Diploma Thesis

A Development of a Taxonomy for the Use of Tablets in Schools

Sabrina Huber

Institute for Information Systems and Computer Media
Graz University of Technology

TU Graz
Graz University of Technology

Advisor: Assoc. Prof. Dipl.-Ing. Dr. techn. Martin Ebner

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Abstract

The current media landscape is changing and growing at a high pace which is increasingly affecting the school sector. Numerous schools all over the world have already focused on the value added to lessons by tablet computers, such as Apple's iPad. A vast size of learning applications and ways to transfer subject matters are provided on and through such devices. However, at the present time, there is little experience with respect to the didactically reasonable inclusion of tablets in schools. Therefore, the motivation of this thesis is to provide a general overview of the didactical integration of tablets, in this case, Apple's iPad. Within a field experiment educational apps are being tested and evaluated according to the Austrian curriculum for foreign languages as well as iOS Human Interface Guidelines that focus on user interface and user experience. The investigation shows that almost all objectives, teaching tasks and concepts of the curriculum can be promoted with the aid of tablet computers. Nevertheless, a lot of prerequisites in terms of hardware and software are required for a successful integration of tablets. In addition, there are some drawbacks, such as the lack of teacher training and slower text production.

Keywords *tablet computers, mobile learning, human interface guidelines, curriculum, L3T, school, teaching, learning, media didactics, media pedagogy*

Kurzfassung

Die aktuelle Medienlandschaft verändert sich mit steigendem Tempo und ist von zunehmender Bedeutung für den Schulsektor. Zahlreiche Schulen in der ganzen Welt haben den Wert von Tablet Computern, wie zum Beispiel Apples iPad, für den Unterricht erkannt und setzen diese bereits im Unterricht ein. Tablets bieten eine Vielzahl von Lernapplikationen und Möglichkeiten den Stoff vielseitig darzustellen. Zum aktuellen Zeitpunkt gibt es jedoch wenig Erfahrung in Bezug auf eine didaktisch angemessene Einbeziehung von Tablets in Schulen. Die Motivation dieser Arbeit ist es daher, einen allgemeinen Überblick über die didaktische Integration von Tablet Computern, in diesem Fall Apples iPad, zu schaffen. Innerhalb eines Feldversuches werden Applikationen für den Schulsektor unter Berücksichtigung des österreichischen Curriculums für Fremdsprachen und iOS Human Interface Guidelines, die sich auf User Interface und User Experience beziehen, evaluiert. Die Untersuchung zeigt, dass fast alle Ziele, Lehraufgaben und Konzepte des Curriculums mit Hilfe von Tablet Computern gefördert werden können. Dennoch sind viele Voraussetzungen in Bezug auf Hard- und Software für eine erfolgreiche Integration von Tablets nötig und es gibt einige Nachteile, wie zum Beispiel das Fehlen der Lehrerweiterbildung auf diesem Sektor und langsamere Textproduktion seitens der Schüler.

Schlüsselwörter *tablet computer, mobiles lernen, human interface guidelines, curriculum, L3T, schule, lehren, lernen, mediendidaktik, medienpädagogik*

Statutory Declaration

I declare that I have authored this thesis independently, that I have not used other than the declared sources / resources, and that I have explicitly marked all material which has been quoted either literally or by content from the used sources.

Eidesstattliche Erklärung

Ich erkläre an Eides statt, dass ich die vorliegende Arbeit selbstständig verfasst, andere als die angegebenen Quellen/Hilfsmittel nicht benutzt und die den benutzten Quellen wörtlich und inhaltlich entnommene Stellen als solche kenntlich gemacht habe.

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Graz, April 2012   Sabrina Huber

"Get over the idea that only children should spend their time in study. Be a student so long as you still have something to learn, and this will mean all your life."

Henry L. Doherty

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1 Introduction

1.1 Motivation

The current media landscape is changing and growing at a high pace. The area of application of new devices is broad and expanding, especially in the field of smart phones and tablet computers. The latter are of increasing importance for the school sector, where enormous changes have taken place in numerous schools within the last decades. In terms of media, changes started with supportive devices like the overhead projector and the whiteboard and moved on to portable and classroom projectors and personal computers to enrich learning (Ebner & Kroell, 2011).

Nowadays, more and more schools focus on the value added by tablets, such as Apple's iPad. Not only is this device ready for operation instantaneously but also very light and therefore a great relief for students. Further, a vast size of learning applications and ways to transfer subject matters are provided on and through such devices. A variety of skills for all subjects, such as listening, reading and reasoning skills can be promoted through a range of activities and applications.

The current trendsetter, Apple's iPad, is making its way towards schools with 1.5 million devices in the educational sector in the US offering more than 20.000 educational applications and according to announcements that number will be increasing soon ("Largest Deployment of iPads in Schools," 2012).

In Austria, several schools have already started pilot projects, in primary as well as secondary schools. In 2010, for instance, a secondary modern school with special focus on computer science[1] and a commercial high school[2], both located in Burgenland, have started a one-year project using iPads in class. Electronic learning content is being evaluated by the local teaching training college ("Pädagogische Hochschule Burgenland"[3]) according to didactical and pedagogical values. The project in the secondary modern school will be running for three to four years altogether and students

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[1] http://www.hs-jennersdorf.at/
[2] http://www.hak-eisenstadt.at/
[3] http://www.ph-burgenland.at/

will be able to use the devices in all subjects. The main goal of the project is the improvement of lessons through interactive use.

At the present time, there is little experience with respect to didactically reasonable inclusion of tablets in schools. Additionally, no model of how to integrate the devices in different subjects has been released yet. Therefore, the motivation of the work in hand is to give a general overview of the didactical integration of tablets, in this case, Apple's iPad. Educational apps are being tested and evaluated according to Human Interface Guidelines that focus on user interface and experience. Particular attention is being directed to the development of a model to successfully integrate the tablet in English lessons which then can be fully transferred to other language and partially to all other subjects.

1.2 Problems and Objective Targets

Since iPads have just been considered as possible forms of new media in some schools there are hardly any guidelines or models for their successful integration. In addition, no contents have been adapted to be used on the iPad for the longer term. However, there is a large amount of free and low-priced apps that can be downloaded from Apple's App Store which is constantly changing and expanding and even provides an educational category with apps for teachers and students. Nonetheless, a lot of them are only available in English and are more or less useless for lower grade students who do not understand the language and therefore do not get the tasks. Some apps, however, are quite intuitive and their menus can easily be understood by young learners who have no or little understanding of the English language. The main problem regarding the educational sector of the app store is that the applications are often not suitable for long-term use.

Nevertheless, the lack of suitable applications is not the biggest issue, since there are numerous other ways to include the iPad into lessons. Another important problem to be solved is the teaching training as well as their postgraduate training in respect of teaching with new media. When teachers from different schools were asked whether they would put the iPad to use in their classes, the majority answered that they did not have any idea how they could integrate it but if they knew how they would take it into consideration. Willingness and interest from the teachers' side is present and a requisite full analysis of all fields of required application are reason enough to establish a model for the integration of tablets in schools.

1.3 Outline

The next chapter will provide a general introduction to media didactics and tablet computers and will then focus on the iPad, its specifications and their significance for the use in schools.

Then the current situation of iPads in schools in the United States, Germany and Austria will be presented and compared regarding application scenarios and strategies where conclusions regarding possibilities and limitations will be drawn later on.

In addition to that, prerequisites for teaching, in terms of hardware and software will be listed. The tablet on its own is not enough for successful teaching and several additional tools are needed for its use in the classroom. Students' background, especially regarding their media competence, previous knowledge of tablet computers as well as their attitude towards the iPad will be reflected afterwards.

The next chapter will be an analysis of the realisation of the use of iPads with regard to the Austrian curriculum for foreign languages. Educational objectives and teaching tasks will be discussed regarding their possible promotion, realisation and support with the iPad. Before presenting future perspectives and analogies to other subjects than language subjects, iPad Human Interface Guidelines that are important when it comes to the practical use of the device will be dealt with.

2 Media Didactics

Beside traditional media, new information and communication technologies are the centre of media education. According to Holzinger (2001), media act as intermediary of content. He divides media pedagogy in media didactics, media education and media research (see figure 2.1).

The first term, media didactics, particularly deals with the development, use and evaluation of media. Further, Holzinger states that the purpose of media didactics is to point out possible ways, forms and modes of operation of the use of different media, e.g. in school. Other researchers define the term in a similar way, e.g. Tulodziecki (1997) states that 'media didactics is a part of didactics in which all considerations that deal with using media or media offering to reach pedagogically justified objectives.'

The second division of media pedagogy relates to media and their use, meaning and effect on individuals as well as the society they live in. Learners should know how to deal with media in socially responsible ways from an early age.

Furthermore, Michael Kerres (1998), professor of education (media didactics and knowledge management), defines aspects of didactically reasonable learning environments:

1. a composition of various media

2. encouragement of motivation
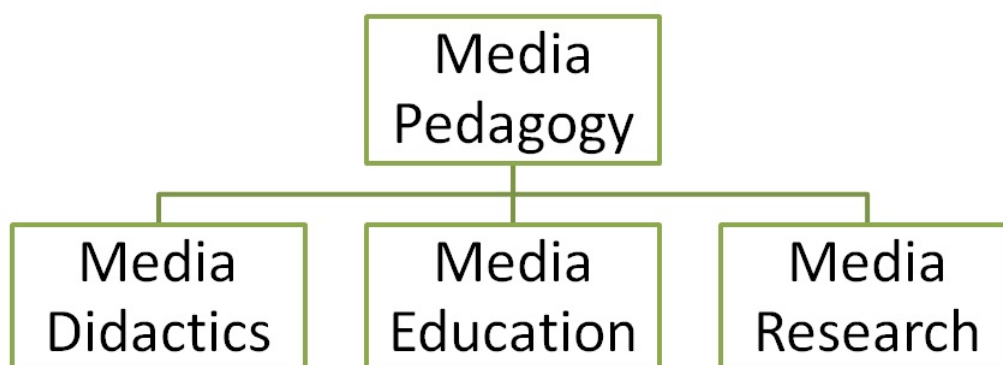
Figure 2.1: Media Pedagogy (own adaption of Holzinger, 2001)

3. learners' learning processes should be supported by their environment

Kerres also mentions six didactical functions of multimedia, namely learning motivation, knowledge representation, knowledge organisation, the management of learning processes through media, support of constructing knowledge and interpersonal communication. Those functions will be examined in the practical part of the work in hand.

2.1 Awareness of Media Didactics

New media in education provide numerous advantages such as reusable learning objects and a better visualisation of difficult subject matters. On the other side, the market place is largely determined by technology and didactical factors are often neglected. In the following subchapters more positive and negative aspects of new media in the educational sector will be presented.

Advantages of New Media

Considering perceptions of media didactics, the advantages of the use of new media can be summarised as follows:

- **Lessons are interactive.** With computer-based courses, students' actions and inputs are involved.

- **Abstract contents can be made descriptive through simulations.** Difficult subject matters can be displayed through simulations, but also through graphics and videos, which leads to the next advantage:

- **Audio and video files can be embedded easily.**

- **Traditional linear thinking and learning concepts are rethought and more flexible concepts similar to networks can be realised.**

- **Learning controls can be individualised.** There are several methods of revisions.

- **Courses can be adapted to special needs.** Students can improve skills individually.

- **Asynchronous collaboration can be realised.** When doing group work, e.g. group portfolios, students can combine their tasks online but do not have to do it at the same time.

- **Learning can take place location- and time-independent.** For instance, cyber homeworks can be done at any time within the deadline.

- **Learning can take place just-in-time.** On the other hand, students can do web-based tutorials or use other tools on the information they need to fulfill certain tasks.

- **Learning objects are reusable.** Teachers can offer their courses to their next class and students can do certain tasks as often as they want or need to.

- **Documentations and revisions are easier to realise.**

- **Individual learning is possible according to the learners' speed.** That also implies the next advantage:

- **Different pre-knowledge can be balanced in a better way.**

Disadvantages of New Media

This section focuses on drawbacks the use of new media implies which partially refers to the users themselves.

- **Students first have to learn how to deal with new media.** They often do not share the same foreknowledge.

- **The minority of educators work in the field of e-learning or use new media widely.**

- **The market place is determined by technology and technicians** which leads to the next point, the lack of didactical factors that often get lost in spite of great technological backgrounds:

- **The presentation of learning content is often based on technical instead of didactical factors.**

- **Didactics is often not considered when creating e-learning solutions.**

- **Learning in front of a screen is more wearying than learning in front of paper.**

- **Self-discipline and learning competence is required.** When students learn time-independent they have to be motivated to fulfill their tasks, e.g. cyber homeworks.

- **Reduced social contacts to teachers and colleagues make the exchange of experiences harder and questions can be left unclear.** Therefore it is of great importance to have sufficient communication channels, like forums and chats where students can asks questions.

- **Some explanations of teachers are reduced,** e.g. to written form only which could leave room for different interpretations.

3 Introduction to Tablet Computers

One of the most significant technologies of the future are tablet computers. The first concept of portable computers with an intuitive user interface was the Dynabook in the 1960s where Alan Kay created the idea of a Personal Computer (PC) for children (Steinberg, 2003).

In 2001 Microsoft introduced the term tablet PC and outlined the concept of the Microsoft Tablet PC which should be deployed for external work in business. However, extensive usage could not be accomplished since the devices where too expensive and their usability left much to be desired (Bright, 2011).

Later, in 2010, the iPad was released by Apple Inc. which focused more on usability and simplicity, proved to be more cost-effective and formed the commercial market for tablet computers. With Apple's iPhone the stage was already set to multitouch finger-sensitive touchscreen interface of iOS mobile operating system which the iPad could benefit from later on.

Parsons and Oja (2010) define tablet computers or tablets as 'portable computing devices featuring a touch-sensitive screen that can be used as a writing or drawing pad'. Further, they state the differences of various tablets, such as the slate and the convertible tablet. Although the former are not equipped with a built-in keyboard, an external one can be attached, which can function as a dock for tablets and provides additional comfort. The iPad, for instance, can be put in an upright position with the aid of its dock, which allows the additional connection of several accessories such as adapters.

The convertible tablet, on the other hand, is more similar to a laptop and usually heavier than a slate. It has a rotating display that is attached to the body with a pivot joint which enables a rotation of 180°, so the display can be flapped down right on top of the keyboard. To enable a more flexible usage, several producers have aimed to reduce or eliminate weaknesses like the attachment with the pivot. In contrast, they have created sliding designs where the screen slides up, e.g. in the Samsung Sliding PC7 Series which integrates the advantages of tablets and notebooks (cf. figure 3.1).

Figure 3.1: Convertible Tablet. Samsung Sliding PC7 Series.
Source: http://www.samsung.com/us/news/newsRead.do?news_seq=19779 (retrieved 12/01/2012)

3.1 iPad

Apple's iPad, the most popular tablet computer and trendsetter, was sold about one million times within just 28 days (Ebner & Kroell, 2011). First and foremost, the device was intended to be a platform for media such as books, films, music, applications and web content. The following subchapters deal with the device's operating system as well as its technical specifications.

3.2 Operating System (OS)

All versions of the iPad run iOS, Apple's mobile operating system, which supports multitasking nowadays. At first, it was developed for the iPhone and now also supports the iPod Touch, the Apple TV and the iPad.

The user interface is grounded on the concept of direct manipulation, a human-computer interaction style which allows the user to manipulate objects such as a rectangle directly by dragging its corners with a mouse (Frohlich, 1993).

Further, the user interface is based on multi-touch gestures to perform several actions and works on Apple devices that run iOS. With one finger, for instance, objects can be tapped to be selected. The one-finger swipe is used to move objects between two positions. Also, this gesture is known as scroll gesture because the user can scroll lists.

Another gesture is the pinch, that usually implies the thumb and a finger to zoom in or out a position, e.g. a picture. Additionally, a page or an image can be rotated when the thumb remains in one position and the second finger rotates around it.

Furthermore, iOS is derived from Mac OS X, a series of Unix-based operating systems and has four abstraction layers, namely the Core OS layer, the Core Services layer, the Media layer and the Cocoa Touch layer. Currently, iOS 5.0.1. is on the market and uses about 770 megabytes of the storage which varies for different models (Haslam, 2007). iOS 4 was released in June, 2010 just three days before the iPhone4 to reduce the strain on Apple's servers where it was the first free upgrade of the OS, before Apple charged $4.99 for each upgrade ("iPad licensing agreement specifies paid annual OS updates," 2010).

Another important innovation since iOS4 is the full support of multitasking which was limited to several apps before. Seven background application programming interfaces (APIs) enable this feature ("About iOS App Programming," 2011).

1. Background audio – this application allows audio focused apps to continue streaming in the background as long as the audio or video content lasts.

2. Voice over IP – voice over the internet protocol - calls can be received while the app is in the background , the apps are suspended when a phone call is not in progress.

3. Background location – the application is notified of location changes.

4. Push notifications – they allow applications to get updates without keeping each app's process alive to check for notifications.

5. Local notifications – they are scheduled to be delivered at a pre-set time and work together with other background APIs, e.g. the user can be notified when a download of a podcast is completed.

6. Task completion – an application asks for additional time to complete a certain task. Because iOS limits the quantity of time an application can continue things in the back, there is actually no reason to manage it, apart from limiting data usage.

7. Fast app switching – with this API apps can be exited while the state of them is saved to Random-access memory (RAM). When you go back, you are at the same point and it seems the app was there the whole time, where it was actually paused in a small state in RAM. However, if an app requires too much RAM, e.g. a game, iOS will automatically kill the least used apps to free space until the needed RAM is free.

Figure 3.2: Technical Specifications, iPad2
Source: http://www.apple.com/ipad/specs/ (retrieved 28/12/2011)

With iOS 5 the iCloud service, a cloud storage, was introduced. It enables the storage of data, e.g. music files or documents, on remote computer servers that can be downloaded to iOS-based devices and PCs running Mac OS X or Microsoft Windows ("Apple Introduces iCloud," 2011).

The iPad's operating system version appears on the 'About' screen (Settings → General → About).

3.3 Technical Specifications

The iPad's size and weight are between laptops and present-day smart phones which is convenient for schoolchildren (see table 3.1 and figure 3.2). This chapter deals with the device's resolution, screen and display and then focuses on its performance and measurements. Since the second-generation iPad was used within the field experiment, this chapter will mainly provide information on this particular device.

3.3.1 Display, Cameras, Battery Life

The display used is a 9.7 inch light-emitting diode (LED) backlit glossy widescreen and a multi-touch display, that comes to a resolution of 768 x 1024 pixels in portrait mode, with In-Plane Switching technology (IPS). IPS involves an Liquid Crystal Display

(LCD) technology developed by the Japanese manufacturing corporation Hitachi to create bigger viewing angles and high-quality colour reproduction. Hence, the iPad has a wide viewing angle of up to 178 degrees. In comparison, other LCD technologies often have more limited viewing angles, particularly in the vertical direction (Brandrick, 2010). Further, guaranteeing that the iPad could be used in different modes without significant problems regarding the viewing angle, was of prime importance for the creators. In particular, when it comes to rotating the device.

In addition, the device is fingerprint-resistant having an oleophobic coating, i.e. if there are oily fingerprints on the screen they can be wiped off fairly easily because of the outside layer.

In contrast to the first-generation iPad, the iPad2 has two cameras that represent one of the major changes and enable taking photos, recording high-definition (HD) videos and making free video calls. The front-facing camera is particularly useful for snapping pictures of oneself since the picture can be seen while taking it, recording videos or receiving video calls, e.g. with the integrated app FaceTime. However, this camera is not as powerful as the second camera, the rear camera, because it only records in standard-definition (SD) with a resolution of 640x480 since it was meant to be there mainly for video calls.

In comparison, the rear camera able to tape HD videos which have at least 720 lines of resolution at 30 frames a second, where more lines indicate a higher resolution. The still camera can take pictures at 960×720 resolution which is equivalent to 0.69 megapixels.

Regarding battery life, all iPad generations have a built-in 25-watt-hour rechargeable lithium- polymer battery that lasts up to 10 hours when surfing the internet on Wi-Fi, watching video or listening to music. When the 3G data network is used, the battery lasts up to 9 hours. The device is charged via power adapter or USB to a computer ("Technical Specification," 2011).

3.3.2 Input/Output

On the bottom edge of the device there is the 30-pin dock connector port that serves to recharge the iPad or connect it to a Mac or PC. Also, adapters, such as the Apple Video Graphics Array (VGA) adapter, connect from the dock. Further, on the bottom the built-in speaker is located with a volume control on the side of the device. In order to listen more privately, headphones that come with the standard 3.5-millimeter stereo miniplug can be plugged in. Consequently, portable speakers with the same jack plug can be used. Also, wireless connection via Bluetooth headphones, namely those that are promoted as Advanced Audio Distribution Profile (A2DP), is possible.

The headphones have to be paired with the iPad once in the Bluetooth settings (under Settings → General). Next to this socket, the imperceptible microphone is located on the iPad1 while it can be found above the front- camera on the newer generation iPad.

In contrast to most mobile phones that require a standard subscriber identity module (SIM) card (25 mm × 15 mm), the 3G iPad connects to the internet through a so-called micro-SIM card (15 mm × 12 mm) that only differs from a standard SIM card in its form. The SIM card slot only exists on the 3G models and consists of a micro-SIM tray on which the actual micro-SIM card has to be placed and that can be opened with a supplied eject tool to open the SIM door (Sadun, 2011).

3.3.3 Sensors

The iPad 2 is equipped with a three-axis gyroscope which allows the recognition of movements as well as its speed and angle, a feature that is mainly attractive to game developers. Additionally, internal accelerometers, electromechanical devices that measure acceleration forces, are required by certain programs to respond to shaking the iPad, e.g. to rotating the screen. According to Ray (2010) an accelerometer 'can be used to determine the orientation, movement and tilt of the device. With the iPad's accelerometer, a user can control applications by simply adjusting the physical orientation of the device and moving it in space.'

Further, the iPad comes with an ambient light sensor that balances the brightness of the screen and the battery life which would otherwise decrease noticeably. In order to balance, the sensor tests the ambient light according to its brightness, i.e. 'If the ambient light is dim, the iPad screen is easier to read, so the sensor dims the screen brightness to save battery power. If the ambient light is bright, the iPad screen is harder to see, so the sensor brightens the screen to improve readability' (McFedries, 2011). In case, the auto-brightness is not satisfactory, the user can also adjust the brightness themselves (Settings – Brightness & Wallpaper).

Table 3.1: Own adaption of Technical Specifications ("Technical Specification," 2011)

	Wi-Fi Only iPad	**Wi-Fi Only iPad 2**	**Wi-Fi plus 3G iPad**	**Wi-Fi plus 3G iPad 2**	**Wi-Fi Only iPad 3**	**Wi-Fi plus 4G iPad 3**
Width	7.47 inches (19 cm)	7.31 inches (18.6 cm)	7.47 inches (19 cm)	7.31 inches (18.6 cm)	7.31 inches (18.6 cm)	7.31 inches (18.6 cm)
Depth	0.5 inches (1.3 cm)	0.34 inches (0.88 cm)	0.5 inches (1.3 cm)	0.34 inches (0.88 cm)	0.37 inch (9.4 mm)	0.37 inch (9.4 mm)
Weight	1.5 pounds (0.7 kg)	1.33 pounds (0.6 kg)	1.6 pounds (0.7 kg)	1.35 pounds (0.6 kg)	1.44 pounds (652 g)	1.46 pounds (662 g)
Storage Capacity	16 GB, 32 GB, 64 GB					
Storage Type	Solid state					
Processor	1GHz Apple A4	1GHz Apple A5	1GHz Apple A4	1GHz Apple A5	1GHz Apple A5X	1GHz Apple A5X
Battery Life	10 hours					
Battery Lifespan	1,000+ charges					
Pre-loaded Apps	12	17	12	17	19	19

Table 3.1: (continued)

	Wi-Fi Only iPad	Wi-Fi Only iPad 2	Wi-Fi plus 3G iPad	Wi-Fi plus 3G iPad 2	Wi-Fi Only iPad 3	Wi-Fi plus 4G iPad 3
Case	Recycled aluminum					
Wi-Fi	802.11a/b/g/n					
Bluetooth	2.1 + EDR technology				4.0	
3G	None	None	UMTS/HSDPA (850, 1900, 2100 MHz) GSM/EDGE (850, 900, 1800, 1900 MHz) Data only	UMTS/HSDPA (850, 900, 1900, 2100 MHz) GSM/EDGE (850, 900, 1800, 1900 MHz) CDMA EV-DO Rev. A (800, 1900 MHz) Data only	None	UMTS/HSPA/ HSPA+/ DC-HSDPA (850, 900, 1900, 2100 MHz) GSM/EDGE (850, 900, 1800, 1900 MHz) CDMA EV-DO Rev. A (800, 1900 MHz) Data only
4G	None	None	None	None	None	4G LTE (700, 2100 MHz)
Video	Up to 720p, 30 frames per second	Up to 720p, 30 frames per second, 1080p video out	Up to 720p, 30 frames per second	Up to 720p, 30 frames per second, 1080p video out	Up to 1080p, 30 frames per second, 1080p video out	Up to 1080p, 30 frames per second, 1080p video out

Table 3.1: (continued)

	Wi-Fi Only iPad	Wi-Fi plus 3G iPad	Wi-Fi Only iPad 2	Wi-Fi plus 3G iPad 2	Wi-Fi Only iPad 3	Wi-Fi plus 4G iPad 3
Micro SIM Card Tray	None	One	None	One	None	One

System Require- ments	• Internet access
	• Syncing with iTunes on a Mac or PC requires:
	  – Mac: OS X v10.5.8 or later
	  – PC: Windows 7; Windows Vista; or Windows XP Home or Professional with Service Pack 3 or later
	
	iTunes 10.6 or later (free download from http://www.itunes.com/download)					

Environ- mental Require- ments	• Operating temperature: 32° to 95° F (0° to 35° C) • Nonoperating temperature: -4° to 113° F (-20° to 45° C) • Relative humidity: 5% to 95% noncondensing • Maximum operating altitude: 10,000 feet (3000 m)					

0.7 kg
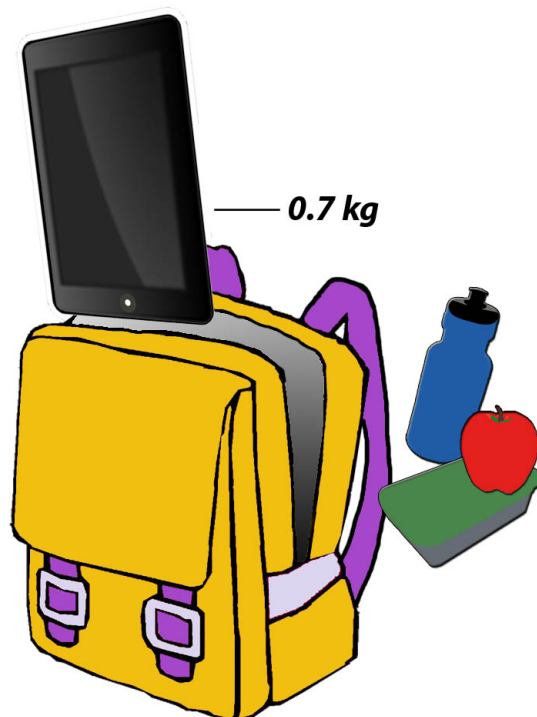
Figure 3.3: Lighter schoolbags (own drawing)

3.3.4 Significance of Technical Specifications for the School Routine

With a size of $241 \times 186 \times 8$ mm the iPad is smaller than A4 format which most school exercise books come in. The device easily fits in schoolbags and with its weight of only 0.7 kilograms (or 0.6 kilograms if it is without 3G) it can be a huge relief for students if they do not have to carry extra books or notepads home or to school (see figure 3.3). The much discussed issues about heavy schoolbags and how too much weight affects students' backbones negatively, would not come up anymore. At this point, the question arises whether it is generally possible to go totally paperless in schools. An answer will be provided in chapter 8 that deals with electronic textbooks.

In addition, the iPad's impressive battery life is eminently suitable for school use. As aforementioned, it lasts up to 10 hours, e.g. when surfing the internet on Wi-Fi. However, when using the device in school, students will not need the device the whole lessons. For instance, it will be on standby mode or simply run at idle when the teacher is showing videos on a projector or is explaining something. Since numerous apps do not require the maximum utilization, the battery life easily serves for two schooldays. Of course, if students are allowed to take the iPads home or own them, they might

have to charge them daily depending on the frequency of use. Besides, the battery life can be extended further with simple steps, such as turning off the Wi-Fi if it is not needed for a longer time, turning off the timing for data fetching, e.g. in email apps, or toning down the brightness. In school, suitcases for the safe and neatly arranged storage are also useful for charging the iPads without tangled wires.

4 Current Situation of iPads in Schools

Over the past months, more and more schools all over the world have started pilot projects using the iPad as new medium. This chapter will provide an overview of longer-term use in schools in the United States, Germany and Austria. Then, the acquired experiences will be summarised and conclusions regarding possibilities and limitations will be drawn.

4.1 Germany

An inspiring example from Germany is the 'Kaiserin Augusta Schule' (KAS), a school in Cologne where a group of dedicated teachers have started a concept for the use of digital media in school. Due to lack of space for new computers in the existing computer rooms, teachers were in search of a more mobile solution. At this point, the idea of iPads came into play. Students of the KAS were already used to working with blogs and doing internet research which having a device in their own classroom would enhance even more. Added to that, the idea was to work collaboratively and use the interactive possibilities the iPad offers. Apple enabled 30 teachers to test the iPad for two hours where the majority of colleagues were in favour of the purchase and use of the devices. The school's friends' association made the investment of 20 iPads which was soon followed by another ten. Since the first of February 2011, 30 iPads have been used in almost all subjects, where its functions have most frequently been applied in Mathematics, Music and Religious Education, a balance that was drawn after the first six months of use. For example, for their school leaving examination in Music, some students used the iPads for compositions where they first had to analyse a progression of a song which was the basis for their own song they had to compose. During the examination students had to explain their analyses and present their process of composition. Before they started composing, all data had been deleted from the iPad and the internet was disconnected for the whole preparation time ("Das iPad im Unterricht an der KAS," 2010).

Further, students use a wiki, a website where they can create, change or delete content on their own or collaboratively using a rich-text editor or a mark-up language. According to an entry on the blog, the wiki was even modified by students at home when they did not have any homework anymore and their grades were already finalised which already shows their motivation and interest. Additionally, the wiki provides teachers and students with important dates and teaching material. The school uses 20 blogs for teaching and administrative purposes.

Project supervisor and teacher André Spang can only report positively about the use of iPads in school. He states that students work more carefully and more concentrated. At the same time, he adds, teachers are relieved since students work more independently and have been enthusiastic from the beginning (Hollstein, 2011).

Interest is shown through the high media response and visits from teachers and professors from other educational institutions. In addition, the project is documented on a blog[1], where renewals concerning apps, examples for teaching with the iPad, first statistics of their use, hardware related topics and collaborations are listed and available.

4.2 U.S.A.

In the United States of America, the headquarters of Apple Inc., hundreds of schools have been experimenting and using iPads in the past two years. A huge project is currently being put into practice in Madison, the capital of the U.S. state of Wisconsin. During 2012, schools in this city will be provided with around 1400 iPads in total. According to the Wisconsin State Journal 'the school district is acquiring iPads as they are less expensive, easier to use, and more portable than the usual computers purchased for educational use. Bill Smojver, the director of technical services for the Madison School District, referred to Apple's recent educational announcements about iBooks Author, iBooks 2, and digital textbooks as a significant development' (Sande, 2012). According to Madison administrators students who used iPads, 'were more engaged in the classroom, as evidenced by a demonstration they witnessed in the Chicago Public Schools.' Some of the schools in Wisconsin will receive tablets for each student, some only for teachers to experiment with the devices and keep records. Regarding the costs, Sande revealed that the tablets were purchased with Microsoft lawsuit settlement funds, a result of a lawsuit regarding overpriced software in Wisconsin for years (Sande, 2012).

Another school, in which students no longer use worksheets but write their essays on iPads, is the Manhattan Beach Unified, located in South Bay, a region in Los Angeles,

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[1] http://ipadkas.wordpress.com/

California. In spite of the price, educators regard the device as a worthwhile investment that is not just a short-lived medium but a device that shapes the future of education, particularly with respect to electronic textbooks . Manhattan Beach Unified purchased 560 iPads for a pilot project and teachers are trained how to use them. Moreover, the district is recording data in the form of surveys that should measure the effectiveness of the project and demonstrate whether the devices assist the process of teaching and learning. Up to this point, the outcome has shown that the project is worth being intensified since the iPads help to increase learning. However, longer-term results have demonstrated how the initial enthusiasm decreases (Kuznia, 2012):

> 'For instance, preliminary results show that the high levels of enthusiasm exhibited by teachers and students at the elementary level tends to wane slightly as the age groups get older, with high schools demonstrating the lowest levels. As for test scores, they've gone up significantly in the one example studied by the district to date: a middle-school science chapter test on DNA, where the percentage of students scoring proficient or better has climbed in a year from 63 to 76 percent.'

Furthermore, the early excitement seemed to be diminishing (Kuznia, 2012):

> 'While 97 percent of the participating teachers in Manhattan Beach reported in November that the iPad makes class more engaging, that proportion had dropped to 86 percent by the end of January. The proportion of students who said so also dropped, though less steeply, from 81 to 77 percent.'

Richard Clark, a professor at the University of Southern California, critically reflects the initial enthusiasm claiming that research shows that the tablets could motivate students for a short while, but when they realised they had to work as hard as without them, their motivation could go away. Clark stated that media did not 'make any difference in learning, any more than the truck that delivers groceries to the store increases the nutrition of the customers that are there.' Despite decreasing motivation, he said, the iPad can be a good teaching tool (Kuznia, 2012).

Nevertheless, the overall agreement between South Bay teachers show the devices are to stay in schools. One teacher of Adams Middle School emphasises that she has never been more committed and seen her students being so excited. She considers the instant feedback that several apps provide as particularly helpful. With their help she knows straightaway where students need further explanations. Another teacher mentions that his students use apps to learn at their own pace. He no longer sees himself as a teacher but as a group leader who controls whether students have successfully completed their tasks before they can move on to the next one (Kuznia, 2012).

Jeff Miller, associate professor in the college of education, is worried about the digital divide that 'in which students from low-income schools don't have the same access to technology as their peers in more affluent areas.' Further, he claims that the iPad should serve as an instrument for teaching and fears that teachers will not provide any guidelines for their students but rather hand out the devices and let them find something out online without supporting explanations. As a last point regarding the use of iPads in South Bay schools, Carolyn Seaton from the Manhattan Beach school states that 'an iPad doesn't teach the kid, the teacher does' (Kuznia, 2012).

4.3 Austria

In 2010 a secondary modern school with special focus on computer science and a commercial high school, both located in Burgenland, have also started a project using iPads in class. They were the first school in Austria to start such a project. Electronic learning content is being evaluated by the local teaching training college (Pädagogische Hochschule Burgenland) according to didactical and pedagogical values. The project in the secondary modern school will be running for three to four years altogether and students will be able to use the devices in all subjects. However, the tablet should not completely replace schoolbooks. The costs for this pilot project are 37.000 Euros and it is financed and supported by the Federal Ministry of Education, Art and Culture (bm:ukk: Bundesministerium für Unterricht, Kunst und Kultur). Additionally a software developer employed by Apple, works on a selection and configuration of suitable educational apps. The main goal of the project is the improvement of lessons through interactive use. Nonetheless, the headmaster of the secondary modern school, Hannes Thomas, states that the use of iPads is no must, but the teachers sound out where it is meaningful ("Schulen im Burgenland starten erste iPad-Klassen Österreichs," 2012).

4.4 Summary

Although the aforementioned teachers and professors do not agree in all points, they all state that the iPad enhances collaboration and interaction among students, e.g. they can work on the same blog entries or do video projects or presentations in groups.

Through more independent work, teachers are not replaced by tablets but assume the role of a coach and have to set enough guidelines for the students so they know what and why they have to do certain tasks. They transfer knowledge, also convey social

Figure 4.1: Keywords – Current Status of iPads in Schools (own graphic)

skills and give encouragement. Additionally, students can learn self-paced as often as possible.

Most schools expect schoolbooks to become digitally available soon, while some do not want to go totally paperless and prefer using tablets in addition to textbooks and others again create their own digital textbooks. All schools agree that the iPad is a relief in terms of reducing the weight of schoolbags. While the majority of schools, regards the iPad as a device that promotes motivation and excitement, it should not be forgotten that observations in the longer term have shown that these reactions can and have already changed in some of the above-mentioned schools.

Another important point that was mentioned by various spokesmen or project supervisors is the high commitment of teachers. The majority shows a positive attitude towards the devices and sees the opportunities for teaching and learning. A number of teachers are currently being trained how to work with the iPads and are shown possible utilization scenarios that are made available to everyone, mostly through school blogs.

5 English Teaching with the iPad

5.1 Background of Students

The students that participated in the field experiment attend the 'Praxishauptschule - Neue Mittelschule (NMS) der Pädagogischen Hochschule Steiermark', a new secondary school which is a model experiment in Austria. By 2015/16 all secondary modern schools in Styria will have become new secondary schools which will become regular schools. Those schools are distinguished by team-teaching, individualisation of lessons, differentiated lessons and support for gifted students ("Neue Mittelschule," 2012).

Altogether 48 students who were from the first grade (aged 10-11) and from the third grade (aged 12-13) participated in the field experiment. Before they were informed about the use of tablets in the upcoming 20 English lessons, they got a questionnaire on their leisure time, experiences with smart phones and touch screens as well as frequency of using the computer. While the results between the two grades were relatively similar in all the other categories, the results regarding the frequency of chatting and writing text messages was noticeably higher with the third graders. Further, they spend more time in social networks, such as *SchuelerVZ*[1] and *Facebook*[2]. The former allows students between the age of 10 and 21 to register as a user while the latter allows registrations from the age of 13.

The first figure shows students' leisure activities where watching TV has priority over surfing the internet (cf. figure 5.1).

51 percent state that they use the computer every day. Girls say they use the computer averagely 7.2 hours a week and boys for 12.5 hours. While girls state they do not even play computer games for two hours a week, boys use to play for almost four hours on average (cf. figure 5.2).

In addition, they spend significantly more time on social networks, watch more videos online and tend to post more information about themselves online. In contrast, most girls do not put any information about themselves online (cf. figure 5.3).

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[1] http://www.schuelervz.net/
[2] http://www.facebook.com/

When comparing these results to the the JIM study (Jugend, Information, Multimedia) of 2011, an annually conducted study about adolescents' use of media, some parallels to the field experiment turn up. For instance, that boys clearly spend more time playing computer games than girls. Additionally, girls are more tentative when it comes to publish personal details online. According to the JIM study only few adolecents present their messenger or telephone numbers and they have become more cautious compared to the previous years ("JIM-Studie 2011," 2012).

Not every student has a mobile phone, while those who do mostly have one with a touch screen. Only a third of the students surf the internet with their mobile phones and exactly those students stated that they download apps occasionally. In addition, two-thirds of the students used or tried out a touch screen before. In conclusion, the use of new media is part of most students' everyday lives. They use computers, game consoles and mobile devices such as smart phones and MP3 players at home and in their leisure time. Although technical equipment in schools has been improved over the past years, the full potential has not been exploited. One reason is the financial shortage of schools that does not only refer to the costs for new hard- and software but also to insufficient funds for maintenance work (Babnik et al., 2011).

Previous to the first iPad lesson, students were asked to write down their thoughts on working with the device. The first question dealt with its scope, 'What can iPads be used for?' 86% answered with 'playing games'. Other frequent answers were 'surfing the net', 'listening to music' and 'watching TV'.

When students were asked how they thought they could use the iPad in English lessons, the most frequent answers were 'for learning', 'writing', 'surfing the net' and 'playing English games'.
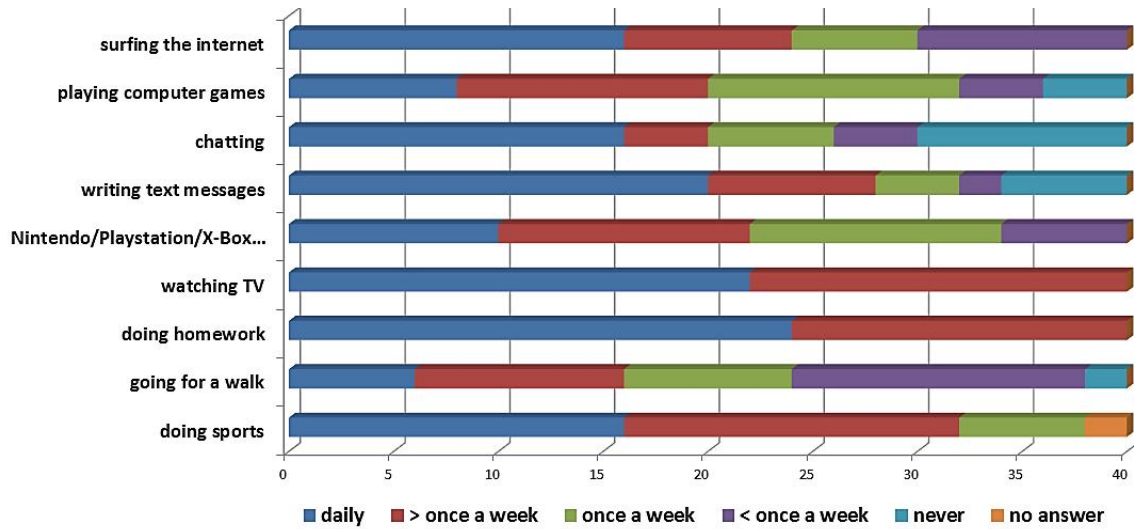
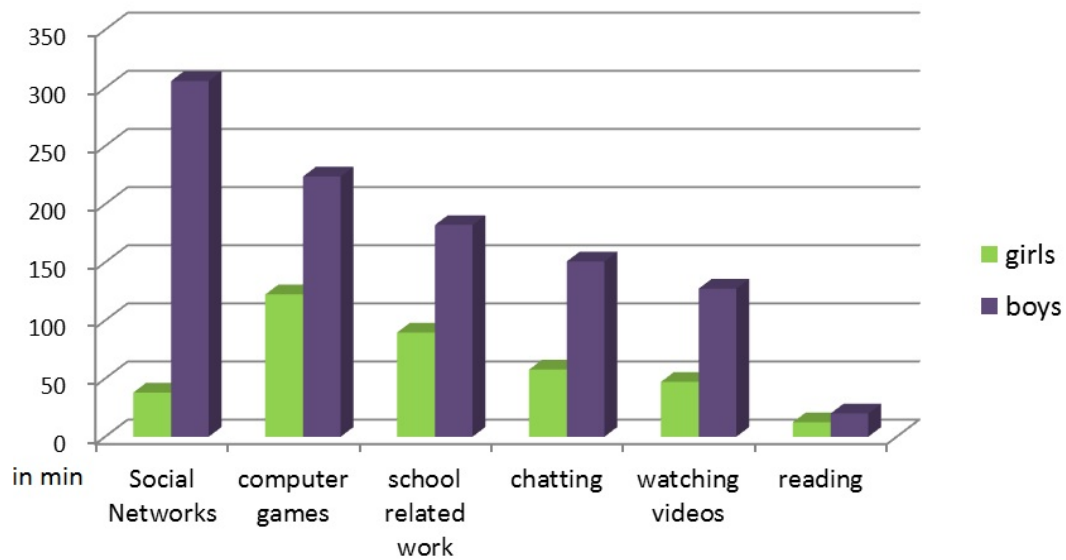Figure 5.1: Students' leisure activities (own diagram)

Figure 5.2: Weekly time spent at the computer (own diagram)
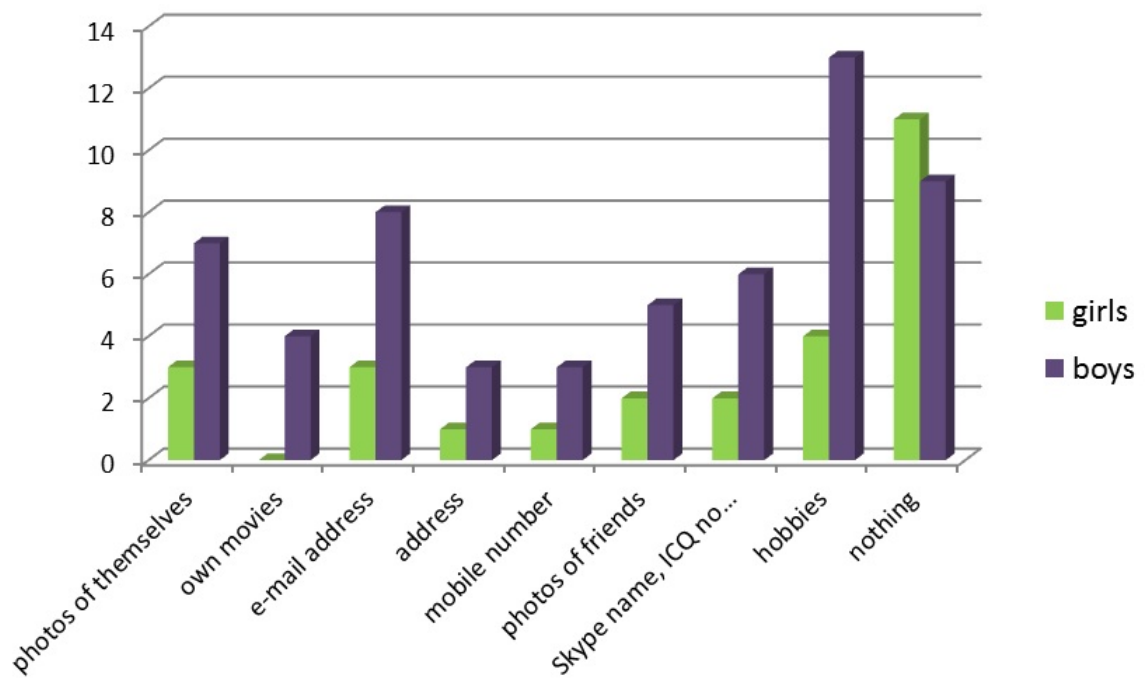
Figure 5.3: Students' personal data online (own diagram)

6 Prerequisites for Teaching

The first lessons in the course of this work were taught only with the aid of iPads. There was neither a blackboard, nor a whiteboard or projector involved. However, the tablet on its own was not enough since students were unable to cope will all the instructions, although they had them as PDF files on their iPads. They were put in their *Dropbox* account which was explained to them beforehand. Nevertheless, students had problems retrieving the instructions, mostly, because they were not familiar with the hierarchy of *Dropbox* or were afraid of losing data. Generally students, particularly the younger ones, needed a lot of help when it came to new applications and tasks. Very often icons and bars and in various apps were not intuitive enough for them. Since many did not dare to try on their own, although they were encouraged to, and numerous questions came up, they were told what to do step by step. Without any doubt these explanations would have been easier with the aid of a projector. For the upcoming lessons such a device was provided and the amount of explanations could be strikingly decreased immediately.

6.1 Hardware

The following technical prerequisites are essential to exploit the iPad's full potential in the classroom when it comes to explanations, presentations, demonstrations and internet access.

6.1.1 Projector and Canvas

First and foremost, a projector and a white canvas are required. In most lessons, a smart board with an OptiPro™ surface was deployed. When a projector was deployed, the amount of explanations could be strikingly decreased (figure 6.1). It is therefore suggested to teach in a room with a projector or smart board, especially when something new is being explained. Students, particularly the younger ones, need a lot of help when it comes to new applications. Very often symbols in various apps were not intuitive enough for them.
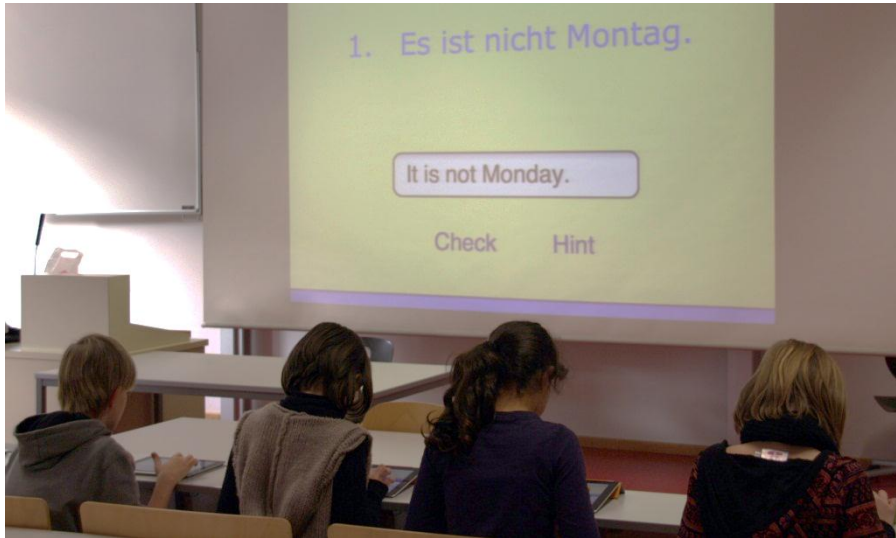
Figure 6.1: Projector (own photograph)

Figure 6.2: VGA Adapter
Source:
http://www.soundtech.com.cy/apple/1379-data-cable-ipad-dock-connect or-to-vga-adaptor.html
(retrieved 28/12/2011)

6.1.2 VGA Adapter

On the bottom of the iPad, there is the 30-pin dock connector port where the VGA adapter (see figure 6.2) is to be attached. From time to time students gave presentations in front of the whole class and it was convenient to make use of their own iPads. Within seconds they could plug it in and immediately start their presentations which was no problem with the iPad of the second generation which provides mirroring of everything on the screen to the projector. In contrast, the VGA adapter only works with certain apps for the iPad1.

Furthermore, regarding explanations on the projector, it would be helpful for students if they could follow the cursor for a better understanding of its position. However, the cursor cannot be seen on the projector as a standard feature.

6.1.3 Smart Cover

Each device was protected by a smart cover which covers the screen and has several built-in magnets. Instead of pressing the on/off button, one of the magnets wakes the iPad when the cover is lifted and puts it on standby when the cover is closed. Although students had the choice between folding the cover into a stand and just using it as a slip-proof pad, the majority chose the latter option. According to those who used the stand, typing was easier and more comfortable (see figure 6.3). In addition, the smart cover can be folded into a video stand (see figure 6.4).

Figure 6.3: Smart Cover Keyboard Stand
Source: http://www.apple.com/ipad/smart-cover/ (retrieved 10/01/2012)

Several other covers for the iPad are offered by various manufacturers, some of which also cover the device's backside.

Figure 6.4: Smart Cover Video Stand
Source: http://www.apple.com/ipad/smart-cover/ (retrieved 10/01/2012)

6.1.4 Earplugs

For individual listening comprehensions students should be provided with earplugs (those with standard jack plugs are fine), otherwise it gets much too loud in the class. Most of the students have MP3-players so they can either bring their own earplugs.

6.1.5 Loudspeakers

When doing listening comprehensions for the whole class using mini-loudspeakers is a good idea (see figure 6.5). They also need to have a standard jack plug.

Figure 6.5: Mini-loudspeakers (own photograph)

6.1.6 Suitcases

If students are not allowed to take the tablets home, it is of great importance to have a good transport system and storage space where they can be charged, locked and accessories like cables can be stored (see figure 6.6). For this purpose several types of suitcases have been developed. For instance, DTM Systems offer suitcases for 6, 8, 12 or 16 iPads, where the smallest option is only a suitcase and the others are available as trolley version (n.d.).

Figure 6.6: Suitcases - Transport System and Storage Space (suitcase used at *PH Steiermark*)

6.1.7 NoteSync

Another possibility for secure storage, re-charging and synchronising of the devices is *NoteSync* by *Leba Innovation* (see figure 6.7). Although the unit is not a required prerequisite, it is mentioned at this point because it can save time and separate chargers. With its 16 USB ports all units can be charged at the same time.

> 'The master Laptop or Mac connects to a separate USB port. If needed the master can be connected to two NoteSync units and thereby allows

the user to control 32 devices. [...] These are managed via iTunes on the master Laptop or Mac, and all connected devices can be controlled individually or as a group and setup from here. Once devices are setup new data on the master synchronizes automatically with all devices that are setup to receive that type of data. All devices can be synchronized in one go, making a time-consuming task easy and fast. A built-in power supply enables NoteSync to charge devices connected without the need of separate chargers. NoteSync switches automatically between charge mode and sync mode when a master Laptop or Mac is connected.' ("NoteSync for iPad," 2012)

Figure 6.7: Storage, Re-Charging and Synchronising with NoteSync
Source: http://www.note-cart.com/NoteSync-173.aspx (retrieved 21/03/2012)

6.1.8 Wi-Fi Router

Depending on the existing wireless capabilities of the school network it could be necessary to attach an additional wireless router to serve all iPads (see figure 6.8). Since, all wireless connections share the same medium, all network connections have to share 54 Mbit/s. This will slow down the speed per client with every new client that connects to the access point.

Further, the realistic amount of users per access point may also be limited by the physical capabilities of the used access point device and may be insufficient with consumer solutions. Therefore one should consider upgrading to professional devices if necessary. However, to avoid the transfer limit of 54 Mbit/s the device will have to be compliant with wireless standard 802.11n. With wireless standard 802.11n, the transmission can make use of multiple antennas and has an increased frequency
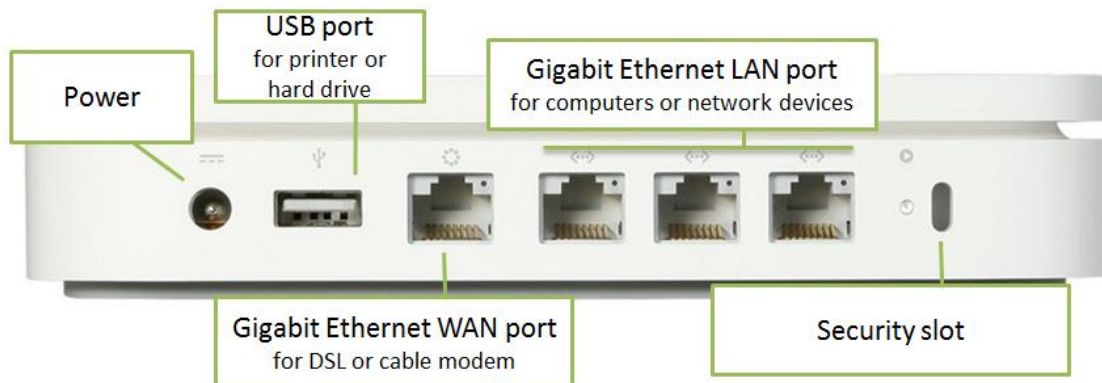
Figure 6.8: Wi-Fi Router
Source: http://www.smarttechbuy.com/?p=308 (retrieved 27/02/2012), own caption

band, which allows transfer rates up to 600 Mbit/s. ("Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications," 2007; "Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications. Amendment 5: Enhancements for Higher Throughput," 2009)

6.1.9 Apple TV and High-Definition Multimedia Interface (HDMI) Projector

Although it was not available within this particular field experiment, other schools have made valuable experiences with the AppleTV. Instead of using a VGA adapter, the iPad can immediately be connected wirelessly to a projector that is connected to the Apple TV, which has to be in the same local area network (LAN). When playing video or audio files, the projector has integrated speakers that fill the classroom, so external ones are not necessary. The great advantage is that no cables are needed and time is saved since students can project their work from their seat. According to the blog of the 'Kaiserin Augusta Schule' in Germany, a school in which the Apple TV and HDMI projector are deployed, students can take turns at doing presentations or showing their actual work straightaway. The set-up was described as very easy, i.e. via an HDMI cable the Apple TV was connected to the projector, the wireless local area network (WLAN) was selected and the password inserted. The Apple TV automatically identifies the network ("Das iPad im Unterricht an der KAS," 2010).

6.2 Software

In addition to technical prerequisites and the already pre-installed apps, the following apps should be installed as a basis for using the iPad in the classroom.

6.2.1 Dropbox

In order to store their written production and other files, e.g. pictures and audio files, and share them with their colleagues or teachers, students could use *Dropbox*[1], a web-based file hosting service that synchronises files.

In the field experiment, instructions, worksheets, useful images for projects, presentations and listening comprehensions were uploaded to one *Dropbox* account all students had access to. Each student was provided with the same e-mail address and password.

For the longer term it is suggested that students and teachers get their own *Dropbox* account where they can submit their work to the teacher's account only which can be appropriate for some tasks or tests. Students and teachers can manage data releases and are provided with more storage.

It has to be mentioned here that files created in apps like *Pages*, *Numbers* and *Keynote* cannot be uploaded to *Dropbox* without a Web Distributed Authoring and Versioning (WebDAV[2]) service ("WebDAV," 2010).

> 'WebDAV is a set of extensions to HTTP/1.1. It is an open, published standard that allows you to edit documents on a remote web server.'

Further, WebDAV supports the following features ("WebDAV," 2010):

- 'Editing: Create, update, and delete files.

- Properties: Store metadata such as titles, author names, and publication dates. You can set, delete, and retrieve these metadata.

- Collections: Group resources into collections that are organized like a file system, similar to a directory or desktop folder.

- Locking: Use locks to prevent others from editing the same content you're working on in WebDAV. The duration of the locks is independent of any individual network connection.'

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[1] https://www.dropbox.com/
[2] http://howto.cnet.com/8301-11310_39-20068049-285/h ow-to-use-webdav-in-pages-keynote-or-\ numbers-with-dropbox/

A way for students to access their *Dropbox* from *Pages* and *Keynote* was to log in via DropDAV, which connects between the Dropbox API and WebDAV clients. To use DropDAV with the aforementioned apps, students had to type in its server address (https://dav.dropdav.com) and their login data of their *Dropbox*.

At the beginning of the field experiment the uploading of students' files was time-consuming because they could not find certain keys on their keyboards, e.g. the backslash, or could not remember the login data for *Dropbox*. Therefore, it is suggested to store such data in apps like *Notes*, where students can easily find them.

6.2.2 Pages

Apple's word processor *Pages*[3] offers what students need for creating documents. Additionally, they can edit or just view documents their teachers put online. If there is not much time for layouting, 16 templates and styles are available.

6.2.3 Keynote

To create presentations students used Apple's *Keynote*[4] that enables quick design and animation of slides.

6.2.4 Microphone + Recording

Students can easily record their voice with *Microphone + Recording*[5], which is also a great tool for pronunciation exercises and practising vocabulary.

6.2.5 neu.Annotate+ PDF

Students can read, highlight and annotate texts in *neu.Annotate+ PDF*[6] (see figure 6.9). Further, pages can be mailed as PNG, JPG and PDF files, saved to photos and opened in *Dropbox, iBooks, Adobe Reader*, and so on. Inserting shapes and highlighters, wrist protection and the possibilities to delete pages, insert pictures or new pages are valuable features.

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[3] http://itunes.apple.com/de/app/pages/id3613 09726?mt=8/
[4] http://itunes.apple.com/us/app/keynote/id 361285480?mt=8
[5] http://itunes.apple.com/us/app/microphone-+-rec ording/id486796173?mt=8
[6] http://itunes.apple.com/us/app/neu.annotate+-pdf/id47 8313705?mt=8

Halloween

Ask your partner:

Have you ever seen	a UFO?
	a ghost?
	a tarantula?
	a bat?

Have you ever been to	Australia?
	England?
	the United States?

Have you ever tried	pumpkin pie?
	a candy apple?
	sweet corn?

Write three sentences about yourself:

Seen: I have never seen a UFO.

Been: I have been to England.

Tried: I have never tried pumpkin pie.

Figure 6.9: Writing in Neu.Annotate PDF+, own picture

7 iPad and Curriculum

This chapter will provide an analysis of the realisation of the use of iPads with regard to the Austrian curriculum for foreign languages ("Lehrplan der AHS-Unterstufe: Lebende Fremdsprachen," 2010). The following educational objectives and teaching tasks will be reflected regarding their possible promotion, realisation and support with the iPad.

Educational Objectives and Teaching Tasks

- Communicative Competence

- Social Competence and Intercultural competence

- Acquisition of Learning Strategies

General Objectives

- Contributions to the Educational Field

- Language and Communication

- Individual and Society

- Nature and Technology

- Creativity and Design

- Health and Exercises

Didactical Basic Concepts

- Communicative Competence as an Overarching Learning Objective

- Balance of Skills

- Contextualization of Vocabulary and Grammar

- Approaching the Target Language Taking the Learner's Language Into Account

- Differentiation of Forms of Work

- Inclusion of the Students' Individual Progress

- Priority of the Target Language

- Reflective Comparison of Languages

- Dealing with Teaching Materials and Learning Aids

- Holistic and Creative Learning

- Diverse Communication Situations and Subject Areas

- Integration of Regional and Cultural Studies

- Promotion of Authentic Encounters

- Cross-Curricular Activities

7.1 Educational Objectives and Teaching Tasks

The Austrian curriculum contains standards for the first foreign language (first to fourth year of learning) and the second foreign language (first and second year of learning).

In Austria, students learn English as a second language (ESL).

Communicative Competence

Over the past years, there has been increasing acceptance among language teachers all over Europe regarding Communicative Language Teaching (CLT). According to studies at the European Centre for Modern Languages, e.g. Newby (2003), it is the communicative label that educators relate to most strongly. In addition, Stanfield (2008) mentions the importance of the communicative approach as follows:

> 'It has been generally accepted that communicative competence should be the goal of language education, in contrast to previous views in which grammatical competence was commonly the main focus. Communicative language teaching is a broad approach to teaching that focuses on interaction as the means of learning a second language.'

Further, it is the central aim of CLT to develop fluency amongst learners and the appropriate use of language in a variety of contexts in both spoken and written language. This contrasts with a mere knowledge of language. This aim may be summarised by the term communicative competence. The very first statement in the Austrian curriculum for foreign languages (Unterstufe) states this point very clearly. The aim of foreign language teaching is the development of communicative competence in the five skills listening, reading, taking part in conversations, coherent speaking and writing. Further, communicative competence should enable students to manage everyday and classroom situations age-appropriately and according to their grade level ("Lehrplan der AHS-Unterstufe: Lebende Fremdsprachen," 2010).

Social Competence and Intercultural Competence

Further, the curriculum informs that foreign language teaching has to make a contribution to the development of the students' socially appropriate communications behaviour. The process of foreign language acquisition offers numerous opportunities to deal with intercultural topics and should lead students towards a better understanding of cultural features that differ from or they have in common with their own culture. Additionally, reflecting on their own culture and experiences plays an important part.

The internet supplies a variety of possibilities to awaken students' interest of other cultures and can help them to overcome stereotypes. Numerous videos and texts provide a great insight into other culture's customs, attitudes, events and so forth. Teachers are responsible for finding age-appropriate and authentic material that can be shown to the students to find out differences and similarities to their own culture. Further, students' socio-cultural competence can be increased and encouraged through role plays that are recorded and edited by themselves and can be shown to the whole class ("Lehrplan der AHS-Unterstufe: Lebende Fremdsprachen," 2010).

Acquisition of Learning Strategies

Foreign language teaching also has to convey a functional basis, learning strategies (see figure 7.1) and learning techniques for independent language acquisition, particularly with regard to lifelong and autonomous training.

Figure 7.1: Overview of Learning Strategies
Source: Own figure according to Mandl and Friedrich (2006)

According to Mandl and Friedrich (2006), learning strategies are the key elements to learning methods and learning skills.

In the course of the field experiment, the focus was partly on elaboration strategies that support the understanding and retaining of new information in the long run. Students' previous knowledge was activated through questions and making notes, mainly in the app *Pages*.

In addition, organisational techniques that helped students with the organisation of new information and with the establishment of connections between the new pieces of information and their previous knowledge were used. An example would be the visualisation of new information through mind maps. Apps like *Total Recall*[1] which is free or *MindMeister (mind mapping)*[2]. Students created the mind map together with their teacher (see figure 7.2).

Figure 7.2: Mind map created with Total Recall (own graphic)

Further, knowledge use strategies should enable students to activate acquired knowledge and apply it, e.g. through writing tasks or activities in which students have to argue and discuss ("Cooperative Learning," 2008). In fact, students wrote short texts in *Pages* but got frustrated in the beginning, because at that point the auto correction mode was on and not in the target language. After changing this setting, most students felt more comfortable with the app.

Strategies for cooperative learning such as learning in groups have to do with motivation to a great extent. Students can pass on their motivation for learning to their colleagues

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[1] http://itunes.apple.com/us/app/total-recall/id360443748?mt=8
[2] http://itunes.apple.com/at/app/mindmeister-mind-mapping/id291226775?mt=8

as well as develop motivation to help others. Since most students were seeking help at some point and very often more than one student needed help with new apps, the teacher could not answer all questions at once. However, students' motivation was high when it came to explaining functionalities or steps to their colleagues.

Learning resources like media can be influenced by coordination and management processes, e.g. time management. Students should learn how and where they can retrieve information.

Mandl and Friedrich (2006) clearly state that the aforementioned strategies are not always definable and not every student can profit from every strategy. They should be used individually and have to be trained and promoted.
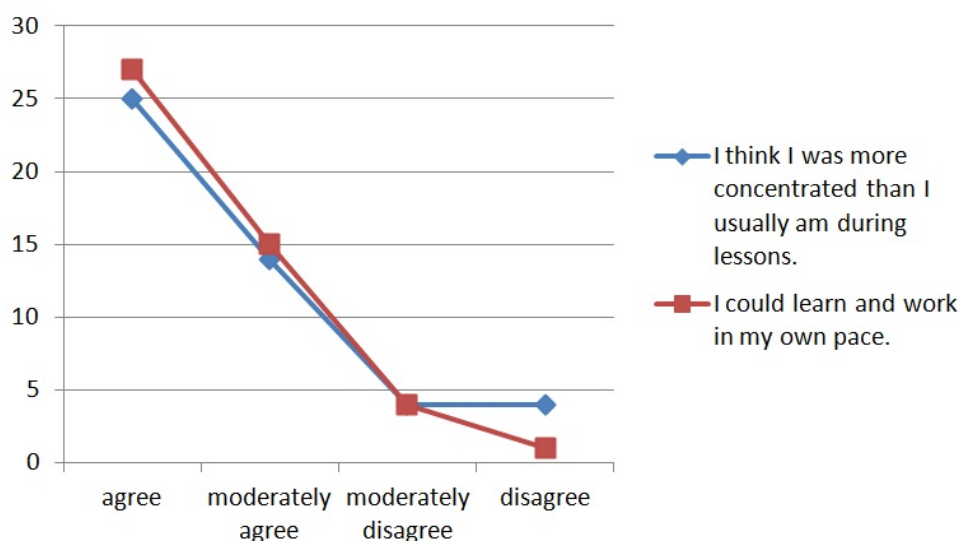
Figure 7.3: Students' self-evaluation (own diagram)

The majority of students had the feeling that they could learn and work in their own pace. In many lessons they got a work plan after new subject matters were discussed and explained. So they could work individually and in their own pace, e.g. when doing online exercises and worksheets (see figure 7.3).

7.1.1 General Objectives

- comprehending spoken language with standard pronunciation and average speech rate

- independently deducing and acquiring foreign language written texts of various kinds through appropriate reading strategies

- productive oral application of the figures of speech acquired in a way that is adequate to the addressee

- productive use of linguistic devices in written texts appropriate to the addressee and according to the type of text

- a goal-oriented incorporation of new information technologies, such as word processing, internet and e-mail

These general objectives are reflected in the Common European Framework of Reference (CEFR) for Languages which describes what learners are supposed to be able to do in the four main skills, namely reading, listening, writing and speaking at each level ("Common European Framework of Reference for Languages," 2011).

Students in the field experiment were supposed to be at level A1 and A2 which the CEFR (2011) defines as follows:

> 'A1 Can understand and use familiar everyday expressions and very basic phrases aimed at the satisfaction of needs of a concrete type. Can introduce him/herself and others and can ask and answer questions about personal details such as where he/she lives, people he/she knows and things he/she has. Can interact in a simple way provided the other person talks slowly and clearly and is prepared to help.'

> 'A2 Can understand sentences and frequently used expressions related to areas of most immediate relevance (e.g. very basic personal and family information, shopping, local geography, employment). Can communicate in simple and routine tasks requiring a simple and direct exchange of information on familiar and routine matters. Can describe in simple terms aspects of his/her background, immediate environment and matters in areas of immediate need.'

In order to help students comprehend spoken language and get familiar with pronunciation and speech rate, listening practise was done in several lessons. For the most part, they were conducted individually (see figure 7.4). Headsets and earphones were handed out and some students used their own earplugs from their mobile phones or MP3 players. Since not all students needed them at the same time, the accessories were always available. All listening comprehensions were made accessible through *Dropbox*, where they could also be played with the integrated media player. In contrast to other media players, this one did not stop playing when *Dropbox* was put into hibernate mode which made it possible to write down notes in *Pages* at the same time or complete corresponding worksheets in *neu.Annotate+ PDF*.

Figure 7.4: Listening Comprehension (own photograph)

Other apps like *Busuu* (Learn English with busuu.com)[3] offer a variety of listening comprehensions from beginner to advanced intermediate level which is equivalent to A1-B2 according to the CEFR. Further, *Busuu* currently covers 150 different topics with everyday situations that are also requested in the CEFR. The app does not only cover listening comprehensions but also focuses on interactive tests and visual material that is connected with audio learning material. Whereas 20 learning units can be used for free the others have to be purchased.

The second objective refers to appropriate reading strategies, which can be divided into three strategies, namely pre-reading, during reading and post-reading strategies. Generally, pre-reading strategies do not involve much reading and writing. However, they should involve student interaction so knowledge and ways of thinking can be shared. For a better understanding, students should organise themselves before reading a text or a story which could be achieved through using and collecting prior knowledge to think about the topic, e.g. through brainstorming via the aid of mind maps. Another great way of introducing students to a text, especially when it is a story, is to tell them the title and they have to predict a plausible context and the ending. Furthermore, videos that are suitable for the new topic can be shown to get students ready and interested in new information ("THINK LITERACY: Cross-Curricular Approaches, Grades 7-12," 2008).

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[3] http://itunes.apple.com/us/app/learn-english-busuu.com!/id379968583?mt=8

During reading, strategies like asking questions or retelling information can be applied to see if students understood the text up to that point. When it comes to intensive reading and highlighting a text, the iPad can be deployed, e.g. with apps like *neu.Annotate+ PDF* that enable annotations and highlighting. Although handwriting has become less important for older students in the past years because many homework tasks can be written on the computer, handwriting should not be underestimated and encourages hand-eye coordination. Furthermore, the clear majority of students have to write their exams by hand. *neu.Annotate+ PDF* allows both, handwritten and typed text. In the beginning, students had problems with both ways. On the one hand, the button to change the width of lines, fill, text and colour was difficult to find for students because it only appeared when clicking on one of the pens. On the other hand, many were much slower with writing by hand so that some of those students brought up the question of using a pen. When the students concerned were provided with two extra pens they felt more comfortable with writing while others never complained and the results were absolutely comparable to their handwriting on printed worksheets.

Additionally, retelling new information could either work with the whole class, with a colleague or alone. The latter option can also involve recording apps like *Microphone + Recording* where students can record their voice and try to retell what they just read. If students are allowed to take the iPads home, they can also monitor themselves when reading at home. Not only can they read the texts aloud and record themselves, but could also make up their minds in the middle of a text and record their thoughts which they can later pass on to their teacher or upload the files in appropriate folders. In this way, students did not only try to focus on their pronunciation and expand their reading skills when reading aloud, but the teacher can also keep track of students' pronunciation, e.g. while students do worksheets teachers can listen to parts of the recordings and write down immediate feedback and provide links to respective dictionary entries to encourage students to improve their pronunciation.

Post-reading strategies include activities that should enable students to get a deeper understanding of the text. Further, students should get the feeling that they have achieved something. Creating conversations between characters is a suitable activity after reading that becomes particularly lively with apps like Comic Life, where students can reconstruct passages from a text. They can either act out scenes themselves and add titles and speech bubbles or they can be provided with suitable pictures and only add appropriate text in speech bubbles. Another activity that is more time-consuming can be acting out scenes and recording movies that students can later edit in iMovie, an app where sounds, pictures, movies and text can be inserted. Students could also have the option to draw their favourite character and describe him or her, which is part of the first graders subject matters (body parts, colours, basic characteristics).

Reading Strategy	Strategy includes	Suggestions for realization on the iPad: Suitable apps
Pre-Reading Strategy	Brainstorming	TotalRecall, MindMeister
	Movies	YouTube
	Vocabulary work	Worksheets in neu.Annotate+ PDF
	Making predictions	Writing a possible ending in Pages
During-Reading Strategy	Intensive reading (highlighting text)	Annotations and highlighting with neu.Annotate+ PDF
	Retelling new information	Microphone + Recording
Post-Reading Strategy	Reconstructing passages/scenes from a text in comic form	Comic Life (after taking suitable photos)
	Reconstructing passages/scenes from a text in movie form	Video editing in iMovie (adding text)
	Creating a portfolio	Pages (pre-set layouts or own design), Doodle Body for drawings

Table 7.1: Reading Strategies and their Realisation on the iPad

Apps like *Doodle Buddy*[4] offer a great variety of stamps, stencils, backgrounds, a text tool and brushes. Students can also connect with colleagues to draw together over the internet.

For the third objective, the productive oral application of the figures of speech, again, apps like Busuu can support learners to acquire words and phrases in a context that is adequate to the addressee.

For the productive use of linguistic devices in written texts, reading and comparing authentic texts can be helpful for young learners. They could highlight differences between texts.

The last of the general objectives, a goal-oriented incorporation of new information technologies, such as word processing, internet and e-mail, is self-evident with the aid of the iPad.

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[4] http://itunes.apple.com/us/app/doodle-buddy-paint-draw-scribble/id313232441?mt=8

Subsequently, contributions to the general objectives of education are mentioned in the curriculum which means that value-oriented thinking and acting in the political, social, economic, cultural and ideological environment is to be encouraged.

7.2 Contributions to the Educational Field

Language and Communication

Foreign language teaching should contribute as a whole to achieve all objectives of education.

Individual and Society

According to the Austrian curriculum a foreign language is an expression of culture and lifestyles. The acquisition of a foreign language serves getting to know the unknown, conscious dealing with cultural diversity, perceptions and judgments. Ways of dealing with the topic of foreign cultures are already described in the sub-chapter 'Social Competence and Intercultural Competence'.

Nature and Technology

Foreign language skills facilitate access to the internationalised presentation of expert information. Therefore, deliberately selected specialised technical texts that are appropriate to the level of learning are to be dealt with from time to time.

Creativity and Design

Foreign language teaching should encourage creative activities such as role plays, theatrical performance and creative writing.

Tablets are perfect auxiliary devices to encourage creativity. As mentioned before, students can record themselves while acting out a play and edit the movies. They can create presentations and portfolios on the iPad, share them with their teacher, colleagues or online, e.g. in the form of weblogs. Regarding design, texts and presentations can be formatted and smartened up in apps like *Pages* and *Keynote*. Further, students can draw and edit pictures on the device, e.g. for portfolios.

Health and Exercises

Although, health related topics are dealt with in other subjects, e.g. biology, foreign language teaching should establish a connection to healthy lifestyles and sports. Consequently, focusing on characteristic sports and exercises and their role in English speaking countries can make a valuable contribution to the topic of health and sports.

Apps like *Fitness Tips*[5] and *Health Tips*[6] can be helpful to raise students' awareness for proper food and exercises. Students will definitely benefit from one quick tip at the beginning of each lesson or week. Additionally, they gain new vocabulary, phrases and idioms.

7.3 Didactical Basic Concepts

Communicative Competence as an Overarching Learning Objective

The ability to communicate successfully is to be aimed at as an overarching learning objective, which is not to be confused with error-free communication. When practicing the five aforementioned skills, the communicative matters are to be emphasised.

Balance of Skills

The five skills listening, reading, taking part in conversations, coherent speaking and writing should be practised to the same extent as much as possible. In elementary instructions, however, listening comprehension and oral communication should be supported through regular listening exercises and possibilities for discussions and talking activities.

Contextualisation of Vocabulary and Grammar

The functional aspect of grammar has priority over the formal aspect. Collocations, vocabulary, phrases and idioms with implicit grammar should be embedded as often as possible, e.g. through the aforementioned health-related apps.
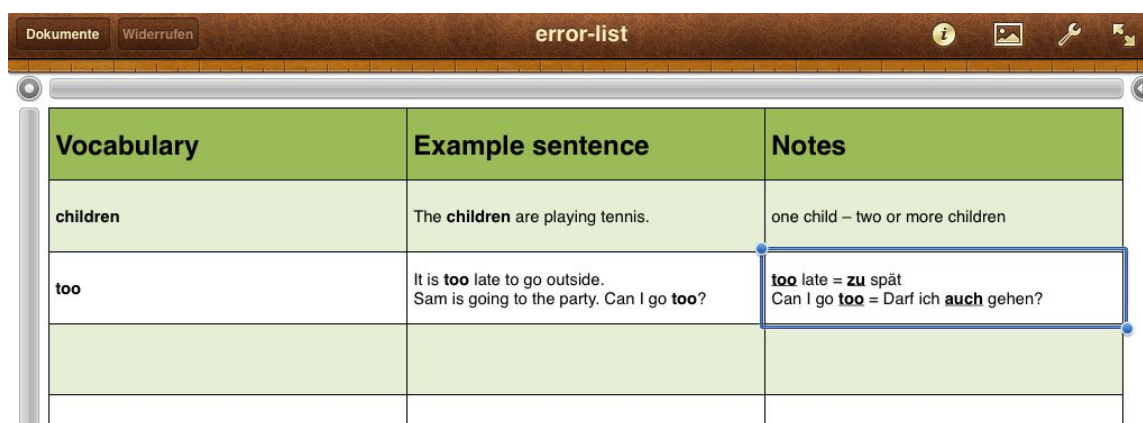
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[5] http://itunes.apple.com/at/app/fitness-tips/id327646940?mt=8
[6] http://itunes.apple.com/us/app/health-tips-1000/id327671535?mt=8

Approaching the Target Language Taking the Learner's Language Into Account

Students' willingness to apply new structures in the fields of lexis and grammar, as well as to make mistakes when learning new aspects of a language, is to be included in their evaluation. Making mistakes is part of the process of learning and should be considered as such in corrections and exercises.

For that purpose, students can compile an error list where they write down their spelling and grammar mistakes (see figure 7.5). *Pages* offers the required table. Students should keep track of their mistakes from the beginning to avoid them as soon as possible. Nevertheless, they should be told not to be afraid of making mistakes. If students have to correct their mistakes and write them down in a list, chances that they will remember the correct version are much better (Robitaille & Connelly, 2006).

Figure 7.5: Error List in *Pages*

Differentiation of Forms of Work

Students learn in different ways. In fact, there is a great variety of learning types, learning styles, learning rates, inclinations and interests, social skills, strengths and weaknesses. Consequently, the curriculum advises that different methodological approaches, scope and complexity of tasks, e.g., through individualised forms of tasks have to be considered. For this purpose, different forms of work have to be introduced, such as open learning, independent learning, portfolios, learning diaries and short presentations. Students should be supported and encouraged according to their performance capability and commitment.

Babnik et al. (2011) summarised forms of learning that incorporate technological support:

- **Self-organised learning**, also known as 'Eigenverantwortliches Arbeiten (EVA) und Lernen' (autonomous working and learning), is distinguished by independent ambition, self-motivation, a selection of appropriate learning strategies, overcoming problems such as learning obstacles and monitoring learning success (Puteh & Ibrahim, 2010).

- According to Babnik et al. (2011), students get the chance to select between levels of difficulty and content with the next form of learning, namely **Open learning**. The internet can provide support through its enormous variety of information.

- **Interdisciplinary learning** enables to focus on a subject area in more than one subject whereby the internet is often used as a resource for information.

- The World Wide Web can also be a great aid for **Cooperative learning** (2008): 'Cooperative learning is a successful teaching strategy in which small teams, each with students of different levels of ability, use a variety of learning activities to improve their understanding of a subject. Each member of a team is responsible not only for learning what is taught but also for helping teammates learn, thus creating an atmosphere of achievement. Students work through the assignment until all group members successfully understand and complete it.'

- As its name implies, **discovery learning** encourages students to learn through discoveries. According to Borthick and Jones (2000) students learn to identify a problem, characterise how it could be solved and look for appropriate information to create a solution strategy which will then be applied. Further, they point out that collaborative discovery learning, learners resolve problems together (see figure 7.6). Babnik et al (2011) add that Web-Quests and Internet-Ralleys promote discovery learning since students have to go on an adventurous search for traces online.

- Tablets can be a valuable support for **Creative Learning**. In the sub-chapter 'Creativity and Design' some suggestions for the incorporation of creative activities on the iPad are provided.

- **Game-based Learning** has become more important over the past years. Since most students are used to play computer or online games in their leisure time, it is not far to seek that educational games should be incorporated in schools. The iPad is predestined to promote such games. Numerous educational games are available on websites or in the form of apps, e.g. *Fun English - language learning games for kids*[7]. Unfortunately, the majority of apps is not suitable for elementary level.

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[7] http://itunes.apple.com/us/app/fun-english/id4289 20239?mt=8

Figure 7.6: Collaboration (own photograph)

Inclusion of the Students' Individual Progress

When evaluating and assessing students' performance, their individual progress and efforts to optimise their work is to be taken into account. Mistakes in spoken or written production are not the only assessment criteria. In addition, students should also show that they understood their utterances and use a variety of linguistic means.

In order to keep track of students' performance, their weaknesses and improvements, their written productions as well as audio files and presentations should be collected in a web-based file hosting service. In this respect, *Dropbox* proved to be very useful, despite of initial problems. At the beginning students did not know where in *Dropbox* they were, because many overlooked the back button in the upper left corner. However, they got acquainted with the hierarchy soon. When using *Dropbox*, data does not get lost and teachers as well as students can access their files from any computer with access to the internet. Since a lot of data will emerge after a while, it would be advisable to create folders for every student which makes it easier to keep track of individual performances. The already mentioned error lists should be stored in those folders, so they can be corrected if necessary.

Priority of the Target Language

In English lessons, students as well as teachers should make use of the English language as much as possible, whereas translations from or explanations in the first language serve as learning aid.

Since the majority of apps, including educational apps are conceptualised in English, this objective is certainly promoted. However, especially young learners might find it difficult to deal with educational apps that were not designed for ESL learners but native speakers who understand captions on buttons or menus.

Reflective Comparison of Languages

The curriculum suggests that when they lead to an improvement of linguistic awareness of the foreign language, comparative and contrastive methods should be taken into account. If there are native speakers of the English language among the students, their skills and knowledge enrich the lessons, e.g. when it comes to authentic information about their home country, their cultural background and their variety of English.

All iPad generations that have an integrated camera, enable *FaceTime*, *Skype* and other video calling software applications. These apps provide great opportunities for cultural exchanges and authentic speech. The time shift between Austria and England is minimal which conforms to one of the requirements for video calling amongst students of different countries. Apart from having native speakers directly in the classroom, talking to them over the internet seems to be the most authentic and enriching possibility to get informed about their home country, culture, variety of English, to name but a few.

Dealing with Teaching Materials and Learning Aids

Students should learn how to deal with learning material as well as dictionaries at an early stage. Further, they should learn the phonetic alphabet which should encourage them to work with unknown words independently.

In addition to listening to grammar rhythms and songs with implicit grammar and new vocabulary, students get the chance to practise their pronunciation and learn the phonetic alphabet with apps like, *Sounds: The Pronunciation App*[8]. The learner can either practise with the phonemic charts for British and American English, record their own pronunciation or test themselves. The quizzes contain listening activities, writing and reading tasks.

Knowing how to deal with dictionaries is of great importance for ESL learners from year one. They can either look up words online or download dictionary apps such as *Merriam-Webster Dictionary HD*[9]. This dictionary provides students with the pronunciation,

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[8] http://itunes.apple.com/gb/app/sounds-pronunciation-app-free/id428243918?mt=8
[9] http://itunes.apple.com/us/app/merriam-webster-dictionary/id399452287?mt=8

meanings, examples, origins, synonyms and antonyms of words. Nevertheless, students should to be introduced to dictionaries and their right use carefully, especially when they learn a foreign language where they are not as familiar with as with their first language when it comes to the use of idioms and collocations.

Holistic and Creative Learning

Further, multi-sensory learning should be promoted because it can activate students' memory capacity and it can increase their motivation, e.g. musical and playful elements can be integrated into teaching. Numerous apps have integrated sounds to enhance learning, for instance *Kids Flashcards +*[10], a app for young learners with categories such as animals, bodies, the alphabet, numbers and shapes.

Diverse Communication Situations and Subject Areas

Students should be acquainted with familiar subject areas such as family and friends, clothing and school through the integration of linguistic resources. These areas conform to the descriptors of the CEFR for languages.

As already mentioned, *Busuu* currently covers 150 different topics with everyday situations that are also requested in the CEFR and can support learners in various ways, e.g. to improve their listening skills.

Integration of Regional and Cultural Studies

Regional and cultural studies are to be connected to the topics and communicative situations, e.g. in order to find out about demographic dissimilarities between Austria and the USA, every student got one state they had to examine closer. Then they made short presentations with their findings.

Promotion of Authentic Encounters

Encounters with native speakers, student exchanges and intensive language weeks as well as audio-visual media and new technologies should be authentic.

In addition to the abovementioned possibility of video calling, writing e-mails and exchanging pictures or e-cards with short writings are authentic and can enhance interest in foreign cultures immensely.

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[10] http://itunes.apple.com/us/app/kids-flashcards-+/id381645968?mt=8

Cross-Curricular Activities

The curriculum suggests that the foreign language should be experienced as an authentic means of communication in cross-curricular activities.

Through using the iPad a first connection to computer science education is already established. Students use text processing and presentation programs, the internet and familiarise themselves with file-sharing.

Organisation

TeacherPal[11] is an app that enables tracking students' grades, cooperation, attendance and behaviour. The app has a straightforward user interface and provides a great deal of options to organise classes and students (see figure 7.7). Further, the app will help remembering names at the beginning. Photos of every student were taken and names and the respective number of the iPad were added so students always got the same device. If a special seating plan exists the pictures can be arranged according to it. Further, emails to all students (and/or parents) can be sent, general notes can be made, files in the *Dropbox* can be accessed and modified and gradable items can be added. The latter automatically calculates grades if a maximum grade and its weight are added.

7.3.1 Summary

To conclude, none of the aforementioned objectives is impossible to promote with the aid of iPads in the classroom. Nevertheless, difficulties and retardations might emerge when it comes to writing tasks since not all students could cope with writing without pens straight away. Age- and grade-appropriate exercises are available online or in the form of apps but have to be selected carefully. Only some apps are meant to be used for the longer term while several websites offer a great variety of activities and tasks that can be a valuable aid for more than one lesson. However, some interactive exercises require Flash, which the iPad does not support.

With the majority of the previously presented apps, students are equipped for exercises and activities that involve all skills that foreign language learners should develop and improve.

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[11] http://itunes.apple.com/us/app/teacherpal/id389584618?mt=8

Figure 7.7: *TeacherPal* - Organisation

8 iPad Human Interface Guidelines

8.1 Introduction

The guidelines are chosen according to their relevance mainly for the user and not the designer only. The Human Interface Guidelines contain four chapters where the first provides an overview of the device showing differences from the iPhone, such as its large screen and its highly interactive interface. In the second chapter strategies for changing iPhone to iPad apps are described where the familiarity with iPhone OS makes changing code relatively easy while developing the user interface and experience is more challenging. This paper now focuses on the third chapter, the iPad User Experience Guidelines that help the designer and programmer to deliver great user experience. The fourth chapter, the iPad User Interface Element Guidelines that state how to use user interface elements in iPad applications is an extension of chapter three and will therefore be covered in one. In the former guidelines interactivity and content come to the fore. The best apps promote those features by ("iPad Human Interface Guidelines," 2011):

1. "Downplaying application UI so that the focus is on the content that people want.

2. Presenting the content in beautiful, often realistic ways.

3. Taking full advantage of device capabilities to enable enhanced interaction with the content."

The following guidelines and principles were selected and investigated in more detail (see examination of guidelines a little later):

- Aim to Support All Orientations – Meaningfulness of rotating the device

- Flatten Your Information Hierarchy – The importance of auxiliary views, e.g. bars

- Add Physicality and Heightened Realism – Real-life graphics to make users comfortable

- Multi-touch Gestures – Performance of certain actions

- File-Handling – Differences to other operating systems

- Keyboard – Hidden functions

Human Interface Principles

- Aesthetic Integrity – Measurement of the incorporation of an applications appearance with its functions

- Consistency – Transferability of the user's experience and skills between different apps

- Direct Manipulation – Direct control through multi-touch gestures

- Feedback – Immediate feedback after operations

- Metaphors – Relation of virtual objects to real world objects

- User Control – The user's responsibility of actions

8.2 Research Method

About 140 students of the University of Technology in Graz developed iPhone and iPad applications in a research based teaching session within small teams of two to four students. Additionally, a master class on graphical design assisted each group concerning interface design issues. They received additional lectures on appropriate Human Interface Guidelines, especially for iPhone / iPad applications provided by Apple. Finally, the three best practices out of all developed apps additionally to standard apps were selected and tested during the winter term 2010 in real life school settings amongst children between the age of eight and ten on their iPads. In summer term 2011 a similar study was carried out with some improved scenarios to do research on how the applications could be used in teaching and learning. In addition, the insights of the field experiment will be taken into account.

In order to find out whether and to what extend the application of the Human Interface Guidelines was leading to the predicted user satisfaction, thinking aloud tests as well as user observations were conducted in the field test. Finally interviews helped to clarify user experiences and impressions. Only those methods allowed to view the users in the areas connected to the HIG and to find out where and why difficulties occurred.

The main focus now lies on the user observations done and the outcome lessons learned for interaction design. Finally, from a didactical, technical and also developmental point of view it will be shown what the essential criteria to establish mobile learning in the classroom are.

8.3 Examination of Guidelines

8.3.1 Aim to Support All Orientations

As the title suggests the iPad is able to support all orientations. Once students found out that rotation was possible they assumed that it would work for all applications and mostly wanted to turn the device to landscape mode because they could zoom in more. When apps did not support the landscape mode students asked if something was wrong with their device and were distracted from their tasks. On the other hand, at times it can be better if the rotation mode is locked because students were irritated by the screen rotating during activities that involved moving the iPad, e.g. interactive games where they had to move objects through shaking the device.

Some students were not aware of the advantages and disadvantages the alignment provides for certain exercises. Many apps have been designed to take advantages of the two orientation modes or have restrictions, e.g. when they used *Mail*, the default mail app on the iPad, they had a list of mails and accounts on the left pane in landscape mode but not in portrait mode. The majority of students that used portrait mode was confused and asked for a solution. Therefore, designers should always keep in mind to find a way to make users aware of additional auxiliary information that gets lost in portrait mode. Another point, the Human Interface Guidelines focus on regarding rotating screens is reformatting. Students often lost their sentences when rotating their iPad from landscape into portrait mode. The younger ones repeatedly asked for help when that occurred. They should be told from the beginning that they should stay in one mode all the time when writing.

Also, if the device is in portrait mode and an application is starting in landscape mode it is most likely that it will only run in that particular mode only.

8.3.2 Flatten Your Information Hierarchy

Very likely students forget where in their applications they currently are. Therefore, most apps have additional tools on one screen so the user does not have to click through various places. Students should be familiar with auxiliary views right from the

start. Firstly, there are navigation bars, mostly on the left pane, that compresses the information hierarchy by one level, e.g. in *Dropbox* (see figure 8.1).
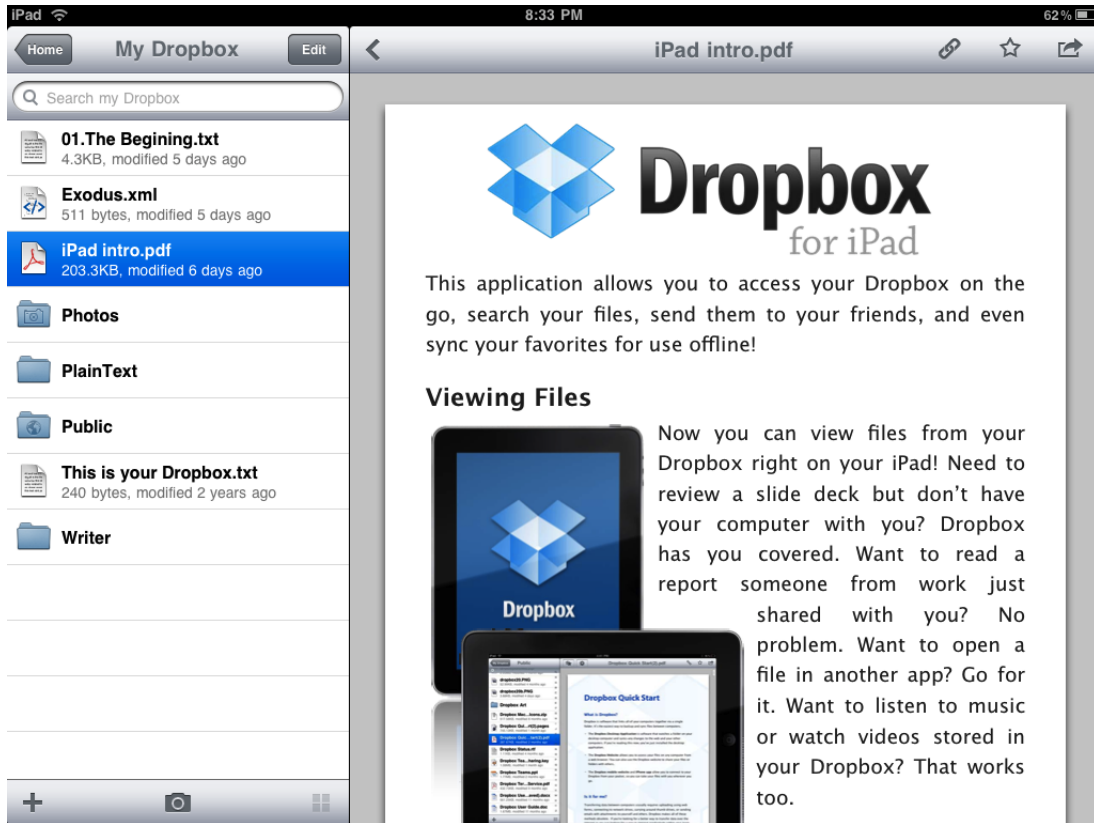

Figure 8.1: Navigation Bar in Dropbox
Source:
http://http://ipadwatcher.com/2010/10/15/dropbox-access-and-share-files-from-your-ipad/
(retrieved 21/02/2012)

Secondly, popovers are often used so the user does not have to go to another screen to get additional information. Thirdly, segmented control in a toolbar enables displaying different categories and the user does not have to leave the site (see figure 8.2).

Figure 8.2: Segmented Control in *iTunes*

Lastly, similar to those toolbars, tab bars are often used to display various categories without moving to another site deeper into a hierarchy but swap in different screens (see figure 8.3).
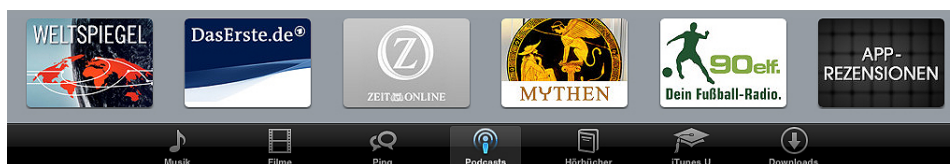
Figure 8.3: Tab Bar in *iTunes*

At the top edge of the screen there is the status bar which displays the time, the battery charge and the network connection. Since it is not only important for teachers to control and keep track of the time but also for students, no matter where they sit, the status bar should not be hidden. Also, the user should monitor the battery charge. Sometimes, students were worried when they had a low state of charge, e.g. 20%. However, the iPad's battery is quite powerful and students should be told about it from the beginning, otherwise the same question will come up over and over again.

8.3.3 Add Physicality and Heightened Realism

Numerous apps provide the user with realistic dimensions so it is easy to understand how they work, e.g. the address book, where students needed little explanation. Additionally, the Human Interface Guidelines suggest delighting the user with spectacular graphics so they are drawn into an application. As long as those graphics and animations are not simply a distraction for the students, there is no problem. However, especially the 10 year olds were easily diverted, particularly with eBooks that contained a considerable number of animations and sounds. For a while they forgot about reading and just played around.

8.3.4 Multi-touch Gestures

The user interface is based on multi-touch gestures to perform several actions students should know. With one finger, for instance, objects can be tapped to be selected. The one-finger swipe is used to move objects between two positions. Also, this gesture is known as scroll gesture because the user can scroll lists. Another gesture is the pinch that usually implies the thumb and a finger to zoom in or out a position, e.g. a picture. Additionally, a page or an image can be rotated when the thumb remains in one position and the second finger rotates around it. Very little explanation was needed here since students knew most essential gestures from TV, their smart phones or immediately found them out themselves or together with their colleagues.

8.3.5 File-Handling

Those students who already worked with devices with operating systems that had a file browser got used to not thinking about those soon. They should be encouraged to view their documents as objects in various apps, such as *Pages*. Another difference to other systems is that the users do not have to save their work except they cancel or delete since iPad apps such as *Pages* or *Keynote* are responsible for saving. They save when a document is quit, another one is opened. Additionally, those apps save periodically. Since students often asked how they should save or they were unsure about their documents being saved, teachers should pay special attention to explaining that. However, students will certainly use notebooks, PCs or the like at home or in school where automatic saving cannot be taken for granted, e.g. in Microsoft Word. Again, they have to be made aware of that difference.

8.3.6 Keyboard

Very briefly the keyboard is mentioned in the guidelines but its usability and features are of great importance. For students, especially young learners, it was a big challenge to type their first sentences. They did not know about the touch typing system and it took them very long to figure out certain special characters because they could only be found through pressing two keys, e.g. you need to press '.?123' and '#+=' to get to the percentage sign. If teachers do not encourage their students to search on their own before they ask for every detail, they will have nearly all students put their hands up at the same time.

In addition, there are numerous relatively hidden keyboard features which students randomly came across. When you write at least one word and double-click the space bar, you get a blank character and a dot. Or when you hold down the comma, you get an apostrophe and when you do the same with the dot key, you get a quotation mark which saves a lot of time in longer texts. Try out various letters to get other versions like umlauts or letters with accent marks. Another new feature is the split keyboard one student found out about. When you click the show/hide button at the bottom on the right, you can undock or split the keyboard which can be very handy. Undocking allows moving the keyboard to another position. The keyboard can also be split when you hold one finger on each side of it and just swipe them outwards. In reverse order you can merge it again.

Depending on which language is selected, adapting the keyboard settings can be very useful too. For instance, students in the field experiment used German settings and when they wrote their texts in English auto-correction was turned on and distracted

them. Under Setting > General > Keyboard auto-correction can be turned off. Further, auto-capitalization and caps lock can be turned on and off.

Generally, it can be said that the majority of students felt comfortable using the iPads keyboard (see figure 8.4). Although they had to get used to hidden functions they improved. Still, the speed of typing is slower than their handwritten work.
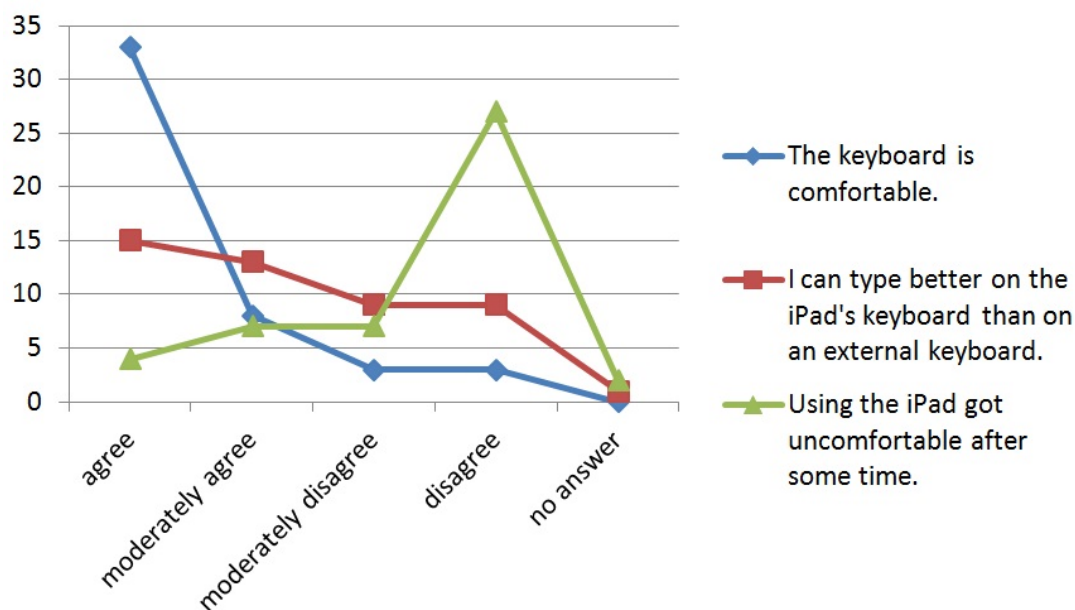

Figure 8.4: Use of Keyboard (own diagram)

8.4 Human Interface Principles

> 'A great user interface follows human interface design principles that are based on the way people—users—think and work, not on the capabilities of the device. A user interface that is unattractive, convoluted, or illogical can make even a great application seem like a chore to use. But a beautiful, intuitive, compelling user interface enhances an application's functionality and inspires a positive emotional attachment in users.' ("iOS Human Interface Guidelines," 2011)

Aesthetic integrity does not indicate the beauty of an app but measures how well the look of an application incorporates with its function. Apps like *Pages* and *Keynote*, that allow productive tasks, focus on simple design and not on spangling elements that could distract the user. Those two apps use straightforward buttons and provide the user with a clear understanding of their purpose. Also students who were new to

text processing and presentation programs figured out the purpose of various buttons quite fast. Nevertheless, many had problems highlighting and copying words. They were not used to double-clicking words or tab on words for longer. Some stated they would prefer a mouse in the first lessons. However, after more practice the majority felt comfortable with the apps.

Further, aesthetic integrity does not mean that all apps have to have reduced decorative elements. On the contrary, if an app promotes widespread tasks, e.g. a game, users do not want to get bored and expect pleasant appearance that guarantees a good time and proposes to discover more.

8.4.1 Consistency

Consistency in the interface is of great importance since users can confer their experience and skills between different apps, e.g. from *Pages* to *Keynote*. Students first learned how to work with pages and then familiarised themselves with *Keynote*. Most symbols remained the same and all the gestures like double-clicking for cutting, pasting etc. were not new for them anymore. The aforementioned apps were clearly developed according to standards the user is familiar and comfortable with from other leading productivity programs. Further, they are very intuitive for new users and follow the principle of consistency, which means they are consistent with iOS standards. The icons always have the same meaning and the user can predict what they will do when they are at a different place.

8.4.2 Direct Manipulation

With the iPad the user can directly manipulate objects, such as pictures, onscreen and does not have to use commands like buttons for that manipulation. Students soon understood how to control pictures, e.g. how to zoom in or make them bigger or smaller. They enjoyed the multi-touch interface straight away, started experimenting and passing on their knowledge, e.g. when one student found out how to rotate images, another way of experiencing direct manipulation, he immediately showed his colleagues. Students had immediate results that they could see from the beginning.

8.4.3 Feedback

Another essential principle is the immediate feedback the user wants and gets after operating a control. For example, when a word is highlighted in *Pages*, it turns blue if

the user tabs the info button it glows for a second to indicate a successful operation. Such feedback is of great value for the user since they know whether something has worked or not and saves time. Apart from visual, also audible feedback can help the user to clarify results of actions. Students mainly got to know visible feedback because they had to turn off the sound most of the time to avoid a higher noise level.

8.4.4 Metaphors

A principle that avoided many questions of students that would certainly have come otherwise, is the use of metaphors. Since iOS offers numerous metaphors through graphics and gestures the user can physically interact with realistic onscreen objects. Students quickly related virtual objects such as icons to real world objects if they had a similar appearance, e.g. folders. Mostly, those metaphors have less or hardly any limits of the real-world object. Folders on the iPad can be filled with considerably more files than real ones. The user knows that the main purpose of folders is filing. If they also had to organise files into registry, the usability of virtual folders would be diminished, which means that metaphors should not be expanded too far.

> "Metaphors in iOS include:
>
> - Tapping Music playback controls
> - Dragging, flicking, or swiping objects in a game
> - Sliding On/Off switches
> - Flicking through pages of photos
> - Spinning picker wheels to make choices"

("iPad Human Interface Guidelines," 2011)

8.4.5 User Control

The last Human Interface Principle suggests that it should mainly be the user who starts and is in charge of the actions. It is considered as a mistake if apps make decisions for the user on their own, except if they help to avoid risky results. Our students often used English apps although they just started to learn the language. Additional messages and controlling actions would likely have led to distraction and more questions. Therefore, it is enough to have straightforward actions they could understand without difficulty although they knew little about the language. Here, the aforementioned metaphors were of great help since they often were symbols or icons without text.

8.5 Summary of Outcomes

Taking the aforementioned guidelines and principles into account, their thorough use definitely improves the development process as well as the interface design and leads to a better reception of learning apps. However, children, in our case young learners at the age of eight to ten, still need further explanations from their teachers. Although the apps we used were mainly self-explanatory many students needed additional help since they often were afraid to do something wrong or were not motivated to explore on their own. After some encouragement and support they first tried themselves and then asked their colleagues. Clearly the role of teachers leads to a motivating and supportive one which also means that their efforts are increasing too.

8.5.1 Importance of the Guidelines

Although students will sooner or later be well versed with the functions of the devices because they experimented or helped each other, it is of great importance that their teacher knows about gestures, bars and orientations to provide all relevant information. Regarding the iPad HIG they should be aware of the following points:

- Not all applications allow rotation and it should be pointed out when and why landscape or portrait mode is more appropriate and which restrictions the two orientations imply.

- Students should know about the hierarchy, position and function of auxiliary views such as bars so they do not get lost (e.g. in *Dropbox*).

- Students should be familiar with multi-touch gestures from the start to know how to perform various actions.

- File-Handling on the iPad differs to other operating systems and students should know how to find their files and why it is not necessary to save them in apps like *Pages*.

- The keyboard offers numerous functions but many of them are hidden. However, using them saves a lot of time when writing a longer text. Students should know how to find them.

- The appearance of an application does not necessarily say something about its content. Before students use it, teachers have to make sure they tried it out themselves before to see whether the app delivers what its appearance promises. Often the animations and graphics are better than the content and learning effect.

Guideline/Principle	Considerations
Aim to Support All Orientations	No big changes of interface
Flatten Your Information Hierarchy	Provision of auxiliary views
Add Physicality and Heightened Realism	Realistic dimensions
Multi-touch Gestures	Knowledge of gestures
File-Handling	Differences to other operating systems
Keyboard	Hidden functions
Aesthetic Integrity	Appearance matches content
Consistency	Transference of skills
Direct Manipulation	Direct control through user
Feedback	Immediate feedback after operations
Metaphors	Virtual objects relate to real world objects
User Control	Responsibility of actions

Table 8.1: Summary of Considerations Regarding the Guidelines and Principles

8.5.2 Criteria to Establish Mobile Learning in the Classroom

Visual Aid

In a class with more than 20 students who all have their own device, one teacher can hardly cope with all the questions that constantly emerge. From our experience, mentioning how certain apps work is not enough. Teachers need a beamer or smart board for explanations while all students are watching. Otherwise, the same instruction has to be given over and over again.

Organisation

We suggest making folders to keep track of your apps, e.g. one folder for every subject or for all productivity apps, like *Pages* and *Keynote*. Further, all files should be stored in a *Dropbox* account that is shared with all students. For instance, English students shared all their *Keynote* presentations, MP3 files and worksheets.

Material

Currently, no digital schoolbooks for the iPad are available in Austria. Can teachers move forward with subject matters without them? Yes, they can but with additional preparation time for the teachers. We split up a class (one half worked with iPads the other one without) for a month and tried to complement the books with worksheets, online exercises and apps and could practice listening, writing, speaking and reading skills. There was no measurable difference between the two groups and we managed to work on exactly the same subject matters. There is plenty of online exercise of all kinds available. However, teachers always have to be careful with copyright issues.

Choice of applications

Teachers should try out apps before they show or start them together with their students. Sometimes, apps are more difficult that their title or description suggests. Further, teachers have to take into account that young learners of a new language might not even understand the error messages or buttons (if they have text on them). They should choose apps that offer great metaphors for children and are very intuitive. Moreover, some apps are really just fillers for five minutes because they do not have much content, are too easy or too difficult for learners. It is the same with worksheets – teachers should look through them first, not only to be prepared for questions, but also to check whether they really fit the desired outcome or purpose.

Writing

Since we did not want students' handwriting to be underestimated, we used apps such as *neu.Annotate+ PDF* that allows handwritten annotations for several worksheets. Additionally, they wrote some texts in *Pages* which is useful for all subjects where students have to make notes too. As mentioned in the chapter about Human Interface Principles the buttons are quit self-explanatory but students had problems with deleting words or pictures. There is no metaphor for those actions but when they were told via the aid of the beamer hardly anyone asked the same question again.

Managing classes and grades

Teachers can easily get themselves organised with apps like *TeacherPal* that offers a section to enter grades, students' cooperation, attendance and behaviour. A seating plan with pictures and additional information about students, like names, email-addresses can be added too. In addition, there are numerous free apps to monitor tests and homework for students if they are allowed to take their devices home.

Connectivity

Since the school network very likely cannot cope with 20 or more devices an additional router is recommended to guarantee a stable internet connection.

Internet research

No matter which subject they currently have, students will need the internet, e.g. for downloading worksheets, watching short clips and most of all doing research. Therefore it is of great importance to make them aware of copy right issues, quoting and which websites are suitable for their research purpose.

Battery life

Teachers/students should monitor battery life every day. Depending on how many hours the devices are used the iPads should be charged. It can be very annoying if students do not have a device.

Books for free

Shakespeare, Twain or the Three Little Pigs by Halliwell-Phillipps – they can all be read for free. The iBook store offers numerous books for all age groups which is great for all language teachers but also technical, scientific and health related books can be found well enough.

Group projects

Students get instant access to information for their projects, can share those, split tasks and make presentations. Once they are done they can present them in front of the whole class and upload them to their *Dropbox*. A great app for doing research is *Wikipanion*[1], where students can find out about nearly anything. They can save a search history and images and add bookmarks. In addition, the *World Atlas HD*[2] and *GeoMaster Plus HD*[3], where students learn interesting facts about countries and can test their knowledge, are very helpful.

Movies

Students cannot only watch movies but also create their own, e.g. with iMovie which costs about four Euros. They can record their own theatre plays or short dialogues, cut them, add sounds and text. They can monitor themselves, e.g. their pronunciation, and their colleagues, give better feedback and understand the feedback they have been given better. Movies are not only a good idea in language subjects but also in scientific subjects like Physics or Chemistry where students make experiments from time to time and can add text for a better understanding later on. Experiments have already been carried out by Prof. Eduard Schittelkopf at the PH Graz.

8.5.3 Conclusion

An active participation, that means more interaction, leads to greater learning experience. Therefore the development of appropriate learning apps can be a promise for the future of teaching. Taking into account Human Interface Guidelines improves the usage within real-life learning and teaching settings. Further, a beautiful, intuitive and convincing graphical user interface adds to positive feelings in users. There is a strong

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[1] http://itunes.apple.com/de/app/wikipanion/id288349436?mt=8
[2] http://itunes.apple.com/de/app/world-atlas-hd/id364733950?mt=8
[3] http://itunes.apple.com/us/app/geomaster-plus-hd/id464061812?mt=8

relationship between good interface design and the ease-of-use of learning apps. However, the look of an app should also incorporate with its function. Developers should always consider the needs of the target group carefully before they start designing and test their apps, e.g. an app for young learners is not appropriate if it contains difficult buttons or too much text. Learning objects of the future can be small apps, but it has to be kept in mind that they will be designed for a special target group – the learner.

To conclude, students quickly got accustomed to working with the iPad and the majority was fine with the explanations provided by the teacher (see figure 8.5).
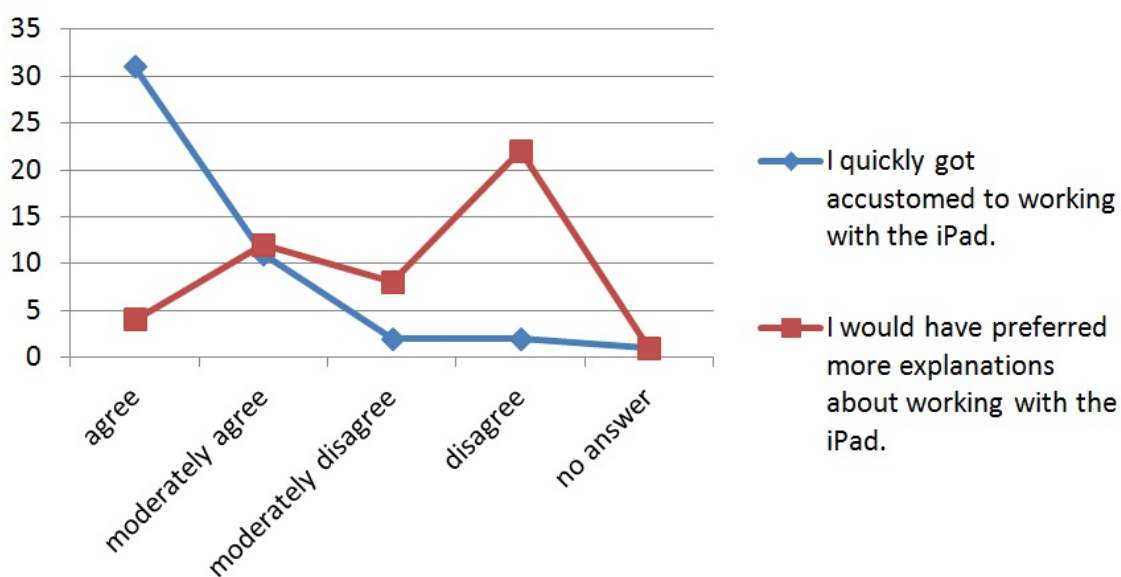
Figure 8.5: Orientation (own diagram)

Table 8.2 contains a checklist that summarises the most important technical, didactical and administrative issues that should be considered when using the iPad in class.

Technical Issues	☑
Visual aid (beamer...)	☐
Battery life	☐
Connectivity	☐
Didactical Issues	☐
Choice of applications (to be checked beforehand)	☐
Administrative Issues	☐
Organization (folders...)	☐
Tool to manage classes and grades	☐
File-sharing (Dropbox...)	☐

Table 8.2: Checklist

9 Future Perspectives

In this chapter current discussion about electronic schoolbooks and possibilities for teachers to create them themselves will be presented. Afterwards, possible problem situations will be dealt with.

9.1 Electronic Schoolbooks

Currently, educational publishing companies in Austria are adopting a wait and see attitude when it comes to creating electronic schoolbooks. In the previously mentioned secondary modern school in Jennersdorf, printed school atlases, Bibles and dictionaries are things of the past and can be found on the iPads instead. Teachers focus on audio-visual contents. Graphics, simulations, videos provide illustrative lessons. Nevertheless, 'searching for contents is very time-consuming' as the headmaster of the secondary school, Hannes Thomas, puts it. On one side, there is a lack of German speaking applications and on the other side, almost all apps only deal with one aspect or topic at a time. The majority of Austrian teachers who are currently using the iPad in schools, perceive the device as a supplement to already existing schoolbooks ("Tablets statt Schulbücher," 2012).

Nevertheless, digital contents are provided by most educational publishing companies. Cyber homeworks were students often get a week to complete their online tasks are becoming more and more popular and are favoured by students. However, when it comes to preparing for vocabulary revisions, they still consult their exercise books. According to the publishing director of Hoelzel, Lukas Birsak, there is no clear advantage of the use of digital media in schools. On the contrary, he states that their use can lead to improper work. Additionally, he states that at the moment there is no big ambition to change the current situation and that above and beyond financing, the schools' infrastructure and choice of devices play a decisive role ("Tablets statt Schulbücher," 2012).

9.1.1 iBooks 2

In January 2012, Apple launched iBooks 2, an electronic textbook platform that provides new interactive multi-touch textbooks created with new authoring software which will be discussed later (see figure 9.1). The possible ways of learning have changed extensively within the last years. Although students use new technologies at home, they have hardly found their way into the classroom. Apple promotes the iPads appearance and usability[1]:

> 'A multi-touch textbook on iPad is a gorgeous, full-screen experience full of interactive diagrams, photos, and videos. No longer limited to static pictures to illustrate the text, now students can dive into an image with interactive captions, rotate a 3D object, or have the answer spring to life in a chapter review. They can flip through a book by simply sliding a finger along the bottom of the screen.'

What is more important regarding the use of electronic textbooks in schools is that text can be highlighted easily, notes can be taken, students can search for content and find definitions in the glossary. Additionally, they do not need to carry as much weight as they are now used to do. Samples can be downloaded and teachers can still decide if they want to purchase the whole book or not.

Although it is amazing for students to learn with 3D simulations and objects or have interactive photo galleries, the content should always come to the fore. Nevertheless, the great graphical user interface and design of the textbook can be a great motivation for students.

A convenient method to personalise learning is to highlight text by swiping over it, make additional notes and then view all the text passages and notes together in the note view. Additionally, all the highlights and notes are converted into study cards.

9.1.2 iBooks Author

Textbooks can be created via iBooks Author that offers templates with a number of layouts (see figure 9.2). When the content is ready it can be complemented with additional pictures, movies, widgets and other objects and easily be customised. When the whole book is ready, it can be published in the iBookstore or shared on iTunes U.

If the book is distributed as ibooks-file, it can only be sold in the iBookstore. If the author, however, exports the book as PDF or in the ePub format, the release in other stores is not prohibited.

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[1] http://www.apple.com/education/ibooks-textbooks/

Figure 9.1: iBooks Textbooks
Source: http://www.apple.com/education/ibooks-textbooks/ (retrieved 20/03/2012)

9.2 Problem Situations

The following problems can occur, even if all hard- and software prerequisites are fulfilled.

Slower Written Production

Writing exercises were done in *Pages* and *neu.Annotate+ PDF*. At the beginning, students were rather slow in terms of typing. Since school lessons only last for 50 minutes, most of the time students do not write long texts. Fill-in exercises are more common. However, longer tests could not be written on the devices.

Slower Correction of Written Production

Corrections of written work can be more time-consuming, at least at the beginning. Teachers could correct texts in neu.Annotate by highlighting mistakes and annotating. However, texts have to be converted into PDF files first. Another way to do corrections of written work is the direct marking of words or passages in Pages. Underlining words
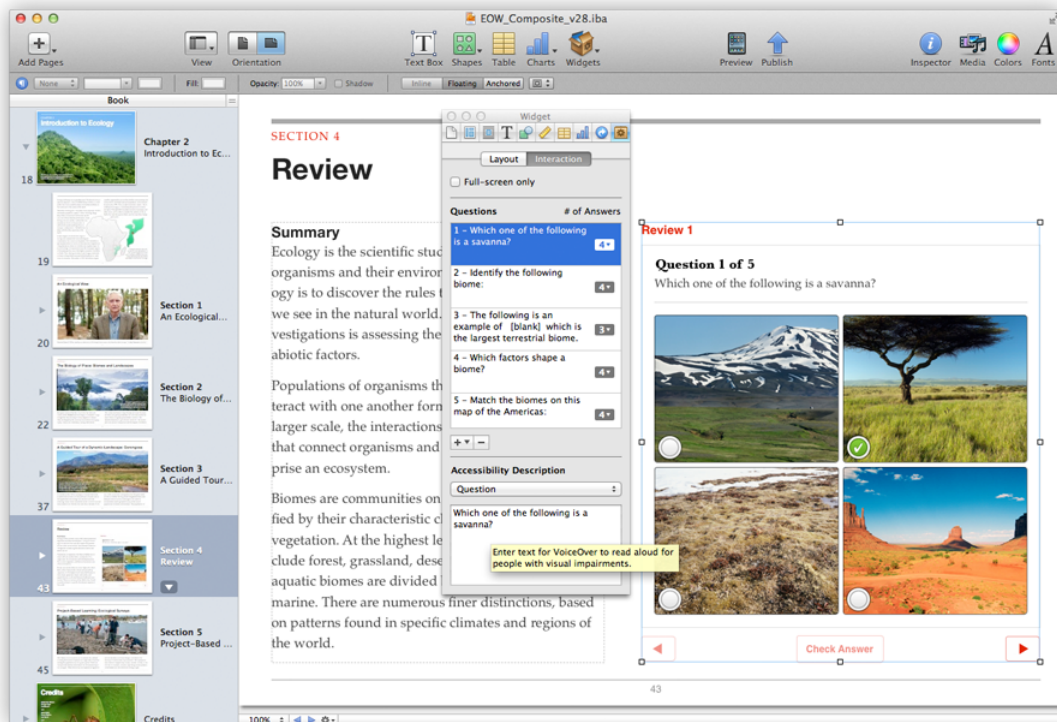
Figure 9.2: iBooks Author

Source: http://www.apple.com/ibooks-author/ (retrieved 20/03/2012)

or changing their colour is significantly more time-consuming than doing the same with a common pen.

Storage

Carrying the tablets away and storing them is a matter of organisation and time. Teachers only have five minutes to go from one class to the next and very often students have questions in the breaks that could not be answered in the lessons. If the devices are used the whole school day, students could store them before they leave the building, unless they are allowed to take them home. Again, a teacher would be needed to supervise the students storing the iPads, since the devices should not be left unattended.

Distractions by Games

Dealing with games is another important aspect and should be thematised in the classroom. The easiest way to avoid students playing games during the lesson, is not to have any installed on the iPad. Nonetheless it should be kept in mind that students, no matter if they use tablets, notebooks or printed textbooks, can be distracted by anything, e.g. they could be doodling or talking to friends. However, if students are distracted by games on the iPad, they might very likely not involve other students. When students in the field experiment got distracted by the iPad, they indeed did not tend to involve their colleagues.

In addition, there are apps like *LanSchool* that allow teachers to monitor students' iPad use (see figure 9.3). The *Teacher's Assistant*[2] has to be paired with a *LanSchool* Teacher console which can either run on Mac or a Windows PC. Students have the *LanSchool Student*[3] version on their devices.

The app should enable the reduction of student distractions, supervision of student activity as well as individual help for students[4]:

- **Reducing student distractions.** Teachers can blank screens, limit applications and internet surfing on students' iPads.

- **Monitoring students.** Teachers can view all student screens as thumbnails at once and can send individual messages.
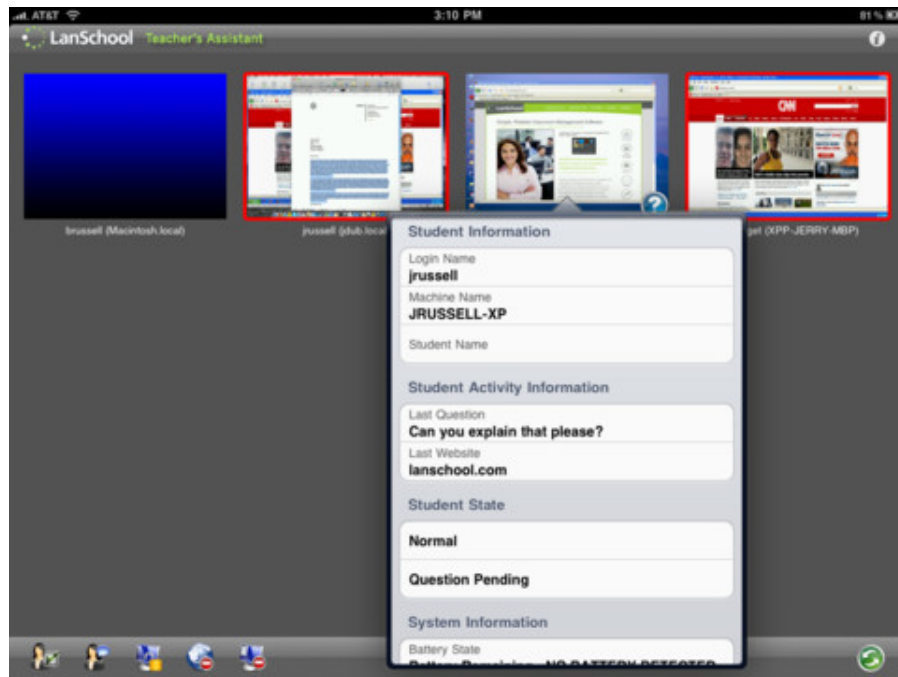
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[2] http://itunes.apple.com/us/app/lanschool-teachers-assistant/id376316935?mt=8
[3] http://itunes.apple.com/us/app/lanschool-student-for-ipad/id399127571?mt=8
[4] http://www.lanschool.com/ipad

Figure 9.3: LanSchool - Monitoring Students
Source: http://itunes.apple.com/us/app/lanschool-teachers-assistant/id376316935?mt=8 (retrieved
20/03/2012)

- **Assessing student understanding.** Teachers can send out questions to students.

- **Helping individual students.** Each student can ask for the teacher's help. The teacher gets a question mark on the student's thumbnail.

Lack of Availability

In the field experiment it soon became clear that most ESL apps could only be used for a few minutes after students completed all the tasks. However, numerous online exercises that do not require Flash were used to deepen subject matters. Using the iPad in class does not automatically mean, using apps all the time.

Language Barriers

Most apps are in English and not designed for ESL learners which sometimes makes it difficult to find level-appropriate apps. Some apps, however, are quite intuitive and their menus can easily be understood by young learners who have no or little

understanding of the English language. In any case, the level has to be taken into consideration.

Teacher Training and Redefinition of Approaches

Teachers need to redefine some of their approaches, e.g. when it comes to planning lessons. The use of tablets will challenge their conventional role, which means that they will go into the direction of being coaches. Further, the device and its possibilities have to be understood before planning lessons. Teachers who are willing to teach with tablets, have to make themselves familiar with the devices to use them properly in the classroom. Also, the curriculum with its objectives should be borne in mind since teachers could also be distracted by well-designed apps that might have little content.

No Flash Support

Flash is the basis for numerous learning programs. However, the field test could be managed without significant losses. It is of great importance that teachers check if websites they want to integrate to their lessons work properly. This works best, if they use their iPads for their preparation work straight away.

Hardly Any Interfaces

Since the iPad does not have USB interfaces, it soon becomes clear that saving and sharing data has to proceed differently which can mean a huge reorganization and reorientation for students and teachers. However, the aforementioned web-based file hosting service *Dropbox* provides great storage and saving opportunities which takes a stable internet connection for granted.

9.3 Discussion

Nowadays children grow up with a great variety of new media and learn how to deal with new devices fast. New media like tablets can enrich lessons because of their interactivity, visual aids and flexibility. Although no study can prove an improvement in performance, at least no decrease in such could be detected. Students themselves

thought they learned a bit more in the iPad lessons which is bound to be subjective but could not be proven (see figure 9.4).
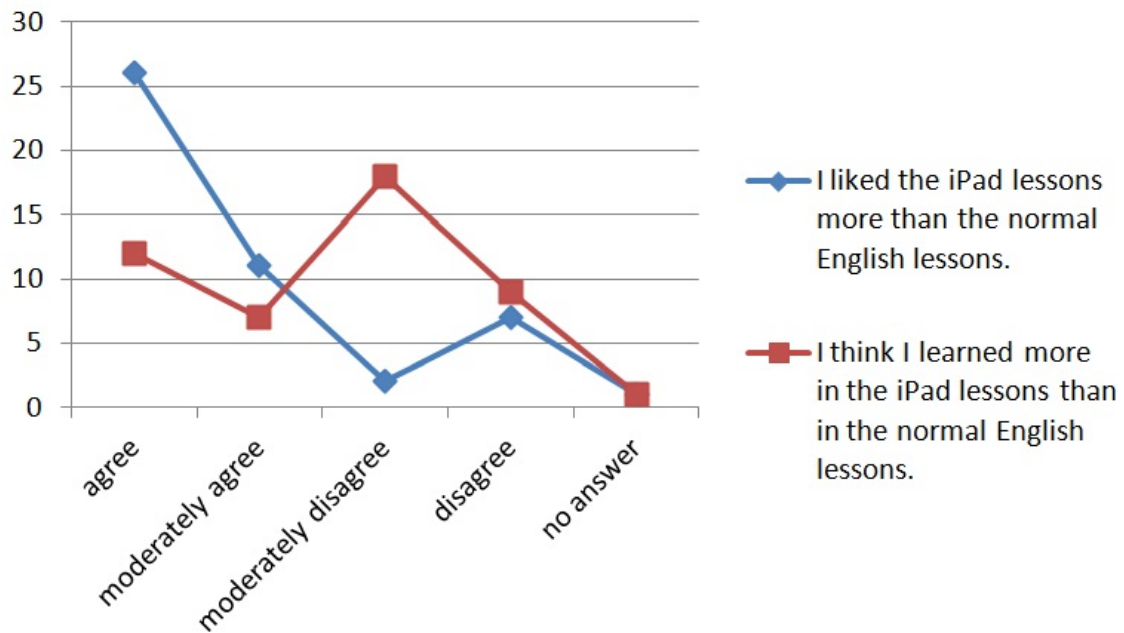

Figure 9.4: Learning

Apple's iPad is the trendsetter and currently appears to be more suitable for the use in schools than other devices because of the great variety of apps and the consistent further development of electronic textbooks.

On condition that teachers know how to handle and work with tablets in the classroom, the advantages and possibilities outweigh the disadvantages because most of them can be counteracted as described in the chapter about problem situations. Financing iPads for the whole class remains one of the biggest issues and remains reserved to a minority of schools. However, support programmes do exist.

Further, the field experiment has shown that educational objectives as well as teaching tasks can be promoted and handled with the aid of the iPad whenever it is appropriate to use the device. Figure 9.5 and 9.6 summarise the didactical basic concepts, educational objectives and teaching tasks as well as contributions to the educational field and their

realisation and promotion through the iPad.
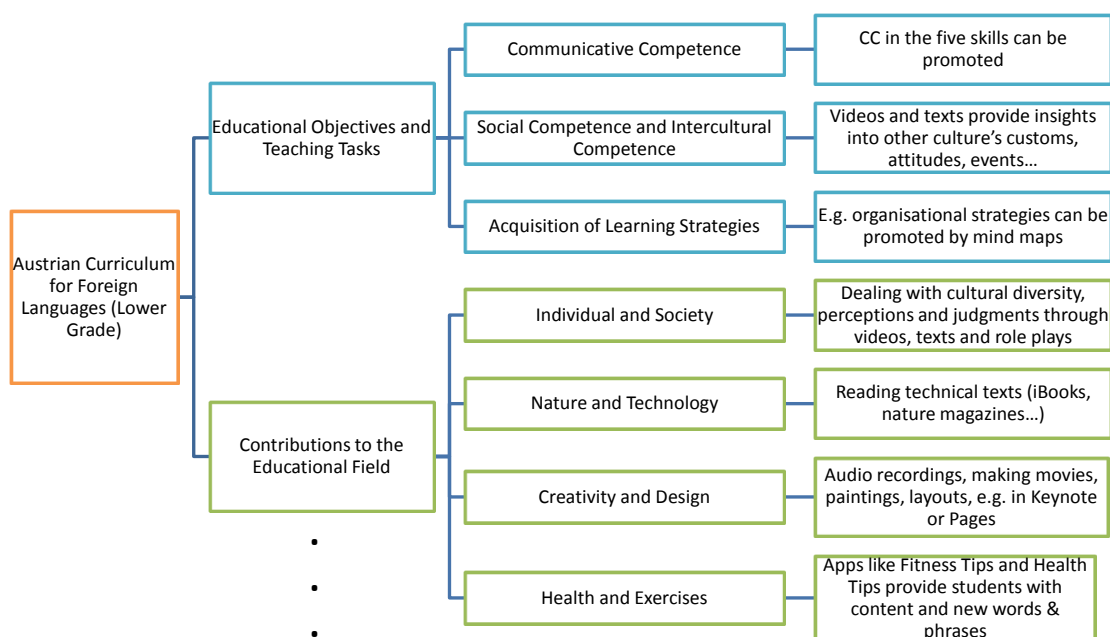
Figure 9.5: Summary: Realisation of the Curriculum's Requirements (own graphic)

Students learn fast and will soon be familiar with tablets in classrooms because they experiment a lot and help each other. The teacher should know about the devices' peculiarities, gestures, bars and orientations to help students. The following points are a summary of the most important guidelines in terms of classroom situations (see figure 9.7).

The apps presented in this work can partly be transferred to other subjects. *Pages*, *Keynote*, *neu.Annotate PDF+*, *Microphone + Recording* and *MindMeister (mind mapping)* can be used in all subjects, except Physical Education unless theory is discussed extensively. Annotations, notes, presentations can be done in Biology, Geography, Chemistry and almost all other subjects. A great variety of more specific apps for other subjects exists and has to be tried out by the teacher before since many are not age or grade-appropriate. Generally, specific apps that can only be used once should be seen as small learning aids and it has to be considered if their installation makes sense or not. Otherwise, plenty of material can be found on websites where a stable internet connection is the most important prerequisite.
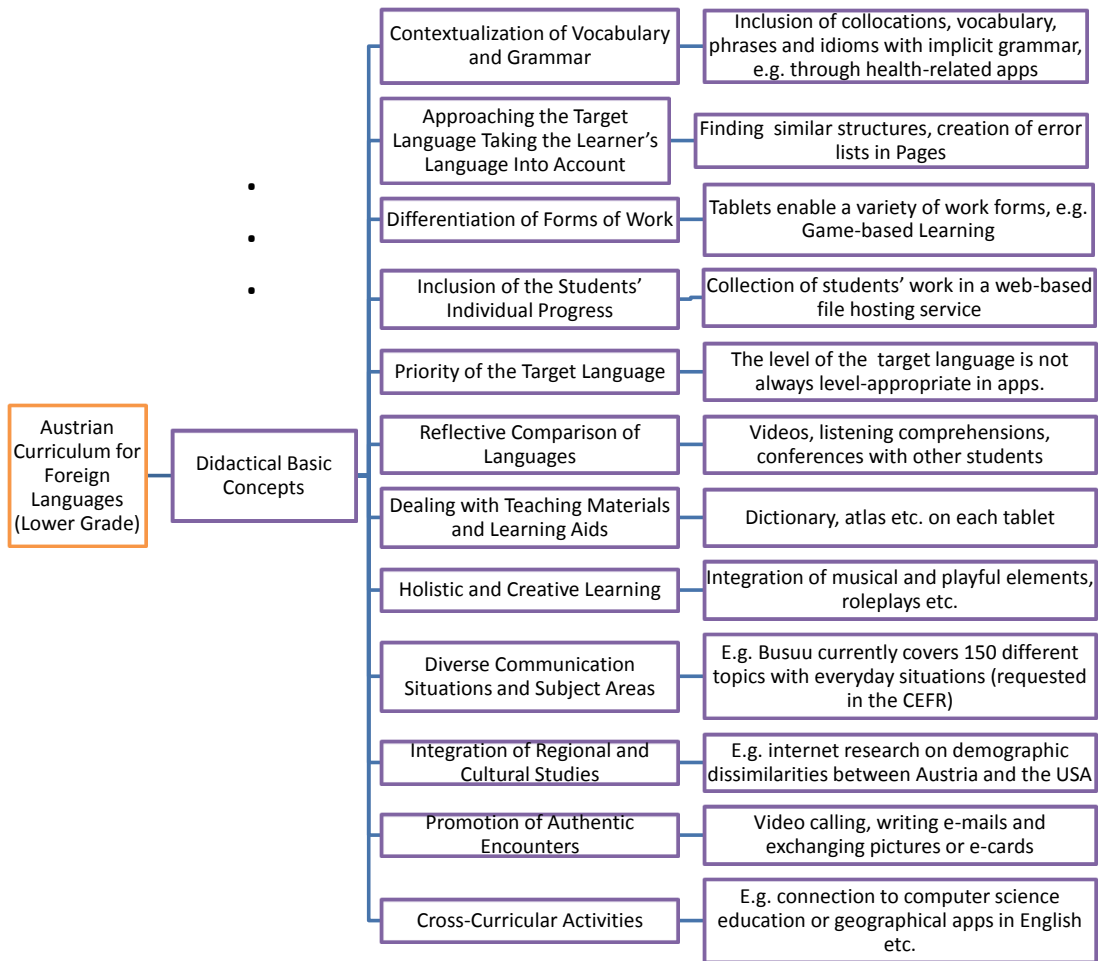
Figure 9.6: Summary: Realisation of the Curriculum's Requirements (own graphic)
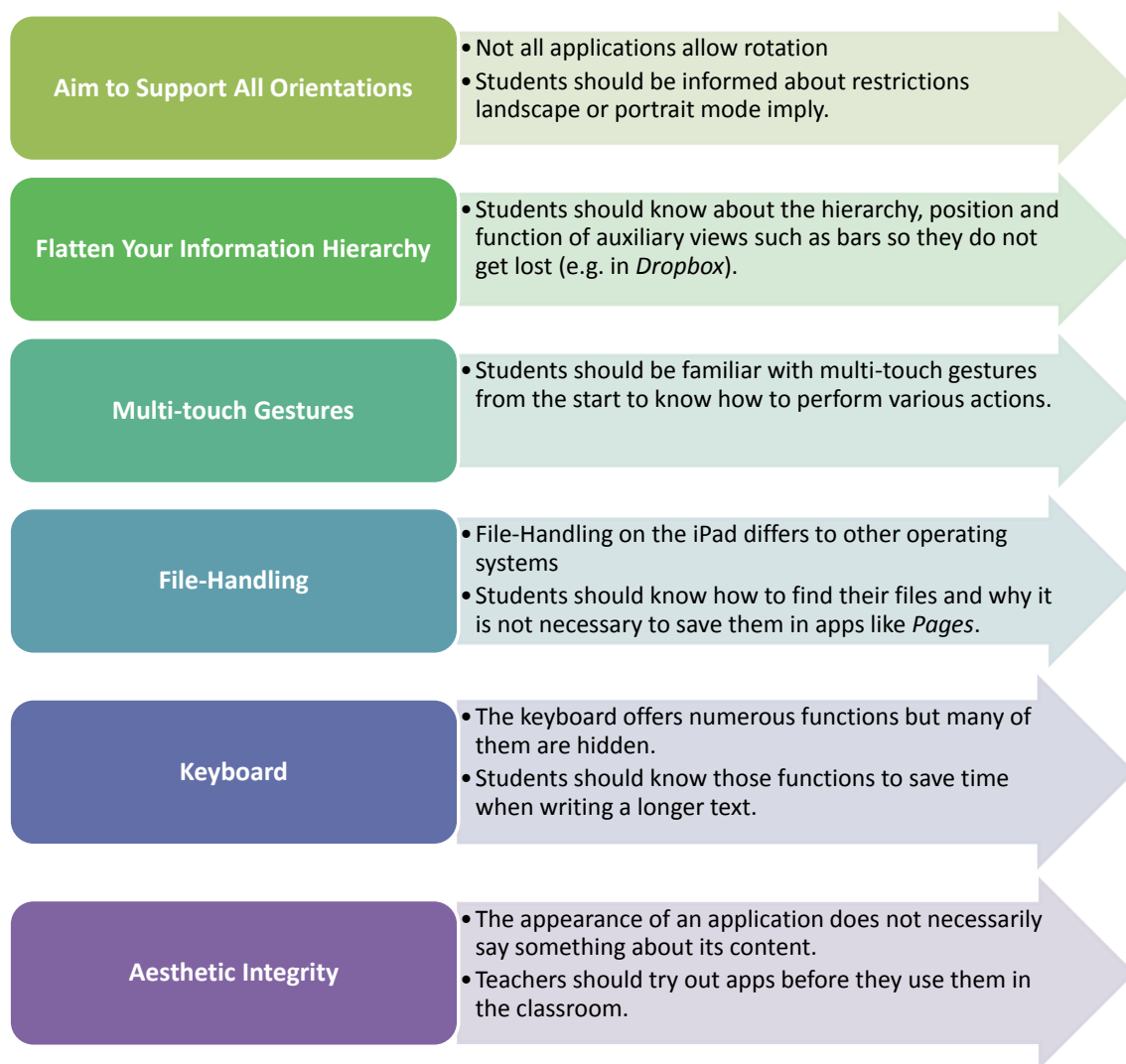
Aim to Support All Orientations
- Not all applications allow rotation
- Students should be informed about restrictions landscape or portrait mode imply.

Flatten Your Information Hierarchy
- Students should know about the hierarchy, position and function of auxiliary views such as bars so they do not get lost (e.g. in *Dropbox*).

Multi-touch Gestures
- Students should be familiar with multi-touch gestures from the start to know how to perform various actions.

File-Handling
- File-Handling on the iPad differs to other operating systems
- Students should know how to find their files and why it is not necessary to save them in apps like *Pages*.

Keyboard
- The keyboard offers numerous functions but many of them are hidden.
- Students should know those functions to save time when writing a longer text.

Aesthetic Integrity
- The appearance of an application does not necessarily say something about its content.
- Teachers should try out apps before they use them in the classroom.

Figure 9.7: Importance of the Human Interface Guidelines (own graphic)

List of Abbreviations

SD   Standard-Definition

HD   High-Definition

VGA   Video Graphics Array

IPS   In-Plane Switching

LCD   Liquid Crystal Display

LED   Light-Emitting Diode

SIM   Subscriber Identity Module

A2DP   Advanced Audio Distribution Profile

PC   Personal Computer

KAS   Kaiserin Augusta Schule

HDMI   High-Definition Multimedia Interface

LAN   Local Area Network

WLAN   Wireless Local Area Network

CLT   Communicative Language Teaching

CEFR   Common European Framework of Reference

NMS   Neue Mittelschule (new secondary school)

EVA   Eigenverantwortliches Arbeiten

HIG   Human Interface Guidelines

ESL   English as a Second Language

PH   Pädagogische Hochschule

bm:ukk Bundesministerium für Unterricht, Kunst und Kultur

OS   Operating System

API   Application Programming Interface

RAM   Random-Access Memory

JIM   Jugend, Information, Multi-/Media

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