the screen graphic to change the alignment and margins of your text. Notice in Figure 15 that margins are written with the extension “dip”.



Figure 12

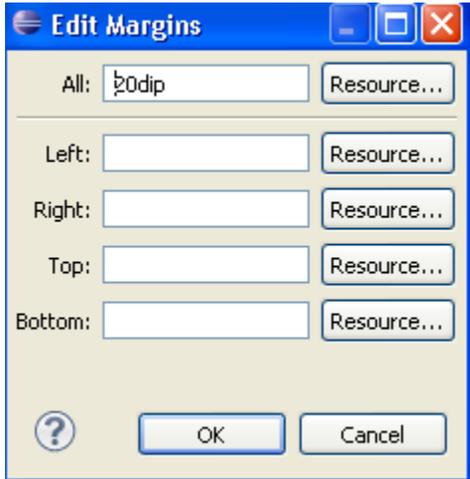


Figure 13

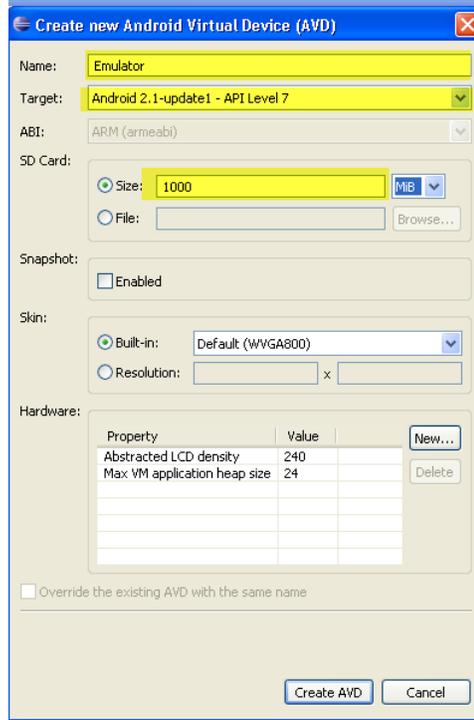


Figure 19

Finally, you probably want to change the color and size of your title. To do this, return to the Properties tab and scroll down to the text properties. You will use the hexadecimal color codes to choose color and the “dip” extension to choose size. You may also use the “Text Style” property to make your text either bold or italicized.

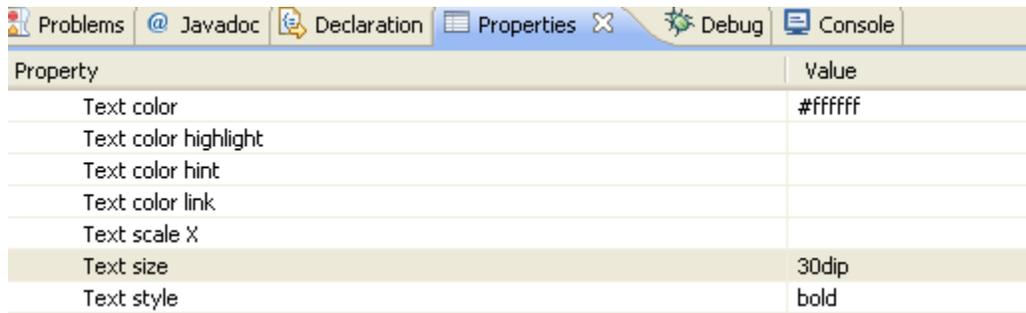


Figure 14

Debugging the Application

Debugging is a way of testing the application. In order to debug you must first create an emulator by clicking on the icon shown in Figure 18.



Figure 15

Once the AVD Manager window appears click “New” and fill out the information to create a new virtual device, as shown below. You may choose any name you like for your emulator, but your target should ideally match the target selected for your project when you first created it. You may also choose whatever size you would like as long as you have that much room available on your hard drive. Once you are finished, click “Create AVD” as shown in Figure 19.

Once you have created your emulator you are ready to open your emulator and debug your application. Click on the debug key shown below and choose to debug as an Android Application. Debugging is a process you will revisit frequently during the Android development process.

Working with XML Layouts

While programming for Android, it is the XML files that are used to develop the appearance of the application. The Eclipse IDE provides the option of working with these files either graphically or programmatically. Although both methods are easy to learn, this paper will focus on the graphical design option because that is how I developed the Texas Paleontology application. The three layout tags used in this particular app were ScrollView, LinearLayout, and TableRow.

Since cell phone screens are traditionally quite small, the ScrollView layout is intended to fit large amounts of information onto the same page. This way when the user is finished with one section he or she can simply scroll down to reveal more screen space. However, it is also useful to provide a way to ensure visibility in the event that the user rotates his or her phone to a landscape orientation. There is one restriction to the ScrollView layout, and that is it can only have one direct “child” layout. For example, in Figure 20, shows the outline for the Geologic

Time Scale XML file. ScrollView is the parent layout, and TableLayout is the only direct child of ScrollView.

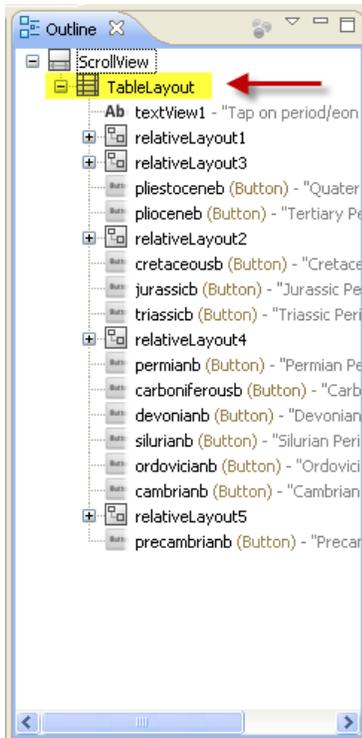


Figure 16

For the Texas Paleontology application, every XML file included the ScrollView layout to ensure proper views when the phone orientation changes.

The other most frequently used layout in this application is the LinearLayout, which is exactly what its name implies. LinearLayout is the best way to create a simple list, one line after another. Figure 21 shows the Field Trips page, which is a good example of a LinearLayout. The ScrollView, or course, is at the top, but then the LinearLayout simply contains the text and images that appear one row at a time.

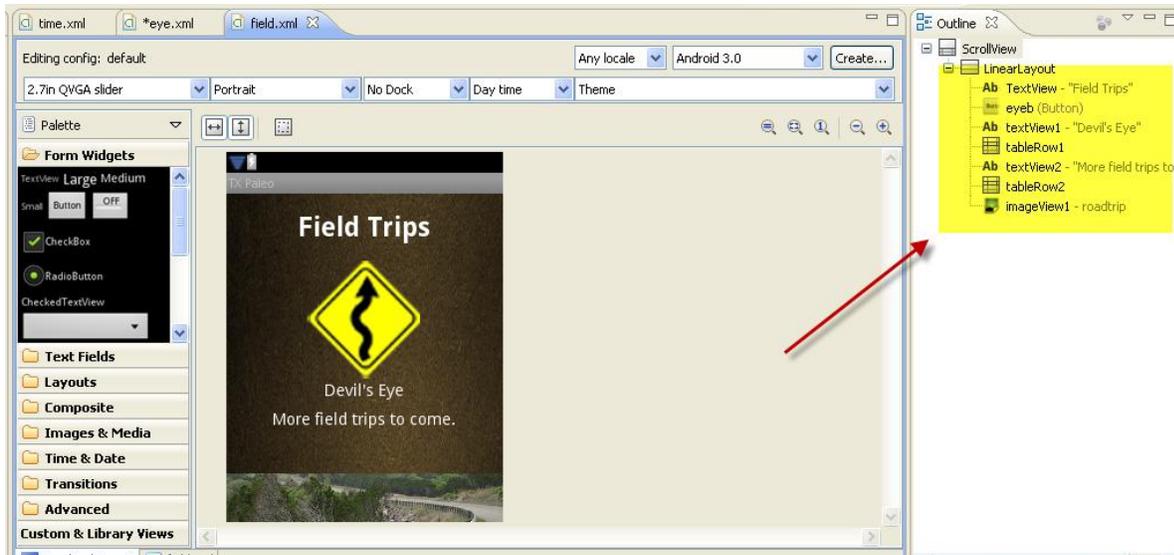


Figure 17

Finally, the TableRow is another useful layout for putting more than one item on the same line. This layout was indispensable while creating a well-proportioned main menu appearance. Figure 22 shows the visual layout for the main menu with all three TableRows, while Figure 23 shows the corresponding outline. Note that there is no need to use the TableLayout in order to use a TableRow.

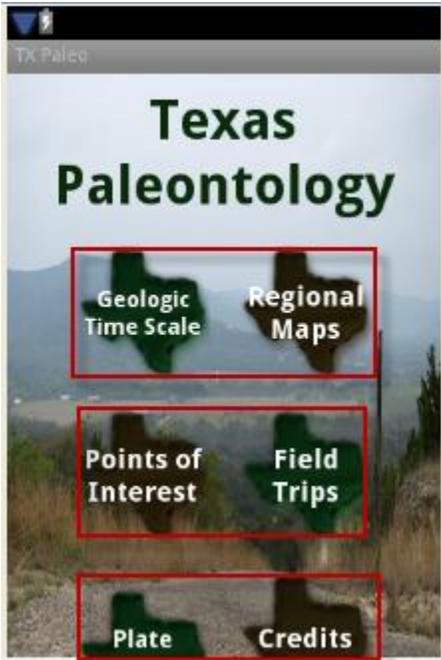


Figure 18

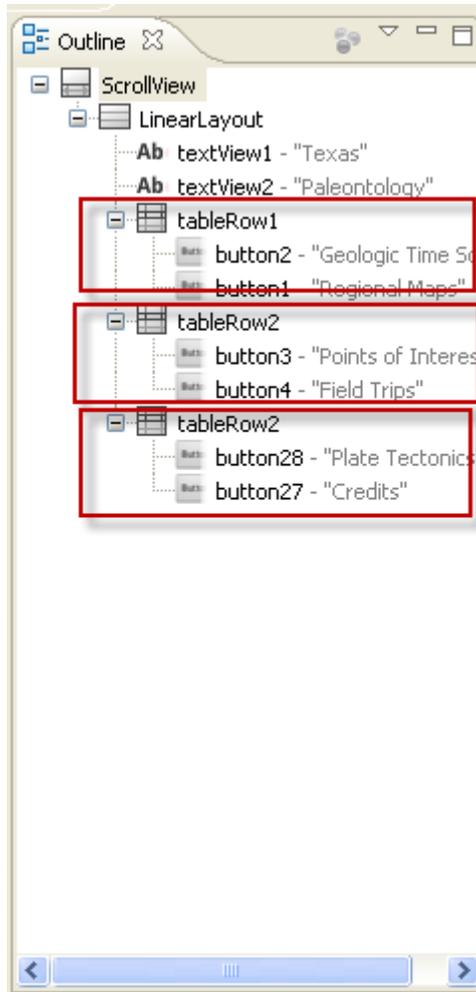


Figure 19

In addition to using the XML layouts, there are also a number of widgets required to make the application work and give it a pleasing appearance. The widgets used in the Texas Paleontology application besides TextView, which was described earlier, were ImageView and Button. As the names imply, ImageView is used to insert an image and Button is used to create a button. The properties of each can be changed using the “Properties” window at the bottom of the Eclipse window. For example, the buttons that are featured in the Texas Paleontology main menu appear to be shaped like the state of Texas. That is because, as shown in Figure 24, the background property is changed to reflect a .png file in the “Drawables” folder of the project.

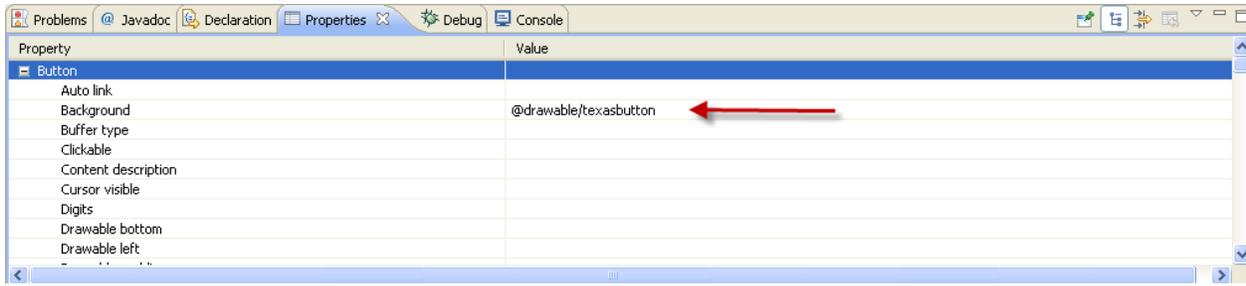


Figure 20

Working with Java Files

If working with XML files to design attractive screens was all that was involved in Android programming a lot more people would be creating applications. Unfortunately, all XML files do is make an application look nice. In order to control the actual behavior of the app, one needs to become somewhat proficient with JAVA. In order to understand the basics of this programming language, which include classes, fields, and methods. These concepts were intimidating to me at first, but thankfully, the Android development environment makes it easy to use them without becoming a programming expert.

Java is known as an object-oriented language, with an object referring to anything that can be manipulated. The object then encapsulates the object's properties. For instance, a bank account could be an object in a java program, and it could encapsulate a balance attribute of \$50 (Frieson, 2010). However, such an object must be instantiated using a class. The Android plugin for Eclipse includes a huge array of classes at the developer's disposal. Out of all these choices, the three most important classes are Activity, Intent, and Context (Darcey, 2010).

For every screen within the Android application there must be an associated java file. To create this file, right-click on the package name under the src file, choose New, and then select Class, as shown in Figure 25.

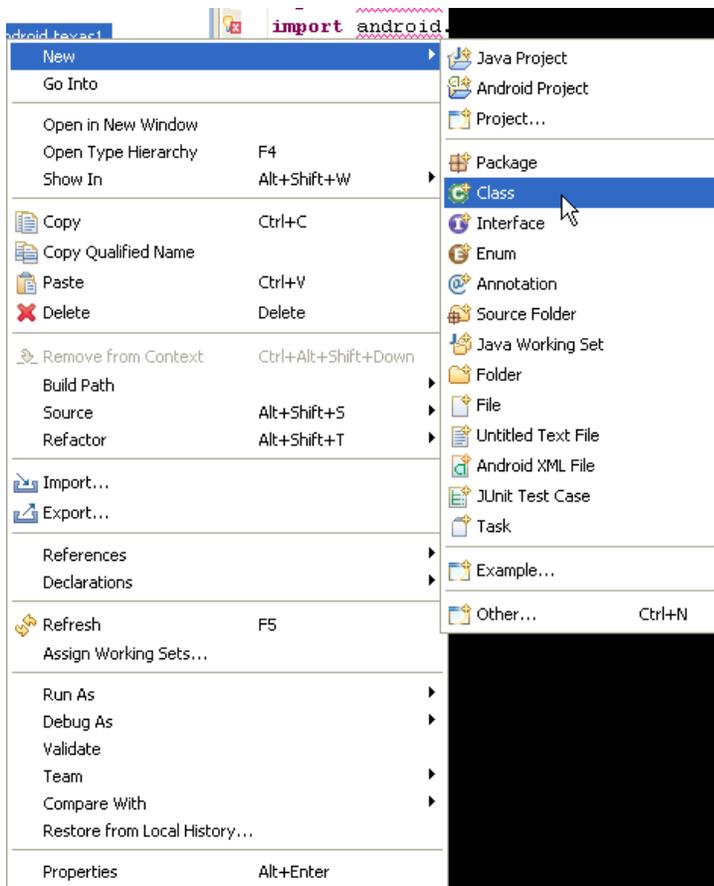
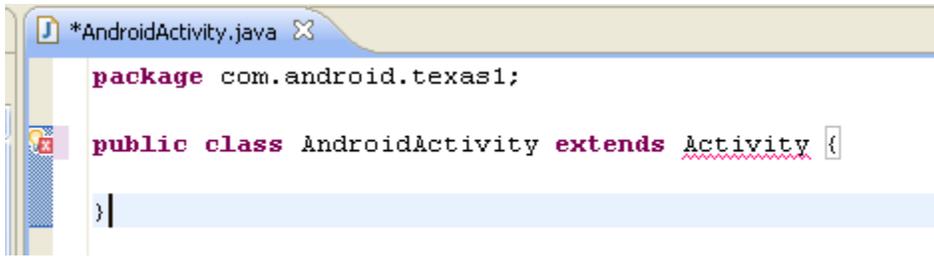


Figure 21

Within the Java Class window you will give a name to the new file and click “finish.” This action will create the beginning of a java file that you can manipulate to function within your Android application. In order for it to work, however, it must extend one of the available Android classes, which usually will be the Activity class. Within the java file, after the class is instantiated, type “extends Activity.” Note that java is a case sensitive language, so “extends activity” is not the same as “extends Activity.”



```
package com.android.texas1;

public class AndroidActivity extends Activity {

}
```

Figure 22

You will notice in Figure 26 that an error message highlights the word Activity. In order to eliminate this error, allow your mouse to hover over Activity and when the menu appears select “Import Activity.” Figure 27 illustrates this menu. This action will import the Activity class from the Android .jar file included in the Eclipse IDE, that way you can use it to make your file work.

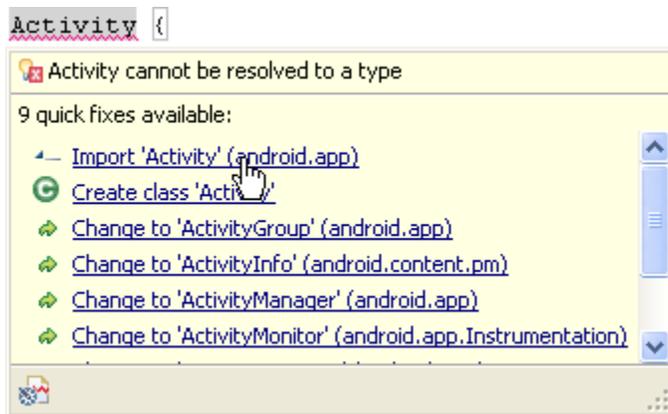


Figure 23

Once the Activity class has been imported, you must link the java file to whichever XML file you choose. This is accomplished through an override command, which is illustrated in Figure 28. Notice the method is called “onCreate.” This means that when the class is called up, or “created,” by the application this is the XML file that will appear. In Figure 28, the file “cambrian.xml” is referenced by the code `setContentView (R.layout.cambrian)`.

```
*Cambrian.java X
package com.androidbook.texas1;

import android.app.Activity;

public class Cambrian extends Activity {
    @Override
    public void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.cambrian);
    }
}
```

Figure 24

After the basic file is created, any other actions can be added. Since I am not a java programmer the majority of my code had to come from books and online tutorials that I edited to fit the Texas Paleontology application. This practice seems like simply a shortcut, but as I was forced to research one programming issue after another, my java knowledge grew until I could read the code with some degree of literacy. Below in Figures 29, 30, and 31 are templates I used to create buttons, access Google Maps, and add an Itemized Overlay to those maps.

```
//Regional Maps Button
Button button1 = (Button)findViewById(R.id.button1);
button1.setOnClickListener(new View.OnClickListener() {

    @Override
    public void onClick(View v) {
        // TODO Auto-generated method stub
        startActivity(new Intent("com.androidbook.texas1.TexasMapActivity"));
    }
});
```

Intent must also be defined in the Android Manifest.



Figure 25 - Code for creating a working button.

```

public class EyeMap extends MapActivity {
    public static Context mContext;
    MapController mControl;
    GeoPoint GeoP;
    GeoPoint GeoP1;
    MapView mapV;
    LocationOverlay myOverlay;

    @Override
    public void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.eyemap);

        mapV=(MapView)findViewById(R.id.MapView);
        mControl=mapV.getController();
        mapV.displayZoomControls(true);
        mapV.setBuiltInZoomControls(true);

        //coordinates for UT, where the map is centered.
        double lat =30.245781;
        double lng =-97.716065;

        //coordinates for the Texas Natural Science Center
        double lat1=30.2869983;
        double lng1=-97.7319078;
    }

    return false;}

    @Override
    protected boolean isRouteDisplayed() {
        // TODO Auto-generated method stub
        return false;
    }
}

```

Figure 26- Accessing Google Maps

```

public class HelloItemizedOverlay extends ItemizedOverlay<OverlayItem>
{
    private ArrayList<OverlayItem> mOverlays = new ArrayList<OverlayItem>();
    private Context mContext;

    public HelloItemizedOverlay(Drawable defaultMarker, Context context)
    {
        super (boundCenterBottom(defaultMarker));
        mContext = context;
    }

    public void addOverlay(OverlayItem overlay)
    {
        mOverlays.add(overlay);
        populate();
    }

    @Override
    protected OverlayItem createItem(int i)
    {
        return mOverlays.get(i);
    }

    @Override
    public int size()
    {
        return mOverlays.size();
    }

    @Override
    protected boolean onTap(int index)
    {
        OverlayItem item = mOverlays.get(index);
        AlertDialog.Builder dialog = new AlertDialog.Builder(mContext);
        dialog.setTitle(item.getTitle());
        dialog.setMessage(item.getSnippet());
        dialog.show();
        return true;
    }
}

```

Figure 27-Itemized Overlay to mark points on the Google Map

Editing the Android Manifest

Another important file within an Android application is the manifest, which is entitled `AndroidManifest.xml`. It is within this document that you must define all intents and permissions. In the case of the Texas Paleontology app, the application needed to access the both the internet and the device's location. The application also needed a large number of intents

to be documented in the manifest. While I added the permissions graphically, the intents were easier to add programmatically.

In order to add a permission to the android manifest one must open up the AndroidManifest.xml file and choose the “Permissions” tab at the bottom. Next, click on “Add” and select “Uses Permission.”

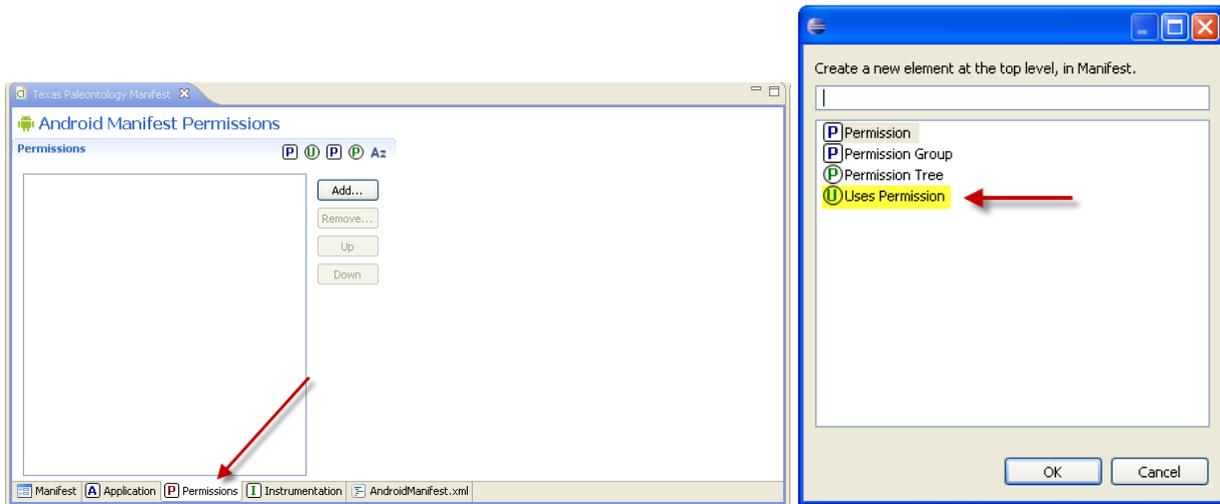


Figure 28

Figure 33

Once this choice is selected, a dropdown menu is provided with a number of permissions at the developer’s disposal. Any permissions selected will eventually trigger an alert message to an Android user who downloads the application to his or her phone.

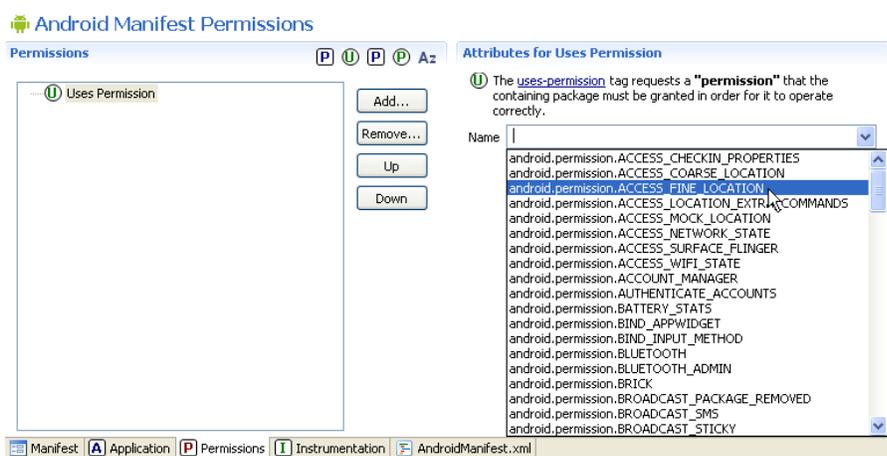


Figure 29

In addition to adding the appropriate permissions, the manifest also needs an Intent tag for any link or button used by the application. An example of such an Intent is shown below:

```
<activity android:name="TexasTertiaryActivity"></activity>

<activity
android:name="TexasTertiaryActivity"android:label="@string/app_name">

<intent-filter>
<action android:name="com.androidbook.texas1.TexasTertiaryActivity" />
<category android:name="android.intent.category.DEFAULT" />
</intent-filter></activity>
```

This code declares an activity with the name “TexasTertiaryActivity,” or “TexasTertiaryActivity.java” as it would appear in the source file. The label of the activity is the string entitled “app_name,” which in this case is Texas Paleontology. That label does not appear anywhere but above the screen, as shown in Figure 35. The action points to the package, which is named com.androidbook.texas1 and then tacks on the TexasTertiaryActivity class title at the end of it. The category, in the case of the Texas Paleontology application, is almost always listed as default.

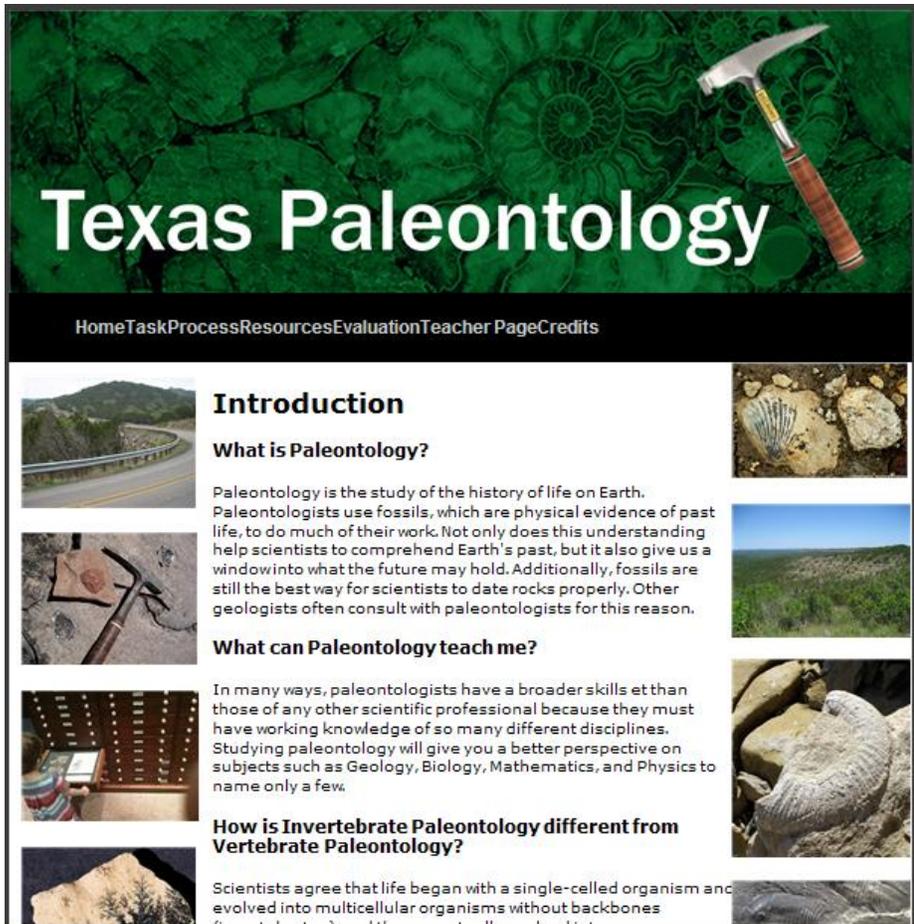


Figure 30

Developing the Texas Paleontology Webquest

In order to give students an opportunity to incorporate the Android application into their studies this project also contains a webquest that allows them that opportunity. A webquest is an online lesson in which students use internet resources to explore a particular topic. The Texas Paleontology webquest instructs students to design their own field trip using Google Maps and, if circumstances allow, actually take the trip. Since today's secondary students are a very visual generation it was important to create a website with a visually-appealing layout and color scheme. In order to achieve this goal it was necessary to incorporate cascading style sheets, or CSS, into the project instead of relying only on HTML.

Since I had never used CSS before I used the ebook entitled "Basic CSS" by Dan Thompson. This publication was an invaluable step-by-step guide on how to use CSS code. In addition, "Adobe CS3: Classroom in a Book," written by the Adobe Creative Team, was a useful guide in learning how to use the Dreamweaver website development program. Once I had a solid grasp of Dreamweaver and CSS the website development process continued smoothly. Figure below illustrates the final page layout. The complete website's final HTML and CSS code can be accessed by following the Dropbox link provided in the appendix.



Final Results

The Texas Paleontology application can be downloaded from the Android marketplace. After the user installs and opens the program they will see the splash screen appears while the application loads, followed by the main menu. Both screens can be seen in Figure 36.

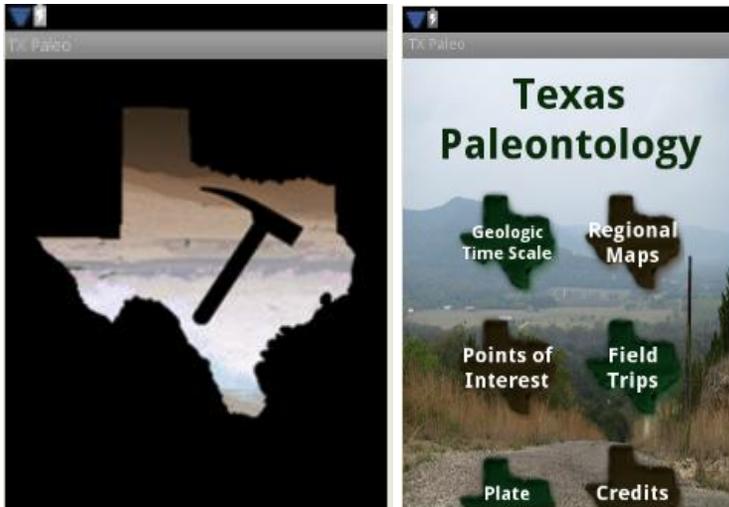
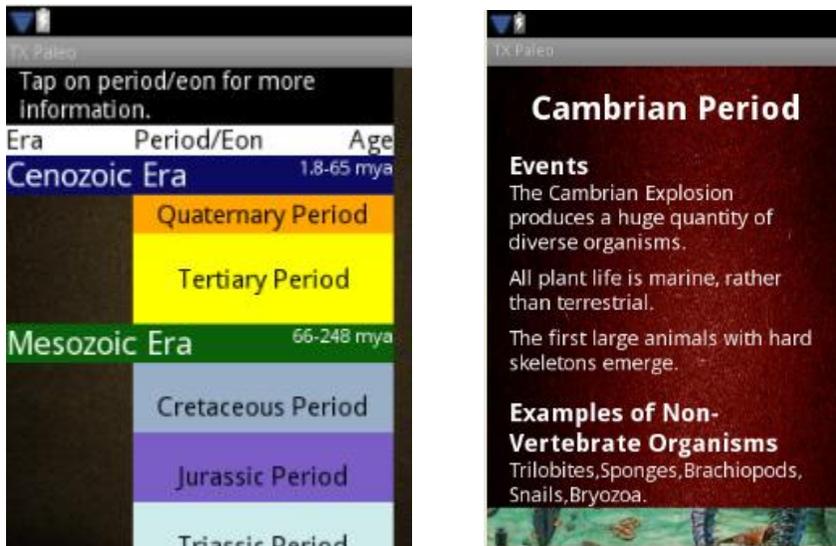


Figure 31

The Geologic Time Scale option takes the user to a graphical time scale in which each period can be tapped to reveal a description of that particular time period. Figure 37 shows the time scale screen along with several period screens.



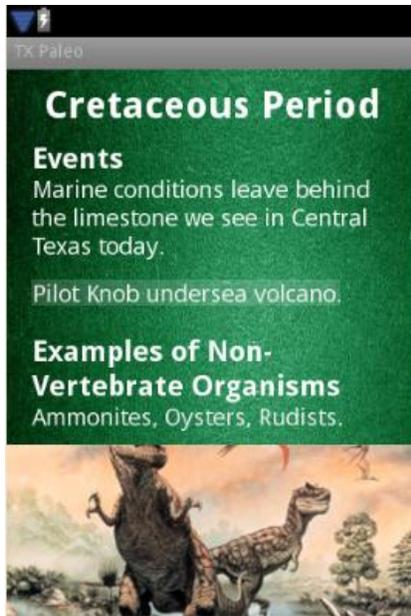


Figure 32

Another option users can select from the main menu is Regional Maps. On this screen, a portion of which is shown below, the application displays maps of Texas that reveal what time periods of Earth are exposed in different regions of the state. As in the Geologic Time Scale screen, users have a way to explore each time period. Tapping each individual map reveals the screen that describes the corresponding time period.

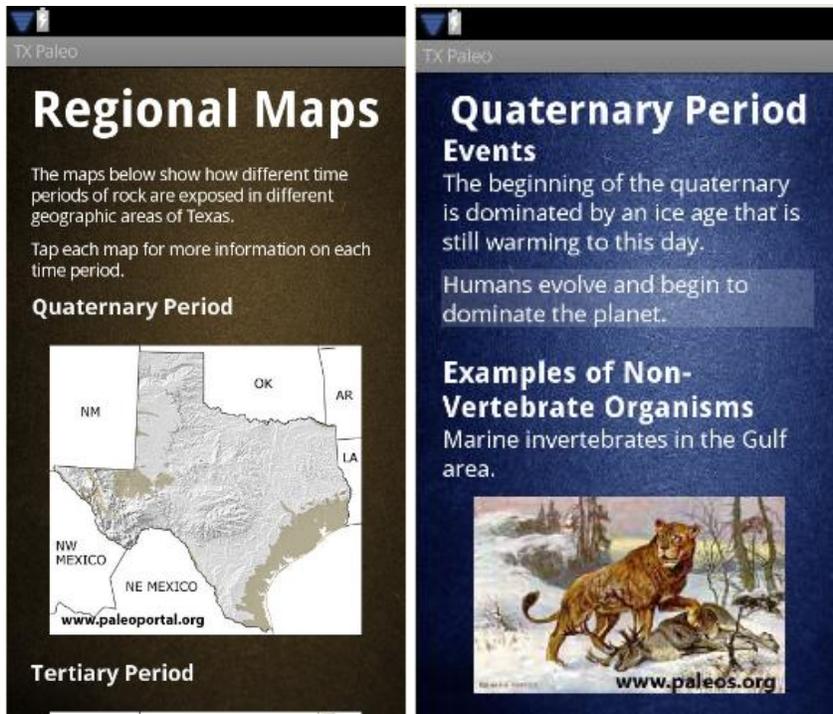


Figure 33

In order to help the user visualize the layout of the Earth during each chapter in the planet's history, the main menu includes the option Plate Tectonics so they can view the evolution of the continents starting with Pangaea and ending with the layout we know today. The top of this screen is shown in Figure 39.

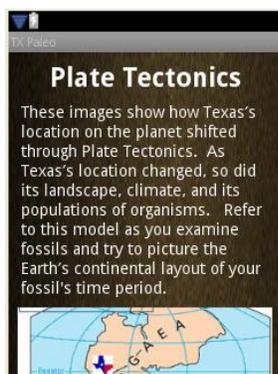


Figure 34

The Texas Paleontology application offers two options for exploring different significant sites throughout Texas. The first option is to select Points of Interest, which marks any

paleontological learning opportunities throughout the state. Such locations include museums, state parks, and other sources of fossils. Second, users can choose Field Trips to take specific trips throughout a particular area. Currently the only posted field trip is the Search for Devil's Eye, but more may be added in the future.

Finally, one of the advantages of mobile phone applications is the option they offer for later upgrades. Therefore, if any more significant locations, maps, or other enhancements become possible it is not too late to improve upon the existing application.

Conclusion

Before this project, the concept of creating a cell phone application did not enter my mind due to the seemingly complex process. However, throughout the course of the application development I came to realize that it is a very reasonable process for the average non-programmer to learn. Therefore, it is very likely that phone applications can be incorporated into classroom learning. Furthermore, it is also likely that cross-platform application development could eventually be used to enhance communication between teachers and parents.

Just like companies such as Teacherweb.com provide an easy way for educators to set up their own course websites, a company could similarly create a building environment for individualized phone applications that could perform tasks such as outline course curriculum and send alert messages when deadlines are approaching. This communication could also be applied to communication from building level administration. For example, at my high school an advanced student actually created an Android application that provides general information about the school as well as a map of how to get there. This idea could be enhanced by adding alert messages, teacher contact information, and any other useful features.

Furthermore mobile applications would be a terrific way to develop a project-based learning environment for students. For example, any subject could conceivably teach students how to create an application that is applicable to its material and continue to improve on that app throughout the school year. If every unit exam includes a practical that requires students to add quizzes, maps, or any other feature that might help teach the material, then at the end of the course the students will have created a useful product as well as a tool to review for the final exam. Also, this approach teaches the required content while simultaneously teaching programming skills.

No matter what form the use of mobile technology takes in the future of education there can be no doubt that it is only a matter of time before teachers realize that cell phones can be a valuable educational tool. As more capabilities are added to phones there will also be more applications for classroom use. As educators we would be wise to see these devices as potential tools for learning rather than threats to it. The benefits such integration would be beneficial to teachers and students alike.

Chapter 4: Application to Practice

My initial familiarity with the UTeach program was through colleagues who were participating in the UTeach Summer Masters program. As I listened to their discussions about lesson studies and legacy cycles I became intrigued and wanted to be a part of the program myself. Now, as my own UTeach experience comes to a close, I learned valuable lessons and gained a great deal of insight that has allowed me to grow as an educator. As my career progresses I hope to share my experiences for the benefit of students as well as other educators.

One of the most valuable lessons I learned during my time in this program was the value of taking science outside of the classroom and into the field. Most of my years as an educator have been spent teaching Biology, and most of the content requires us to experiment in an indoor laboratory environment. It was not until I experienced so many field trips through the Jackson School of Geosciences that I discovered the joy of taking science education into the great outdoors. Since science is an endeavor to understand the natural world, it makes sense to work with as much of that world as possible. This principal was completely lost on me until I studied with the Jackson School, but now I intend to incorporate it into my educational philosophy.

In addition to the desire to incorporate more field work into my curriculum whenever possible, the UTeach Summer Masters program also introduced me to a new set of tools to use in the classroom. For example, Dr. Stroup introduced us to the idea of generative learning, where instead of providing one answer to a single question; students are challenged to generate several questions for a single answer. This method was useful when I taught protein synthesis the following year. In the past I had asked students to identify one protein that would be formed from a certain sequence. Instead, I have begun to provide a protein and ask students to come up with as many DNA sequences as possible that would all form that one protein. The new lesson

has resulted in better understanding of the function of DNA and the protein synthesis process not only for my students, but also those of my colleagues who decided to try the technique themselves. In the future I hope to be able to utilize more techniques I learned in the UTeach program and help other educators incorporate them as well.

Another important skill I gained from the Summer Masters program is the ability to better evaluate statistics. Since data-driven curriculum is such a large push right now it is useful to be able to distinguish between relevant statistics and misleading ones. Before I took statistics with UTeach I already had a basic working knowledge of statistics, but it was the fall and spring semesters of UTS 180 that gave me the ability to evaluate the credibility of statistics. Not only has this skill come in handy while evaluating test scores, but it also proves useful when sorting through the huge amount of propaganda directed toward educators. Education is big business, and any doubts of that fact can be quickly dispelled by walking through the vendor hall of the Conference for the Advancement of Science Teachers or any other educational convention. A huge number of companies use statistics as a tool to market educators, so it is important to be able to understand whether or not such statistics are valid. The UTeach program helped improve my ability to evaluate statistics and that ability helps benefit my students and my district.

Another important quality instilled in me by the UTeach Summer Masters program is the need to sometimes look beyond test scores in order to evaluate learning. In today's environment of high-stakes tests it is easy to become wrapped up in benchmark scores and TAKS data and lose sight of critical thinking and other skills that multiple choice tests cannot accurately measure. During the class EDC 385G: Knowing and Learning in Math and Science Education, we learned how test scores were written for the purpose of placing students on a bell curve, and therefore

include a number of items that are completely insensitive to teacher instruction. While this idea is not a popular one within the halls of a public school, it has been useful for me to keep in the back of my mind after I work extremely hard and then see only lackluster standardized test scores. This idea that education cannot be measured by test scores alone has been instrumental in keeping me from complete disillusionment with my ability to teach at-risk kids

Overall my UTeach experience has been so positive that I am extremely thankful for being admitted to the program. At the time of my application process I was confident in my ability as a science teacher, but I was nervous about my lack of undergraduate science degree. Although I took a great deal of science classes in college I still graduated with a degree in History, which I worried would bar me from the UTeach Summer Masters program. Since beginning the program though, I have learned so much and grown so much as an educator that I will always be grateful to UTeach and the University of Texas for allowing me this opportunity, and to the Jackson School of Geosciences for making it so memorable. I can only hope, in the years to come, that I can use my UTeach experience to better serve my students as well as the educational community.

Appendix

All code used in designing the “Texas Paleontology” application can be accessed at the following Dropbox link:

<http://dl.dropbox.com/u/18467840/TexasPaleo.zip>

The Texas Paleontology application can be downloaded onto an Android phone by accessing the following link:

<https://market.android.com/search?q=texas+paleontology&so=1&c=apps>

All code for the Texas Paleontology webquest can be accessed at the following Dropbox link:

<http://dl.dropbox.com/u/18467840/MastersProject2.zip>

Bibliography

- Adobe Creative Team. 2007. Adobe Dreamweaver CS3: Classroom in a Book. Berkeley, CA: Adobe Press
- Bell, Frances. 2011. Connectivism: Its Place in Theory-Informed Research and Innovation in Technology-Enabled Learning. *International Review of Research in Open and Distance Learning*. Mar 2011. Vol. 12, No. 3.p 98-118
- Darcey, Lauren, Conder, Shane. 2010. *Sams Teach Yourself Android™ Application Development in 24 Hours*. Indianapolis, IN: Sams
- Corn, A.L., Patterson, W., Love, C., Erin, J.N. 1994. The Use of Mobile Phones by Iterant Teachers of Students with Visual Disabilities. *Journal of Visual Impairment & Blindness*. Sep-Oct 1994, Vol. 88, No. 5p.446-57
- Domitrek, Julie, Raby, Rebecca. 2008. Are You Listening to Me? Space, Context and Perspective in the Regulation of Mp3 Players and Cell Phones in Secondary School. Sep 2008, No. 8p.1.1-33
- Gilroy, Marilyn. 2004. Invasion of the Classroom Cell Phones. *Education Digest: Essential Readings Condensed for Quick Review*. Feb 2004, Vol. 69. No. 6.p.56-60
- Hartnell-Young, Elizabeth, Vetere, Frank. A Means of Personalizing Learning: Incorporating Old and New Literacies in the Curriculum with Mobile Phones. *Curriculum Journal*. Dec 2008, Vol. 19, No. 4.p.283-292
- Jing, Lei. 2009. Digital Natives as Preservice Teachers: What Technology Preparation is Needed? *Journal of Computing in Teacher Education*. Sep 2009, Vol. 25. No. 3.p.87-97
- Johnson, Clarence, Kritsonis, William Allan. 2007. National School Debate: Banning Cell Phones in Public Schools: Analyzing a National School and Community Relations Problem. *National Forum of Educational Administration and Supervision Journals*. Vol. 25, No.4
- Johnson, Doug. 2004. Ban or Boost Student-Owned Technology? *School Administrator*. Nov 2004, Vol. 61. No10.p8
- Jones, Ann. 2010. Affective Issues in Learning Technologies: Emotional Responses to Technology and Technology's Role in Supporting Socio-Emotional Skills.
- Lee, Wei-Ming. 2011. *Beginning Android™ Application Development*. Indianapolis, IN: Wrox
- Meier, Reto. 2010. *Professional Android™ 2 Application Development*. Indianapolis, IN: Wiley Publishing.

- Murphy, Mark L. 2010. *Beginning Android™ 2*. New York, NY: Apress.
- Obringer, S. John, Coffey, Kent. 2007. Cell Phones in American High Schools: A National Survey. *Journal of Technology Studies*. Vol. 33, No.1.p.41-47
- Park, Yeonjeong. 2011. A Pedagogical Framework for Mobile Learning: Categorizing Educational Applications of Mobile Technologies into Four Types. *International Review of Research in Open and Distance Learning*. Feb 2011. Vol. 12, No.2.p78-102
- Pellegrino, James W., Quellmalz, Edys S. 2010-2011. Perspectives on the Integration of Technology and Assessment. *Journal of Research on Technology in Education*. Vol. 43. No. 2.p.119-134
- Reinders, Hayo. 2010. Twenty Ideas for Using Mobile Phones in the Language Classroom. *English Teaching Forum*. Vol. 48, No.3.p.20-25
- Roberson, James H., Hagevik, Rita A. 2008. Cell Phones for Education. *Meridian: A Middle School Computer Technologies Journal*. Vol. 11, No.2p.5
- Smith, James. Frieson, Jeff. 2011. *Android Recipes: A Problem-Solution Approach*. New York, NY: Apress
- Steele, James. To, Nelson. 2010. *The Android™ Developer's Cookbook: Building Applications with the Android™ SDK*. Boston, MA: Pearson Education.
- Thompson, Dan. 2007. *Basic CSS*.
- Valk, John-Harmen, Rashid, Ahmed T., Elder, Laurent. 2010. Using Mobile Phones to Improve Educational Outcomes: An Analysis of Evidence from Asia. *International Review of Research in Open and Distance Learning*. Vol. 11, No.1.p.117-140