

MAINSTREAM ADAPTIVE TECHNOLOGY

A Project

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in

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by

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by

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Department of Graduate and Professional Studies in Education

Abstract
of
MAINSTREAM ADAPTIVE TECHNOLOGY
by
Mary Grace Ventura

Statement of Purpose

The ubiquity of mobile devices used by students with disabilities prompts the author to develop a concise and accessible a manual for mobile devices. The author believes that providing students with disabilities with an accessible tool will educate, empower, and promote confidence, independence and improve quality of life. With inspiration from the Coordinator of High Tech Center, Sacramento State University, Ms. Carol Houston, this manual aims to assists students with disabilities seeking answers to problems using mobile devices such as iPads, iPhones, iPod Touch and Android smart phones. Additionally, the author hopes to instill awareness of the different accessibility features of mobile devices that can improve activities of daily living.

Sources of Data

Resources for this Project were obtained using research materials, books, information from professional journals, library resources, EBSCO host, ERIC Data bases, and internet resources (i.e. Apple's website and Google). The information was reviewed and summarized to enlighten the reader about accessibility features of mobile devices.

Conclusions Reached

The manual was developed for students with disabilities to provide knowledge on different accessibility features of mobile devices. With the development of a manual dedicated to the improvement of skills and knowledge of students with disabilities the author hopes to inculcate awareness and motivation in using mobile devices.

_____, Committee Chair
Dr. Guy Deaner

Date

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Chapter 1

INTRODUCTION

Background of the Problem

The Vocational Rehabilitation Counseling Program at California State University, Sacramento requires each graduate student to complete a Master's degree project prior to graduation. This author is privileged to work on the project on Mainstream Adaptive Technology for students with disabilities attending California State University, Sacramento.

The National Center for Biotechnology Information (NCBI, 2007) has defined mainstream technology as any technology used by most people (NCBI, 2007). Other characteristics of mainstream technology include portability, "interoperability," and accessibility (Vaughn, 2006). Vaughn (2006) stated that portability is the ability to carry the device anytime and anywhere such as cell phones or mobile devices. "Interoperability" allows a program or device to function with another software/program. Accessibility refers to a technology that removes barriers and helps make the world a better place for people with disabilities (Atkinson & Castro, 2008). For example, individuals can use on screen keyboard or customize the buttons of the mouse based on the users' needs. Mainstream technology includes mobile devices, alarm clocks, T.V., and other electronic devices.

The increasing use of mobile devices in school and home environments is paving the way for a more user-friendly interface (Barbeau, Georggi, Labrador, Perez, &

Winters, 2006). Manufacturers of mobile devices are becoming innovative in the functionality of mobile devices. Manufacturers are researching how and where do individuals use the mobile devices. Also, other factors that manufacturers take into consideration include feedback, needs, activities of daily living, and the environment of users. Users are not only using the mobile devices to communicate but as a scheduler, alert, radio, GPS, Braille, captioning and Text to Speech (TTS). TTS reads text aloud and interacts with different applications such as email, Internet, and word document. For example, a user with visual impairment can read the text of a word document by using the TTS. Individuals with learning disabilities can complete tasks by using calendars and alarms such as setting the reminders for homework, exams, medical appointments and social activities (“On the Go,” 2009). Using built-in programs and apps, individuals can set up reminders or alerts for homework, medical appointments, and examination dates. Another feature of user-friendly interface includes TTS that speaks the turn-by-turn directions when using a Global Positioning System (GPS). Users with visual impairment can hear the text to speech direction and follow the systematic instructions when walking. Also, GPS provides other information such as the miles, traffic, and time (Jayant, Kane, Ladner, & Wobbrock, 2009). User-friendly interface facilitates the use of adaptive technology for individuals with disabilities.

With user-friendly adaptive technology students, can multi task as well as save time and effort in completing tasks. Adaptive technology provides many features that empower students with disabilities to be more competitive with mainstream students. For example, Spalter (2010) mentioned that students with speech impairment can now

actively participate during class discussion using mobile applications and customized mobile devices. Students with visual impairments are able to use TTS or Braille displays to access online materials. He also mentions that using TTS read the on-line material, students can respond to questions posted by teachers and peers in real time. Additionally, Spalter states that students can download eBooks and homework in formats that are acceptable and readable with minimum delay using mobile devices. The screen reader program reads the different formats such as Portable Data Format (PDF), Rich Text format (RTF), and MSWord documents (.doc) without having to go to a computer and have the computer read the documents. Furthermore, he states that using Global Positioning System (GPS) and navigation applications (apps) enables users to find their destination. Individuals can type the starting and ending location, listen to the text to speech instructions and see the visual direction. Also, GPS provides traffic, time, and gas mileage information that the person will need before reaching the destination.

Furthermore, TTS is helpful for students with speech impairments. TTS reads and speaks the icons of Augmentative Alternative communication (AAC) programs that allow the students to express opinions and verbally communicate with peers, teachers and families. AAC are TTS programs such as Blio, Proloquou2go, and Verbally (Riggs, 2011) that can be programmed based on the user's needs. For example, the individual can express his need by pressing the icon appropriate for the activity. Different icons can be customized reflecting the activity such as food, parents, sibling, and other activities. Moreover, built-in TTS programs in iPad, iPhone, and iPod Touch such as VoiceOver enables students to customize the voice and speed based on individuals need.

A study conducted by Madan (2012) indicated that personalized learning enhances academic performance of students. Personalized learning is a process of how students learn according to their abilities and preferences. The intuitiveness of mobile devices improves learning styles of students with disabilities. Each student is unique. Their learning styles are dependent on how they “perceive, gather, and process learning materials” (Karagiannidis & Sampson, 2002). People with learning disabilities learn differently from individuals with visual impairments. Others learn visually especially when they can see someone demonstrating the step by step process of how to complete the tasks. Customizing the user interface such as tweaking the icons and adding apps provides better flexibility. For example, students with a visual impairment can adjust the background of the text for better reading (Andes & Castro, 2010). Additionally, customizing the alarm clock and reminders helps students with learning disabilities stay on track with their activities such as homework, class schedules, medical appointments, and social activities (“On the Go”, 2009). The different apps available from the Android market and Apple store increase the potential of students in accomplishing home work (Stachowiak, 2012). Stachowiak reports that apps such as Blio, eBook reader, read text aloud, highlights text, and adjust voice and speed of reader. Students having difficulty taking notes can install app such as Dragon Dictation and Notability. Also, accessing desktop from mobile device is possible by using Remote Desktop App, Splash top Remote Desktop. Through this tool, students can access the program from the computer. For example, if a program called Read and Write Gold is available from the computer they can press the icon and make use of it.

A study conducted by Sinclair (2011) reveals that students develop creative writing and confidence using mobile devices. For example, when students are able to provide the appropriate answers required by the teacher, this builds confidence. In addition, Sinclair states that when students are able to annotate an electronic book, respond to questions using the passage they read; write their own stories about the eBook; record themselves reading the ebook; their learning is maximized.

Proliferation of mobile devices necessitates a development of manual for students with disabilities. In the United States alone, the total number of mobile phone subscriber accounts to 321.7M (Wireless Quick Facts, 2012). Having a manual that is clear, concise, accessible, and usable by students with disabilities promotes learning, improves skills, and gain confidence. Learning about the different accessibility features of mobile devices categorized based on disabilities is essential in completing activities of daily living for students with disabilities. They gain skills through online videos, tips, and tricks from friends, peers, and teachers. When students with disabilities complete tasks as non-disabled population does, they become more competitive, sociable and independent. The project originated through the suggestion of Ms. Carol Houston, Coordinator of the High Tech Center, California State University, Sacramento. Ms. Houston's specialty is to provide hardware and software support to students with various disabilities. For example, Ms. Houston provides instructional support in using Dragon Naturally Speaking software. With her vision and the author's passion for working with people with disabilities, the author is inspired to complete this project on mainstream adaptive technology.

As a future vocational rehabilitation counselor the author will provide assessment for the adaptive technology needs of people with disabilities. The author's tasks include understanding the functional limitations in relation to disabilities, age, educational background, employment history, and purpose of the adaptive technology. Selecting the appropriate adaptive technology for people with disabilities enhances functional capabilities, improves the quality of life, and increases productivity in the educational and workforce world. People with disabilities can perform their task better by using adaptive technology. Also, they develop independence, increase self-esteem, and become more competitive with other employees (Roessler & Rubin, 2006). Each individual is unique and selecting the appropriate device for users with visual impairment is critical to their daily functions. For example, accessibility features such as bigger icons, built-in TTS programs, and Braille accessibility are examples of appropriate adaptive technology that allow them to perform their job better (Jayant, Kane, Ladner, & Wobbrock, 2009). Deaf and hard of hearing population can use captioning when watching movies or videos. Closed Captioning is the group of words that runs at the bottom of the screen and it relates the story to the individual.

Statement of the Problem

Currently a manual with accessibility features of iPod Touch, iPhones, iPads, and Android smart phones is unavailable for students with disabilities. The development of manual that describes accessibility features takes away the extra work of customizing the computer for students with disabilities. For example, students with disabilities use

different accessibility features such as TTS, Braille, open and closed captioning, and eReader. Occasionally, students with visual impairment experience challenging situations such as reading the material when the program is not properly installed; with built-in programs in mobile devices students can answer homework and connect to the online resources. By having an accessible manual, they can easily find answers to questions about mobile devices. When teachers and support staff lack knowledge and training about technology innovations in mobile devices, there could be a gap between students and technology. Also, when proper accommodations are not in place for students with disabilities the opportunity to actively engage can result in frustration. Furthermore, the project will explore the answers to the following questions:

1. What types of accessibility features available to students with disabilities that increase productivity and functional capabilities?
 - a. Visual impairment accessibility features
 - b. Learning impairment accessibility features
 - c. Hearing impairment accessibility features
 - d. Mobility impairment accessibility features
 - e. Speech impairment accessibility features
2. What are the barriers students with disabilities experience when using mobile devices?

Purpose of the Project

The purpose of this project is to develop a manual that shows accessibility features of mobile devices for students with disabilities at California State University, Sacramento. Accessibility features are built-in apps or programs installed in mobile devices. Additionally, the goal of the project is to help students with disabilities be aware of the mainstream adaptive technologies that will allow them to be competitive with other students. Another goal of this project is to help students with disabilities alleviate some of the stress in using mobile devices. For instance, Kondo and Nakamura (2009), indicate that students with disabilities develop skills and increase potential in completing educational activities using the built-in programs and apps. Each student has unique needs and customizing the mobile devices based on their need is essential in completing daily tasks. The project will explore the accessibility features of iPod Touch, iPhone, iPad, and Android smart phones that can enhance the functional capabilities of students with disabilities.

Definition of Terms

1. *Accessibility Features*

Accessibility features are “built-in feature of an operating system, media player, browser or other product that is (1) labeled as such and (2) documented according to relevant industry documentation standards” (Crowe, 2013). These features can include downloadable apps that can enhance functionality of the device to suit the needs of the user in completing multiple tasks. Apps can be free or for

purchase from Apple store, iTunes, and Android market. For example, VoiceOver, Zoom, open and closed captioning, Braille, GPS, ereader, and TTS (Accessibility, 2013).

2. *Americans with Disabilities Act (ADA)*

A federal act of 1990 that “provides civil rights protection to people with disabilities in employment, state and local government offices, public accommodations, commercial facilities, and transportation and requiring TDD/telephone relay services”. State and local governments provide funding to agencies that provide services and equipment to people with disabilities. Adaptive technology, such as TTS, Braille, GPS, and captioning enable people with disabilities to develop independence, confidence, and promotes quality of life. ADA ensures that every person with disability has equal access to everything just like mainstream. For example people with disabilities are eligible to receive accommodations such as Braille, telephone relay services, and TTS (Intro to ADA, 2008).

3. *Applications (Apps)*

Refers to small programs that can be download free or for purchased to mobile devices. This program enhances potential of users to complete a variety of task (Karch, 2012).

4. *Disability*

Americans with Disabilities Act (ADA) defines disability as any impairment that hinders any major life activities of individuals with disabilities. ADA states

that major life activities include “operation of bodily function including but not limited to, functions of immune system, normal cell growth, digestive, vowel, bladder, and brain, respiratory, endocrine, circulatory, neurological and reproductive functions.” For example people with speech impairment can have some limitations expressing their thoughts, opinions and ideas to their peers, professors and families. Also, people with visual impairment would find it difficult to read instructions and respond in writing without Braille (ADA.gov, 2008).

5. *Department of Rehabilitation (DOR)*

A California state agency that helps people with disabilities become competitive in the job market through assessments, proper training, and finding employment that matches the disabilities and functional capabilities. The vocational rehabilitation counselors assess the functional limitations, vocational goals, education, age, disabilities, and interest of the person with disabilities to find the appropriate employment (<http://www.rehab.cahwnet.gov>, 2013).

6. *eBook (electronic book)*

eBook is an electronic book that allows people to read books similar to reading books in digital format. Reading eBooks allow individuals to annotate, resize the fonts, search, read books anywhere and anytime, and word lookup. Individuals using iPhone, iPod, and iPad can download the eBooks from the App Store and Android mobile devices can download eBooks from the Android Market using Play Book (Lee, 2009).

7. *eReader (e book reader)*

A portable hardware device that reads digital publications. Examples of digital publications include eBooks, digital versions of newspapers and magazines. Although the market is inundated with different eReaders, the most popular is iPhone, iPod, iPad, Barnes and Noble Nook, Kindle, and Sony Reader (Mealer, Morgan & Williams, 2011).

8. *Hearing Aid Compatibility Act 1988 (HAC)*

“Requires that all necessary telephones and wireless telecommunications devices manufactured or imported for use in the United States must be hearing aid compatible according to the Federal Communications Commission (FCC).” Mobile phones were modified to include standardized hearing aids to allow people with hearing impairment the ability to hear (Vaughn, 2006). Additionally, people with hearing impairment can use mobile device that are TTY compatible and or send text messages.

9. *Learnability*

“The degree to which the system enables novice users to use the interface with no experience to achieve mastery of basic and advanced tasks of the system.” (Findlater, Graf, Leung, McGrenere, and Yang, 2010). For example, a person with learning disability is able to use the calendar when setting alerts for turning homework. Also, users evaluate mobile devices in terms of interaction with menus such as simplicity of interface. Furthermore, by using TTS, users can follow the instructions in completing sequence of tasks (Ziefle, 2002).

10. *Mainstream adaptive or assistive technology*

Defined as any “products, items, piece of equipment or systems, whether acquired commercially or off the shelf, modified or customized, that is used to maintain, improve the functional capabilities of people with learning, physical, and communication” impairment (Barton, Hall, & Mitchell, 2009). The adaptive technology is customized, modified and inclusive to fit the needs of the mainstream.

11. *Mainstream technology*

Refers to any technology for general use (NCBI, 2007). NCBI stated that the mainstream technology should be evaluated based on the setting and purpose.

12. *Operating Systems*

A program that interacts with hardware and makes the hardware run (Techterms, 2012).

13. *Personalized Learning*

Refers to customizing the menus of mobile devices suitable to individual’s needs and perception. Students are able to connect, collaborate and share with teachers, peers, and families their ideas and opinion anytime and anywhere. Students are able to collaborate online with other students who have similar interest. Additionally, students are able to download multimedia videos to support their homework (“Mapping A Personalized”, 2011).

14. *Section 508 of the Rehabilitation Act*

“Section 508 is a part of Rehabilitation Act of 1973 which requires that electronic and information technology developed, procured, maintained or used by

Federal government be accessible to people with disabilities.”

(<http://askjan.org/links/rehablinks.htm>.)

15. *Text to Speech (TTS)*

A built in program in mobile devices that converts text in voice output such as VoiceOver. TTS reads the text aloud and interacts with other applications such as email, calendars, Internet and other programs (Rouse, 2007).

16. *Usability*

A characteristic of mobile devices that reflects portability, accessibility, design, and cost of mobile devices. For example, the users can access the tactile buttons, headset, microphone and voice output confidently. The design and portability makes the device easy to use and carry (Vaughn, 2006).

17. *User Friendly Interface*

Provides access and navigation of programs and hardware. Simplicity of icons allows users to access and navigate the touch screen especially when the screen is too small and changing from screens to screens can be stressful. User-friendly interface considers the individual needs. The design and interactive approach is unique for each individual needs (Techterms, 2009). For example, users can schedule alerts when homework is due and medical appointments using a calendar (Kane, 2009).

18. *User Friendly Adaptive Technology*

Includes “product, device, or equipment, whether acquired commercially, modified or customized, that is used to maintain, increase, or improve the functional

capabilities of individuals with disabilities (Burgstahler, 2012)”. For example, Stachowiak, (2012) explains that apps such as Notability helps students with learning disabilities take notes during class lecture. Students with visual impairments use TTS to read materials in their mobile devices. When adaptive technologies are customized to become user friendly, user’s capability and productivity increase (Hache, 2011).

Limitations of the Project

This project is primarily designed for students with disabilities attending California State University, Sacramento. The project was conducted between August 2012 and December 2013. This project is limited to the technology innovations for the period covered. According to Services to Students with Disabilities (SSWD), the total population of students with disabilities attending California State University, Sacramento is 600. Also, this project may be posted on the web so that other students can access the features.

Another limitation of this project is that it is limited to the accessibility features implemented on the current generation of iPods, iPhones, iPads, and Android smart phones.

Finally, the author’s bias reflects the passion to empower students with disabilities to learn the skills to effectively use mobile devices. Having the passion for making a difference in the lives of students with disabilities, the author’s bias encourages students to seek assistance when experiencing technology issues. The author understands that

technology can be overwhelming at times but tools and resources are available. Success is possible through motivation, training, and support, however, individual computing skills and needs play an important element in using mobile technology. For instance, novice users may have limitations using mobile technology. Someday, the dreams of students with disabilities to develop confidence, become independent, and live a quality life will become a reality.

Organization of the Remainder of the Project

The remainder of the project will include the following: Chapter 2, a review of related literature, that explains research on the Apple and Android mobile devices; Chapter 3 provides details about the methodology used in conducting the project; and Chapter 4 explores the summary of the project with recommendations. Appendix A contains the manual with two sections: Section I, Accessibility Features of iPad, iPhone and iPod Touch; Section II, Accessibility Features of Android Mobile devices.

Chapter 2

REVIEW OF RELATED LITERATURE

Introduction

This chapter explains the different challenges experienced by students with disabilities using mobile devices. Also, this section provides information on specific disabilities based on visual, learning, speech, hearing and mobility that can benefit for accessibility features of mobile devices. Having awareness of the different barriers students encounter motivates students with disabilities to connect and seek assistance to overcome such challenges.

Barriers to Using Mobile Devices

Famous people with disabilities include Albert Einstein, Ludwig Van Beethoven, Helen Keller, and Thomas Edison (“Famous People with Disabilities,” 2006). These famous people overcame challenges and became successful. Similarly, students face challenges in using mobile devices. The challenges or barriers encountered by students include financial (Kossuth & Levine, 2011), physical (Briton, Hernandez, Zapirain, & Zorilla, 2012), psychosocial (Shelton, 2009), and technical issues and other problems (Jayant, Kane, Ladner, & Wobbrock, 2009).

A study conducted by Vaughn (2006) indicates that the devices can be overwhelming for people with learning disabilities due to inability to understand, interact, and follow menus of a mobile device. Vaughn explains that modifications in designs

such as the buttons, touch screen display, and controls can affect how people with mobility, visual, and learning impairment use the devices. Also, Vaughn points out that the decreasing size of the mobile device can be a problem for people with mobility and visual impairment. Additionally, Vaughn says that product upgrades or changes cause people to purchase and adapt to the new technology or use the old model.

Another study conducted by Burgstahler (2002), indicates that colorblind students need to recognize the difference of background colors from the text to effectively navigate the site and understand the details provided by the site. Also, students with speech impairment experience inability to participate in audio conferences. Audio conference requires students to respond back during discussion, and students with speech impairment struggle in responding back due to inability to communicate. Often students feel frustrated worried and experience low self-esteem when they are not able to participate in the discussion.

According to Briton, et. al. (2012), people who are intellectually challenged has difficulty using the buttons on a smart phone. People make mistakes when pressing the letters and numbers, especially when the buttons are too small. When people with learning disability send text they press the wrong keys; they struggle in expressing their thoughts using the mobile device. Also, the voice output is essential when navigating the touch screen and shifting from one screen to another. For example, students with speech impairment may experience frustration in communicating their thoughts to teachers, peers, and families when voice output does not work.

A survey of 220 students with disabilities, conducted in United States of America (USA), Japan, and United Kingdom (UK) showed that 83% are smart phone users. Also, statistics show that 29.20% experience challenges when familiarizing themselves with the mobile device features and 18.23% when understanding menus. Also, the students with disabilities struggle switching from one screen to another when capturing information such as recordings and taking notes. Students' frustration increases when they can't capture the text and are unable to transfer the text to other documents (Gartner & Gartner, 2010).

Studies show that sudden ringtones can distract attention especially in learning environments. A study conducted by Shelton (2009) and participated by undergraduate students of Louisiana State University reveals that students exposed to a ringing cell phone scored 25% lower than those who were not exposed to the annoying sound of ring tones. Also, the author explores the cognitive effect of a ringing mobile device. The result also showed that the more personal the ring tone is, the greater the distraction and impact on personal life. For example, the participants were exposed to a fight song. The experiment showed that the students lose focus on the lecture during class discussion. Finally, the study concluded that students who are exposed to unexpected ring tones that are personal, such as ring tone for parents, create a greater impact on personal life.

Another study conducted by Kossuth and Levine (2011) indicates that students are not able to purchase mobile devices due to high prices. The authors mention that accessibility features of mobile devices is an important factor when purchasing mobile devices. Often people find their opportunity to access mobile technology innovations

impossible to reach due to financial difficulty. For example, the greater the severity of disability the more sophisticated the mobile device they may require. Additionally, the authors mention that students in higher education desire “connectedness.” Students want to connect constantly with teachers, peers, and families that result in increased use of wireless connectivity. Inability to connect with other peers can result to frustration and worry.

Burgstahler (2002) describes how some instructors and students with various abilities and disabilities encounter difficulty in accessing technology particularly distance learning using mobile devices. People with disabilities experience the inability to navigate the device. For example, students with disabilities experience inability to switch from one screen to another that causes delay in learning the materials and submitting the homework on time. Also, the inability to access the online learning can increase disability and cause frustration.

Kane et. al. (2009) reports that people with disabilities experience problems accessing the small screen, small buttons, complicated screens menus in mobile devices including small text that is difficult to read. Navigating and memorizing the locations of the screen menus often pose a challenge completing tasks. Finding directions to a specific destination using a GPS app is challenging. Lack of understanding how to use the GPS feature can cause the individual inability to complete the goal of getting to a desired destination. Inability to use the help feature of the mobile device can diminish the functionality of using the device. The study concluded that although mobile device is

designed to increase multitasking of people with disabilities, redesigning of screen menus necessitates improvement for better access (Kane et. al., 2009).

How Mobile Device Accessibility Features Benefit

Different Types of Disabilities

The accessibility features in mobile devices are designed to enhance functionality of non-disabled population and people with disabilities (AT&T, 2011). Programs or apps can empower people who have visual, hearing, speech, learning, or mobility impairments (Spalter, 2010). Students with Autism as an example benefit from Com App 3 App. Com App 3 enables students to customize the mobile devices by adding pictures needed by the consumer. Adding pictures of families and social occasions (i.e. birthdays, and family reunions) enhances mental faculties and enables the students to actively engage during class discussion. Students can also press the icon representing the answers to the question posed by the teacher. People can improve their skills and abilities by customizing the appropriate app to their needs (Com App 3, 2013).

Another app that assists individuals with speech impairment is iConverse. iConverse app has been developed to enhance functionality of individuals with speech deficiency. iConverse is similar to an Augmentative Alternative Communication (AAC) program that allows users the flexibility of customizing icons, adding labels to the icons to enable text to speech, and choosing between male or female voice. Individuals can express their thoughts visually and verbally. By pressing the appropriate icons representing the actions, individuals can express themselves in simple and clear manner.

When a student wants to order a food from the cafeteria for example, he/she would press the corresponding food icon such as French fries. As a result student with speech impairment feels confident and is able to express his/her needs using the mobile device. In the classroom, when a user with speech impairment needs to respond during class discussion, he/she can express himself by pressing the icon that speaks his/her message. Students improve their communication ability by participating during class discussion (<http://www.disabled-world.com/assistivedevices/apps/iconverse.php>, 2011).

Additionally, the article “App Promotes Communication” indicates that Proloqou2go assists people diagnosed with speech/language impairment such as Apraxia (Speech Language/Impairments, 2011). Proloqou2go is one of the AAC apps for iPod, iPad, and iPhone that improve vocabulary and sentence and word prediction skills of individuals. Proloqou2go features text to speech (TTS), customization of 14,000 pictures, vocabulary, phrases and conjugations. Users have the option of building a vocabulary using the Core Word or Basic programs. Individuals can build a sentence by using “I”, “can”, and “do” through Core Word. Users can also express their needs using Basic program. The Basic program develops and enhances communication skills by using one to two level words during communication with others. Individuals can tap the icons, or type the message using on screen keyboard such as “I need, I want” (McAughan, Reed, & Smith, 2011).

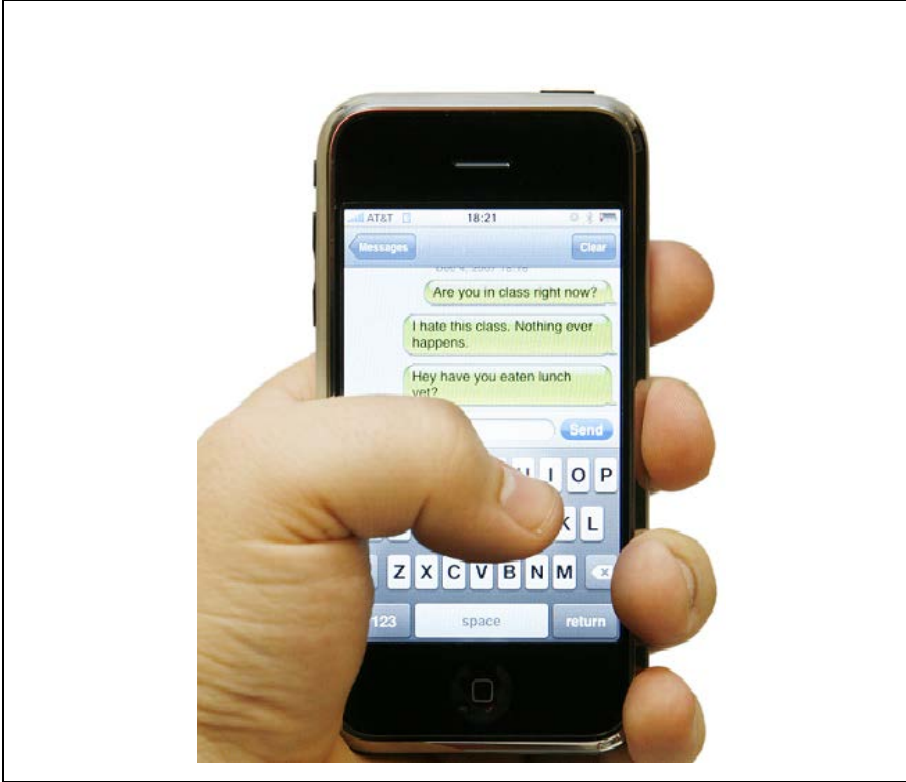


Figure 1. Texting

Texting was pioneered by people who are deaf and hard of hearing (Christianson, 2009). Earlier, people who were deaf and hard of hearing communicated via teletypewriter (TTY) machines invented by Robert Weitbrecht. TTY is a device that allows deaf individuals to communicate by typing messages and sending them along phone lines. However, with the turn of 21st century, people currently send text messages using mobile devices (see figure 1). Also, individuals who are deaf and hard of hearing can send text messages alerting the other person through vibrations in mobile devices. According to a study conducted by Harkins, Sauro, Tucker and Williams (2010) vibrations are designed to replace audible sound, such as ringtones, to alert the person of

an incoming text, email, or other forms of messages (Harkins et. al., 2010). People who are deaf and hard of hearing can customize the vibration patterns to short or long vibrations depending on the urgency of calls. Also, the study indicates that people can avoid disruptive noises to others by using vibrations instead of ringtones.

Additionally, the research shows that people who are deaf and hard of hearing will benefit from Commercial Mobile Alert Services (CMAS) and Light Emitting Diode (LED), is a semiconductor diode that emits light used specially in electronic devices such as light indicator (Webster dictionary, 2013). CMAS is a nationwide plan to alert the mobile device subscribers when an emergency situation arises near the location of the mobile device. CMAS use a vibration pattern similar to the alert in television during emergency situations. Furthermore, the study points out that using light (LED) can be used as an alert in addition to vibration in wireless devices when the device is in line of sight. The study concluded that length of vibration as an alert helps individuals who are deaf and hard of hearing perceive calls (Harkins et. al., 2010).



Figure 2. Braille Touch

Another group that has benefited from mobile device is the visually impaired. A study conducted by Abowd, Clawson, Frey, Romero and Southern (2012) indicate that users with visual impairment were able to use the Braille Touch (Figure 2), an app on an iPhone and iPod Touch. Braille Touch is an affordable and accessible app for individuals with visual impairment. Braille Touch app is designed with Braille alphabet letters such that when users communicate they can press the desired letters essential to expressing their messages. Users can position their fingers just like using a Braille keyboard. Individuals with visual impairment can apply their skills and communicate with their peers via email or texting using the full version of Braille Touch. Braille Touch provides an audio capability that allows the user to hear the sound of the character or word they are touching. When the user touches the letter “B”, the app gives the corresponding sound of the letter “B”. The audio feedback helps the user visualize the letter they are touching (Abowd et al, 2012).

Furthermore, The Cellular Telecommunications and Internet Association (CTIA) (“Blind or Visually Impaired,” 2011) explains the different accessibility features that enhances the performance of people who are blind and visually impaired. CTIA “lobbies for government funding and promotes the mobile industry to consumers. The CTIA also holds an annual trade show in Las Vegas in the Spring where companies show off the latest hardware and services.”

Additionally, the different accessibility features in mobile phones include magnifier, tactile keys, voice control, voice output, customizable displays and audio,

visual and vibrating features. Individuals who are blind or visually impaired can increase the font of text or zoom in to objects to enable them to read the information better and clearer. People who are blind or visually impaired can position their fingers for specific functions such as volume control, on/off power buttons, speed dialing, assigning alerts and ringtones. Individuals can also use voice control by using their voice to play music, place a call, enter text or search for a specific contact. Furthermore, users can use voice output (TTS) to hear battery level, WIFI, and cellular signal levels. By customizing audio, visual and vibrating features users who are blind and visually impaired can recognize the voice of the caller, change or assign wallpaper background, and set the length of vibration to alert of incoming messages.



Figure 3. GPS

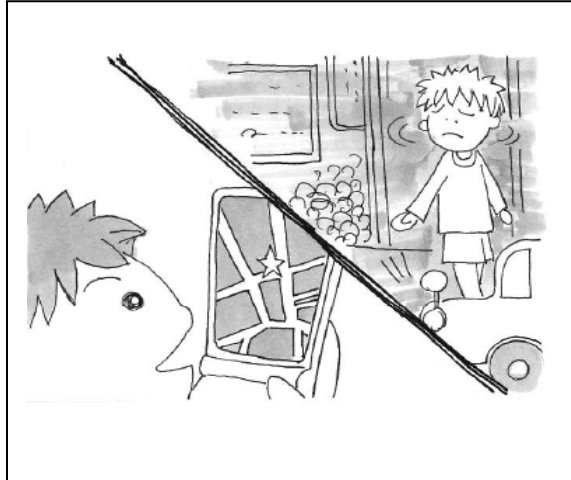


Figure 4. Student using GPS to find directions

Moreover, Kondo and Nakamura (2009) state that students with visual and motor impairment can use a Global Positioning System (GPS) (Figure 3) to find directions when walking (Figure 4). GPS is “a radio system that uses signals from satellites to tell you where you are and to give you directions to other places.” (Webster dictionary, 2013). Students can get information about their location, get directions to destinations, and provide directions to someone who is lost and needing directions. GPS provides estimated time, visual direction, points of interests, text to speech, and email capability. Users may need to have Internet connection to use the GPS capability. GPS is another feature of mobile device.

eReader

As technology has evolved the traditional way of reading books has changed paving the way for eBooks (electronic books). eBooks come in digital form and can be downloaded free or purchased online.

eReaders are built in software programs in mobile devices that allow the reading of eBooks (Mealer, Morgan, & Williams, 2011). Downloading eBooks to mobile devices makes eBooks popular among students due to accessibility. Students with disabilities can read eBooks anywhere and anytime using their mobile devices.



Figure 5. iPad showing an eBook

Portability of eBooks eliminates the need of

carrying bulky books. Instead, students can carry their mobile devices: cell phones and Tablets. One example of eBooks is Figure 5, iPad displaying an eBook. By carrying Tablets that can hold multiple numbers of eBooks at one time students can have access to multiple resources in a short time. eBooks on Tablets provide better options for students with visual impairment due to bigger screen capability. Students can enable TTS (text to speech) that reads the eBook aloud, adjust the fonts and text size, and magnify the text. Students have a choice of using different types of Tablets: iPad, Kindle, Nook, Samsung Galaxy Tablet 2, Sony Experia Tablet S, and Google Nexus (Junus, 2012).

eReaders have different names depending on the brand of mobile device students with disability use. eReaders in Apple mobile devices are called iBook while in Android mobile devices eReaders are called Play Books.

An investigation conducted by Mealer et. al. (2011) at the University of Alabama reveals that the built in accessibility features of the iBook such as VoiceOver (text to speech), magnification, voice customization, and word prediction enables students to read eBooks interactively. Also when students mistyped the word that they are searching, word prediction suggests words in place of the word. Other options include playing audio or video, highlighting text as they read along, and print/email PDF's and notes created in iBooks. Highlighting important points from the eBook allows students to remember them easily. Syncing eBooks with other mobile devices allows students to read their eBooks with other devices such as iPod and iPhone (Mealer et. al, 2011). On the other hand, Play Books accessibility features include TTS (text to speech), highlighting of text, taking notes, search for text, browse by chapters, adjusting the fonts or text size, and share a link to your book (Google Play, 2013).

Awareness and Motivation in Using Mobile Devices

Recognizing the potentials of students with disabilities in using mobile devices creates a positive outlook in their life (Jakobsen, & Nielsen, 2009). Providing tools and resources, such as mobile devices, can help students with disabilities develop independence, equality and increased self-esteem as well as overcome barriers. This section explains how students with disabilities gain motivation in overcoming such

barriers through: the ability to stay connected with friends and families (Jakobsen, & Nielsen, 2009); establishing connection with peers and teachers (Evans, 2010); accessing training manuals (Kondo & Nakamura, 2009); enhancing their instructional learning as well as giving them flexibility (An, Dawson, Malizia, Mockus, Shaffer, & Swaggerty, 2011).

The ubiquity of mobile devices increases our capability to multi task. For example, connecting and communicating with peers, family, and teachers goes beyond email. Students' ability to express their thoughts, opinions, and ideas through texting, video chat, voice recording, Facebook, Twitter, and Skype are phenomenal. Setting reminders and alerts for school activities, medical appointments, and social engagements are essential tasks in activities of daily living (On the Go, 2009). Often, students with disabilities will encounter challenges in completing these tasks. Achieving these tasks can pose challenges such as frustration, stress, discouragement, disruptive behavior in class, lower self-esteem, and anxiety, or the inability to use the mobile device (Kossuth & Lavine, 2011). However, students who are able to demonstrate their skills using mobile devices improved their own learning styles and achieved their goals, which creates a positive persona. For example, students with visual impairment who can set alerts or use TTS in mobile devices can motivate other students to use their devices in the same way. The students who do not yet know how to use their devices will feel motivated to learn how to apply the same technique in using their own mobile devices (Yang, 2012). Students who demonstrate new skills develop strength and courage to voice their achievements. Some do this by recording themselves with short video clips, and

exhibiting social behavior that contributes positively to their community. They become an inspiration to someone who is having similar difficulties using mobile devices (Freed, O'Connell, & Rothberg, 2010). For instance, YouTube shows a video of a student with visual impairment showing the accessibility features of iPads

(<http://www.youtube.com/watch?v=rIEO1bUFHsI>).

A study conducted by Jakobsen and Nielsen (2009) indicates that students with disabilities are motivated to complete their task both in school and internship using smart phones. Using smart phones enables students to apply creativity and techniques in solving multiple problems. Additionally, the research mentions that when students are able to reapply the technique in solving the problems, they become motivated to use the smart phones. Using mobile phones to complete a portfolio in job search is an example. With portfolio production students were able to incorporate photos, videos, audio and links. When students are able to manage the files using mobile phones such as recording relevant information, use of mobile phones becomes easier. The study points out that student with disabilities increased learning and exhibited motivation in presenting their portfolio. Moreover, the study emphasize that teachers need to extend support to students with disabilities by providing feedback to the portfolio, technical advice and relevant sources, and extending the date for completing the project (Jakobsen & Nielsen, 2009).

Kondo and Nakamura (2009) mention that students with disabilities become motivated to use their device when they are able to solve the problem using the manual for their mobile devices. Students with visual impairment, as an example, can set the TTS feature to enable text to speech that allow them to hear the instructions on the

mobile device. As a result students feel independent and confident in using their mobile device (Kondo & Nakamura, 2009).

An, et. al. (2011) conducted a study at Penn State University to explain how mobile devices stimulate and motivate students by reinforcing instructional learning. The study revealed that students feel more flexibility in their busy schedules using their mobile devices. They can learn anywhere and anytime (i.e. home, school, park, and doctor's office). Students expressed that they feel engaged in their studies when they are on their mobile devices. Students can connect with peers, answer emails, send text, download videos, watch videos, listen to music, and take pictures simultaneously. The study concluded that students avoid carrying bulk of books and notebook papers; able to read flash cards while waiting for busses; and reinforce their class discussion.

Cecil, Miller, Rossing, Stamper (2012) reported that portability and accessibility of mobile devices develops confidence, promotes learning, motivates and aids in completing multiple tasks. People can download music, send and receive emails or text, and participate in online forums. With the portability of mobile devices people can avoid the time of being in front of their computer. The different icons representing different apps and programs installed in mobile devices stimulate learning and improved skills. People can have a direct access to their mobile devices. Unlike a computer booting time, external connections, and peripheral devices can be confusing. Using mobile devices eliminates the time of waiting for the computer to display the desktop as opposes to waiting for the screen menu of the mobile devices. The report concluded that mobile devices motivates and develop confidence in people with disabilities.

Summary

The author cites multiple literature reviews that explain the barriers encountered by the students with disabilities in using mobile devices. The literature reviews show that disabilities such as speech, hearing, visual, learning, and mobility can impede the proper use of mobile devices. Other challenges include lack of support from peers, family, and teachers which can affect the utilization of mobile devices.

Additionally, the author points out literature reviews that discuss how mobile devices assist students with disabilities in activities of daily living. The literature reviews show that different apps, programs, and accessibility features improve the performance of activities of daily living. Students with disabilities develop skills, knowledge, confidence, independence, and enhance quality of life. Students with learning deficiencies who struggle with remembering the multiple dates of engagement can benefit from setting an alarm as a reminder. For example, a reminder can be setup for activities such as submitting their homework, taking their exams, attending to medical appointments and social events. Students with visual impairment can get to their destination on foot by using GPS functionality of mobile devices. The students with hearing impairment can send text, email, and video using iPhone, iPad, iPod Touch and Android mobile devices. Students with speech impairment can express their messages using the Proloqu2go, an AAC app that enables students to express their messages through pictures and symbols.

Lastly, the author describes how awareness and motivation can empower students and properly apply the tools using online videos such as YouTube and manuals for their

mobile devices. Students feel empowered, confident and motivated when they are able to solve the problems by applying the techniques specific to their mobile devices.

Chapter 3

METHODOLOGY

Review of Sources

Resources were researched from vocational rehabilitation books, peer-reviewed journals, library resources, EBSCO host, and ERIC Data bases. The author obtained the accessibility features of Apple mobile devices: iPad, iPhone and iPod Touch using Apple's website. On the other hand, the author used Google.com to find out the accessibility features of Android mobile devices. Other resources the author used include YouTube, American Speech Hearing Association, (ASHA), Job Accommodations Network (JAN), Augmentative and Alternative Communication - Rehabilitation Engineering Research Center (AAC-RERC) and government sites such as Census Bureau, and Federal Communications Commission (FCC).

Ms. Carol Houston, Coordinator for the High Tech Center, California State University, Sacramento, has been a major resource of formatting and developing the manual. She mentioned that since each student is unique having a separate category of accessibility features will be helpful for students when they are searching for an app. She also recommended having concise and short instructions to enable students with disabilities to follow instructions easily.

Another important contributor is Dr. Deaner, Academic Advising Coordinator for Vocational Rehabilitation Counseling Program. Dr. Deaner stated that the Android mobile devices enhance the performance of students with disabilities. With his

suggestion, the author included Section II, accessibility features of Android mobile devices.

Additionally, the author conducted informational interviews with Ms. Keabnick, Assistive Technology Specialist of Elk Grove Unified School District, Ms. Sullivan, Speech Therapist of Sacramento City Unified School District, Mr. Frank Pontillo of San Juan Unified School District, and Mr. Hoke of South Sacramento PRIDE Industries. Additionally, the “Manual on Vocational Rehabilitation” for Vocational Rehabilitation was used as a model. The manual consists of two sections: Section I explains the accessibility features of Apple products: iPhone, iPad and iPod Touch, and Sections II discusses the accessibility features of Android mobile devices: Google Nexus, Samsung SIII, LG, and Motorola Droid X2. Each section is categorized based upon speech, vision, hearing, learning, and mobility disabilities.

The manual is written using the MSWord program that is popularly used by students. Since the manual is written in MSWord, searching for a particular accessibility feature is similar to finding a word or phrase in a word document. Students can also access the manual on a computer and mobile device. As an example, students can search for information on GPS features by using the FIND command or control F. GPS feature provides students on foot a step by step direction to a specific destination such as going to another building within the campus.

Methods

Through the inspiration of Ms. Carol Houston, Coordinator for the High Tech

Center, California State University, Sacramento, the author was motivated to complete the project. Ms. Houston's guidance and contribution towards developing the project in empowering students with disabilities has been a great help. She stated that students use mobile technology whenever and where ever. Having a manual that is available for students will empower them towards proper usage of their mobile devices. She mentioned that having information for Apple device such as iPhone, iPad, and iPod Touch would be a great resource. Dr. Deaner, our Academic Advising Coordinator also suggested that having information for the Android devices such as Google Nexus, Samsung and LG will assist students in using their mobile devices as well.

Having the goal in mind the author started gathering information by remembering the feedback of Ms. Houston. With her input, the author reviewed the information on accessibility features of Apple and Android mobile devices. Keeping in mind the main types of disabilities: speech, hearing, learning, mobility, and visual, the author reviewed the accessibility features that can improve the functional capabilities of students with disabilities. By reviewing product reviews about the apps and programs that enhances activities of daily living of the students with disabilities, the author was able to incorporate the information about each disability. For example the author reviewed the accessibility features that can increase the potential of students with speech impairments. By researching the American Speech-Language-Hearing Association (ASHA) website, the author found experiences of Speech Pathologist in using the app for enabling and motivating students with non-verbal skills (Raz, 2012). According to Ms. Kaebnick, Ms. Sullivan, Mr. Pontillo, and Mr. Hoke, using a Tablet with pictures enables students and

employees with speech impediments and Autism to exchange communication among peers, family members, and teachers. Also, the author visited the Job Accommodation Network (JAN) website that explains use of mobile devices as an accommodation for visually impaired people (JAN, 2013). Google.com website proves to be a good resource for research materials on different Android mobile devices. Rehabilitation Engineering and Research Center is one of the sites that the author obtained information about mobile devices communication apps (AAC-RERC, 2011).

The informational interview from Ms. Kaebnick, Ms. Sullivan, and Mr. Pontillo, Assistive Technology Staff was helpful. They mentioned that use of iPad and other Tablets was beneficial to students with multiple disabilities. For example using Proloqu2go an app for Augmentative Alternative Communication assists students with speech impairment express their response and is able to communicate with peers, teachers, friends, and family. By pressing the pictures that matches their response students are able to exchange communication. Ms. Kaebnick, Assistive Technology Specialist of Elk Grove Unified School District (EGUSD) indicated that iPads benefit students with speech impairment. Using Proloqu2go allows nonverbal students to express their message. As Ms. Kaebnick said, “Yes, we have quite a few students using iPads for communication; the most popular augmentative and alternative communication (AAC) application is Proloquo2Go, but we also have students using SonoFlex, GoNow, Assistive Chat (text-to-speech), etc. for communication. There are apps for just about everything our special needs students need; organization, word processing with word prediction, screen readers, task managers, etc. I know there are apps for the visually

impaired (screen readers) and the deaf or hard of hearing”. She also voice her concern of other students who are not responsive on the device they are provided. She mentioned that it depends on the student how they react with the accessibility feature of the device (informational interview, October 4, 2013).

Similarly, the informational interview with Ms. Sullivan, Speech Therapist of Bowling Green Elementary School - Sacramento Unified School District (SCUSD) indicated that they also use Proloquo2go as a means of communication with students who are wheelchair bound and with speech impairment. Ms. Sullivan said that they use iPad Tablet for students with speech impairment. She stated that students are able to communicate with peers, friends, teachers, and family using the device. On the other hand she also expressed concern for other students who are not able to use the device due to the nature of their disability.

Mr. Pontillo, of San Juan Unified School District said that they use apps such as Math Master to assist students with learning disability solving math problems. He also stated that they use eReader app in iPad to have the eBooks read aloud to students who are visually impaired. He mentioned that the accessibility features of mobile devices helps students improve on school activities such as participating in discussion, research and individual studying.

While working as an Intern at South Sacramento PRIDE Industries, the author had the opportunity to work with the employees who are deaf and hard of hearing as well as with autism. The author also conducted an informational interview with Mr. Hoke, Case Manager, about how mobile devices are used as a communication tool with the

employees. Mr. Hoke said, “using an Android Tablet with picture communication, sight word flashcards or PECS (there are many of these), and Google translator (verbal language support) allows employees to touch the picture that expresses their response to the questions.” He also mentioned that training on proper usage of the device will help ensure success of communication with employees.

Chapter 4

SUMMARY AND RECOMMENDATIONS

Summary

The 21st century ushered in the era of mobile devices. Accessibility features of mobile devices greatly benefit students with disabilities. Proliferation of students using their mobile devices whenever and wherever has increased tremendously. Empowering the students with proper tools in utilization of the mobile devices promotes confidence, independence and improved quality of life. Since there is no available manual with accessibility features for mobile devices, the author has completed the project by developing a manual. Creating the manual for iPhone, iPad, iPod Touch and Android mobile devices students can improve on performance of activities of daily living. Having an accessible manual that students can use as a resource will motivate them to solve the issues they face in using their mobile devices. After successfully using the techniques from the manual students can encourage other students to become aware of the resources that are available to their perusal. As a result of sharing the techniques students can connect with peers and enhance their socialization skills.

The manual consists of two sections; Section I focuses on accessibility features for iPhone, iPad and iPad Touch and Section II contains accessibilities features for Android mobile devices: Google Nexus, Samsung SIII, and LG. Each section is categorized based upon speech, vision, learning, hearing, and mobility disabilities. With each category students can find the appropriate accessibility features that can serve as an

aid in properly using their mobile devices. As an example students with visual impairment can use VoiceOver (text to speech), adjust the contrast of background to white on black or vice versa, and enlarge the font of the text. Another accessibility feature that students with visual impairment can benefit from is using GPS. GPS helps students on foot to get directions to their destinations. Setting alarms for different appointments can help students with learning disability not miss the schedule for medical appointment, examinations, homework due dates, and social engagements. Having accessibility features turned on enhances performance of students with disabilities.

Recommendations

The saying goes “change is constant”. With the introduction of new technology innovations, come new accessibility features that can assist people with disabilities improve activities of daily living. The author recommends the following:

1. Updating the manual periodically every six months. Incorporating new accessibility features from Apple and Android mobile devices will enable students with disabilities to stay current with the new technology on mobile devices.
2. Conducting demonstrations and training workshops on the utilization of mobile devices for California State University, Sacramento students with disabilities will enhance the skills of these students in using mobile devices.
3. Set up blogs and forums for students will encourage students to ask and respond to mobile device questions and provide a resource to students, with mobile device issues. Additionally, when they are able to connect with peers by helping others

solve mobile device problems they cultivate awareness about resources on proper usage of mobile devices.

4. Update the links in the manual; with the development of new technology maintaining the links is essential because overtime the links get outdated.

MANUAL FOR ACCESSIBILITY

FEATURES OF iPad, iPhone, iPOD TOUCH and ANDROID

MOBILE DEVICES



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SECTION I: ACCESSIBILITY FEATURES OF iPad, iPhone and iPod TOUCH



Visual Impairment Accessibility Features

VoiceOver

VoiceOver is a built in Text to Speech software (TTS) that reads aloud the icons, keystrokes, menu, and word description to the user. Users can access the screen menus through simple gestures such as tap, double tap, and drag. Single tap reads the menu, double tap opens the menu, and drag enables the person to identify the menus around the active menu. Additionally, flick left or right enables the person to familiarize the location of the different menus. With VoiceOver, the person can hear the description of the different status information, such as battery level, Wi-Fi signals, cell network provider, time of day, and other important details.



Image 1

Home button

Home



How to turn On/Off VoiceOver

1. Tap Home (Center button)
2. Select Settings
3. Select General
4. Select Accessibility
5. Top choice is VoiceOver
6. Slide the Off button to On



To Toggle VoiceOver Triple Click Home and it turns Off

VoiceOver works with other programs

VoiceOver works with all the installed applications. For example, VoiceOver interacts with Music, Messages, iTunes, Safari, Maps and other built in programs; users can use VoiceOver when surfing the web, sending texts and emails. Additionally, VoiceOver has built in more than 20 languages that allow people who speak these languages to use the device.



Image 2 Settings icon

List of Languages

Chinese (Cantonese) English (Australia)

Finnish Danish

French (Canada) French (France)

German Greek

Italian Dutch

English (UK) English (U.S.)

Japanese Korean

Chinese (Taiwanese) Chinese (Mandarin)

Norwegian Russian

Spanish (Mexico) Spanish (Spain)

Swedish

Polish

Portuguese (Brazil) Portuguese (Portugal)

Source: [List of languages](#)



How to change the language

1. Select Settings
2. Select General
3. Select International

When typing messages, creating notes, and editing text, VoiceOver reads each character as you type, and then reads it back when done. Aside from reading each character, VoiceOver can also be set to read each completed word.

Speak Auto Text

Speak Auto Text enables the user to hear sound effects and suggested word predictions. Also, the user can press the space bar to have the device type the word for you.



How to setup Speak Auto Text

1. Tap Home (Center button)
2. Select Settings
3. Select General
4. Select Accessibility
5. Select Speak Auto Text and slide the button to ON

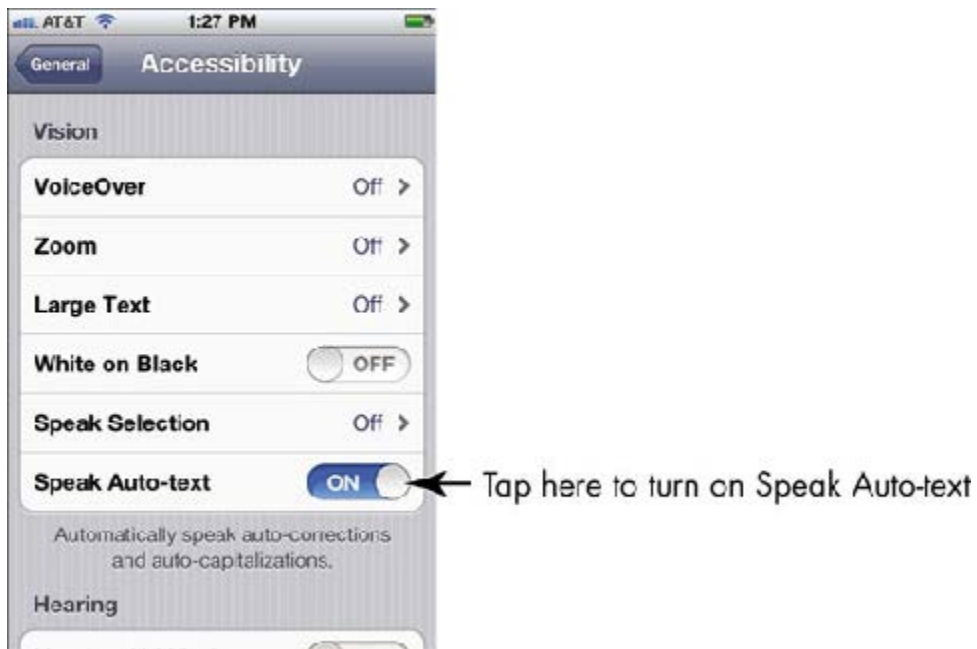


Image 3 **Setting Speak Auto Text On**

Face Time

Face Time is calling via Wi-Fi. With Face Time On, you can send and receive video relay calls to other people. Face Time requires Internet connection and Apple ID.



How to set up Face Time

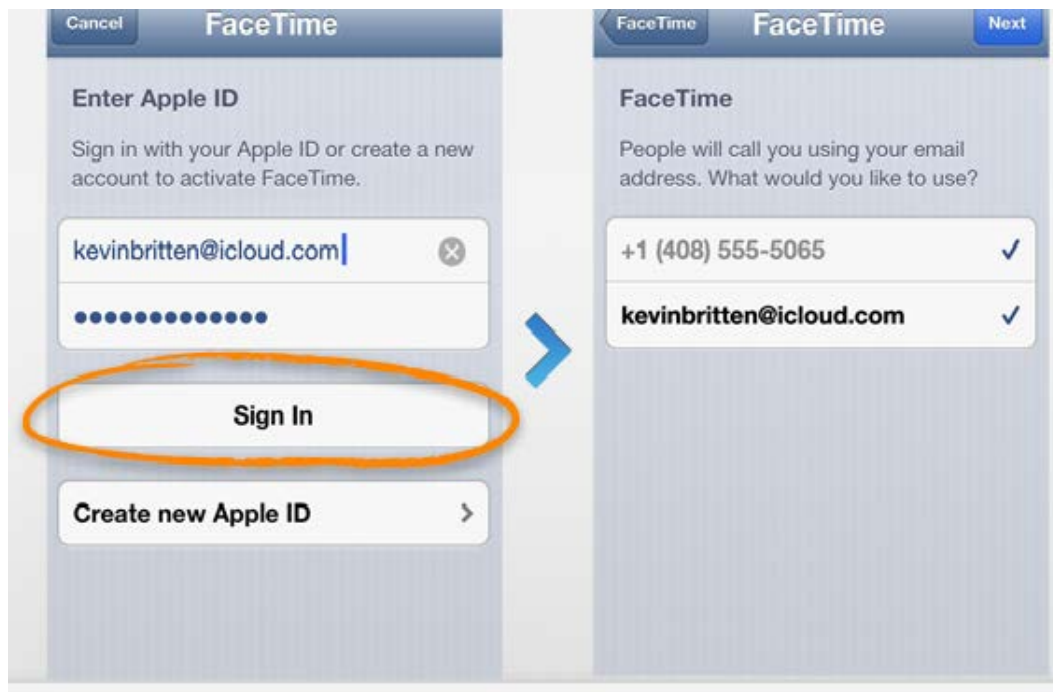


Image 4 Face Time requires email address and Internet service

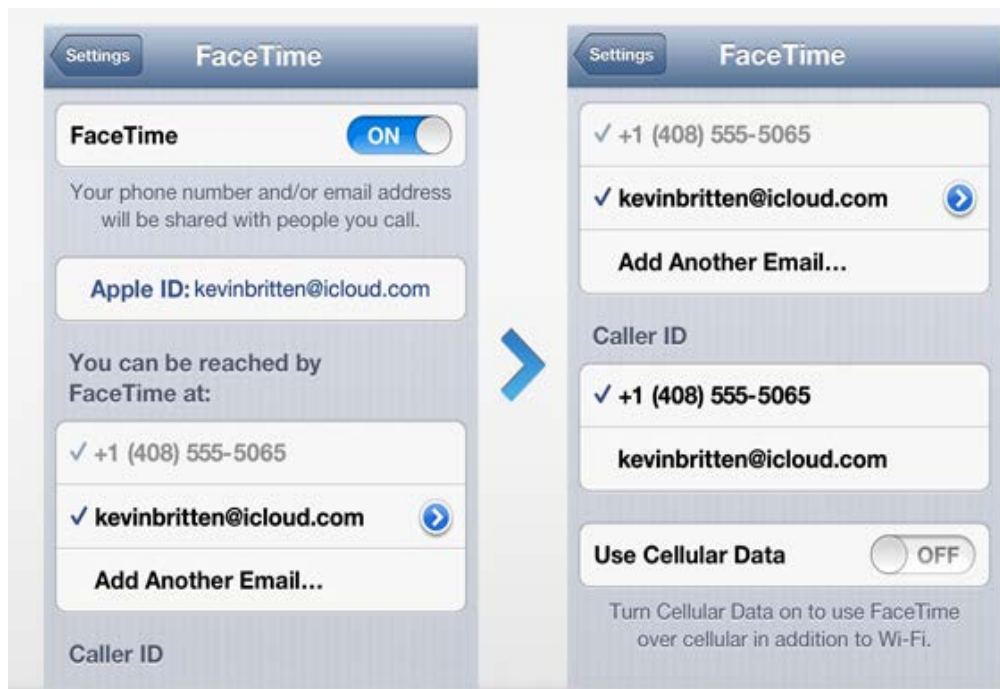


Image 5 **Setting up Face Time**



Image 6 **Face Time calling**

Audible Alerts

iPads let users customize audio alerts for various actions. For example, users may be alerted when events comes up, or when receiving or sending emails. Additionally, iPads provide an audio option for different keyboard actions.



How to set the audible alerts

1. Settings
2. Sounds choose the sound users want for each actions such as new email.



Image 7 **Setting alerts in iPhone**

Large Text

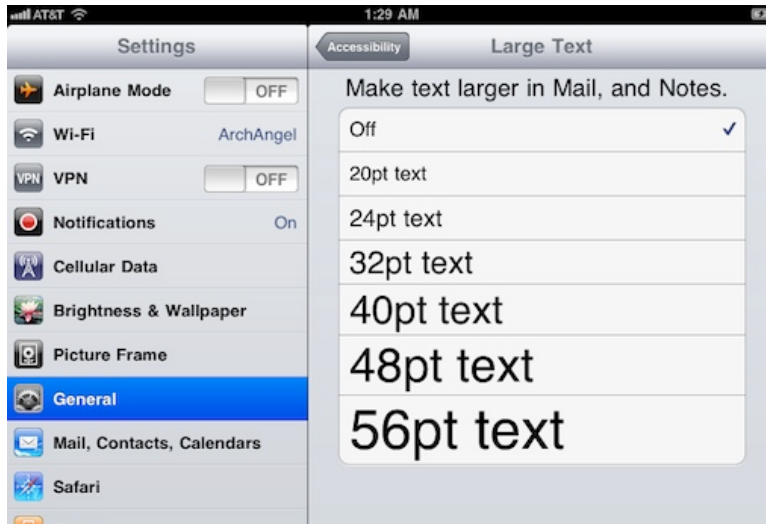


Image 8 **Font sizes**

People with visual impairments can customize the texts up to 56 points in mobile devices. Users find it helpful to enlarge the text when reading, sending texting, and emailing. This feature works in Calendar, Contacts, mail, Messages, and Notes.



How to change font sizes

1. Settings
2. General
3. Accessibility
4. Large Text

Siri

Siri is very user friendly because users can use their voice to request help. Siri is only available with Internet access on. For example, users can ask Siri the weather condition, closest fast food and other details. Users can speak the command such as send messages, schedule meetings, and place phone calls.



Siri is available in iPhone 4S, iPhone 5 and iPad 3



How to activate Siri

1. Tap Home (Center button)
2. Select Settings
3. Select General
4. Turn on Siri



Image 9 **Setting up SIRI**

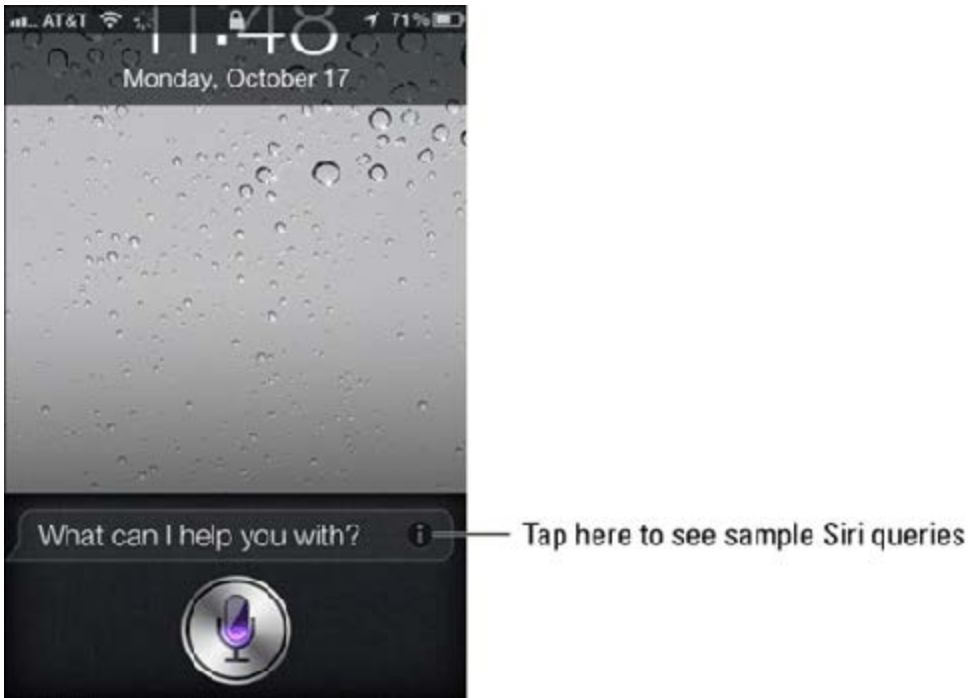


Image 10 **Siri is listening**

White on Black



Image 11 **White on Black contrast**

Different people have different functional limitations such as individuals with visual impairments and sometimes adjusting the screen resolution to suit their needs is essential. One of the interesting features is changing the screens to White on black. Adjusting the screen resolution is helpful for some individuals for better reading, viewing, and reducing strain on the eyes. Users can adjust the background by changing the White on Black option. Users will notice that the White on Black option works during Home, Zoom and VoiceOver and other applications.



How to change the background

1. Settings
2. General
3. Accessibility
4. Invert color (Slide On or Off)

Tactile Buttons

iPhone 5 physical buttons are easy to recognize. For example, the Sleep/Wake, volume-control buttons are found on the upper-right edge, ring silent and the Home button directly below the display.

External Buttons and Controls



Connectors and Input/Output



Image 12 Tactile buttons in iPhone 5

Another tactile buttons include microphone, lightning connector and built-in speaker. These tactile buttons are made accessible to allow users to increase performance.

Speak Selection

Speak Selection works like Voiceover. By double tapping, an individual can highlight the text, copy, cut, and paste the text in another application or within the document. If in case VoiceOver is not enabled, Speak Selection will speak the selected text. For example if the user wants to copy text from Safari, mail or notes simply highlight the text and copy it.



How to activate Speak Selection

1. Settings
2. General
3. Accessibility
4. Speak Selection (Slide ON or OFF)



Image 13 **Setting Speak Selection in iPhone 5**

Zoom



Image 14 Calendar with magnified dates

Zoom works with different applications such as Safari, Mail and other applications. When Zoom is used in Safari, the whole screen is enlarged. On the other hand, using Zoom with other applications enables the individual to zoom in and out of the images. For example, double tapping with three fingers easily zooms in and out up to 200 percent. Additionally, Zoom works with Home, Lock, Spotlight screens and other apps.



How to change to zoom

1. Settings
2. General
3. Accessibility

4. Zoom – slide the button to ON or OFF



Image 15 Zoom in iPhone

Braille

The iPad, iPhone, and iPod Touch accept 30 models of Bluetooth Braille displays. Students can connect Braille devices and be able to collaborate with peers, teachers, and family members. For example, students can use the Braille device to respond to teachers and interact with peers.



How to connect Braille devices

1. Connect Bluetooth Braille display device using a USB connector.

Applications

Zoom Reader

With built-in camera, Zoom Reader enlarges and read printed text by first taking a picture of an object like a book or menu, transforms the image into text using state-of-the-art Optical Character Recognition (OCR) technology. Zoom Reader can read small print on a receipt, box, menu, and or pill bottle.

<http://itunes.apple.com/us/app/zoomreader/id414117816?mt=8&ls=1#>

LookTel Money Reader

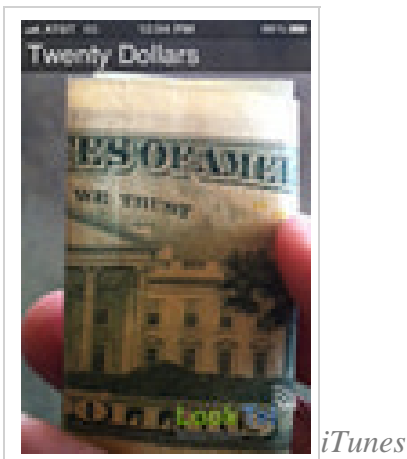


Image 16 LookTel Money Reader screenshot

The LookTel Money Reader helps users by identifying US currency in standard denominations (\$1, \$2, \$5, \$10, \$20, \$50, and \$100 bills). Users can point the iPhone camera at any US bill and LookTel's object recognition technology via VoiceOver tells user the denomination. One drawback of this app is inability to recognize the currency in low light.

<http://itunes.apple.com/us/app/looktel-money-reader/id417476558?mt=8>

SayText

Say Text uses text to speech option that scans text within any image: medical form or restaurant menu, and reads the text aloud. Users can read the text by positioning the document under the iPhone camera and double-tap the "Take Picture" button.

<https://itunes.apple.com/us/app/saytext/id376337999?mt=8>

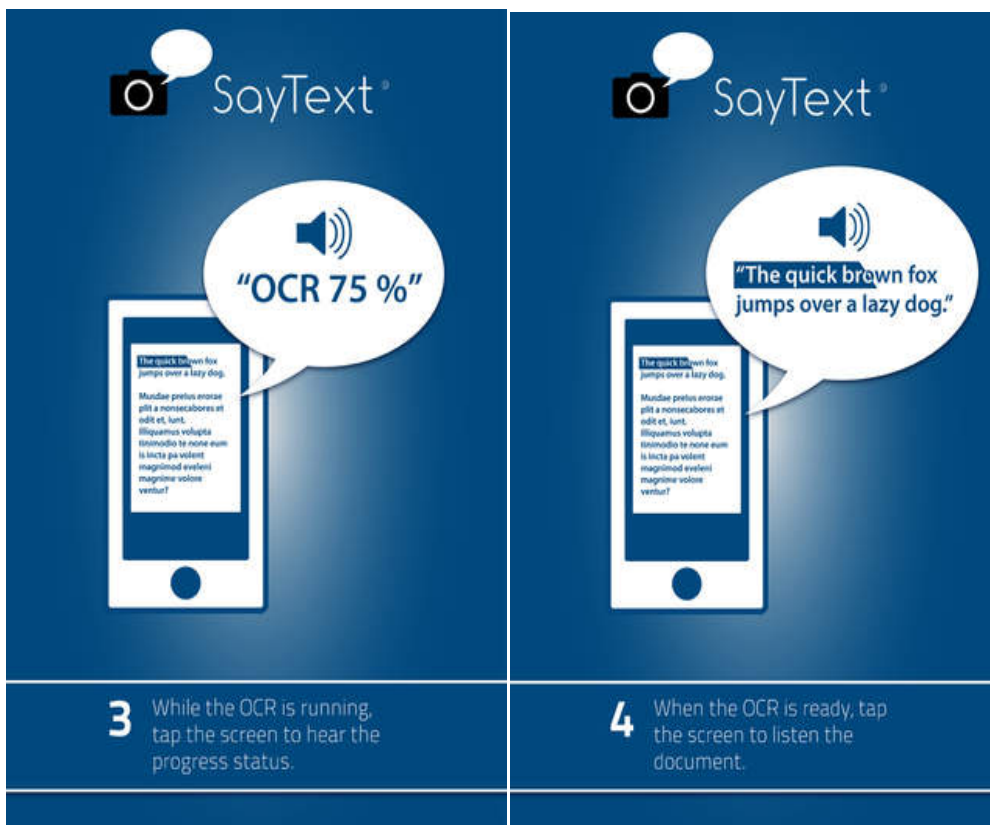


Image 17 Say Text app reads aloud the text

Color Identifier

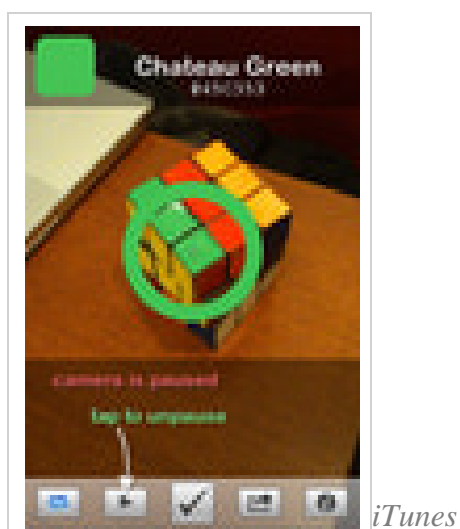


Image 18 Color Identifier identifies and reads the color aloud

Color Identifier uses the iPhone camera to distinguish and speak color names aloud. Shades identified are specific to the point of annoyance. The company makes a free app called Color ID Free that sticks to basic colors. The app is beneficial for people with visual impairment particularly when distinguishing different colors of clothing

<https://itunes.apple.com/us/app/color-identifier/id363346987?mt=8>

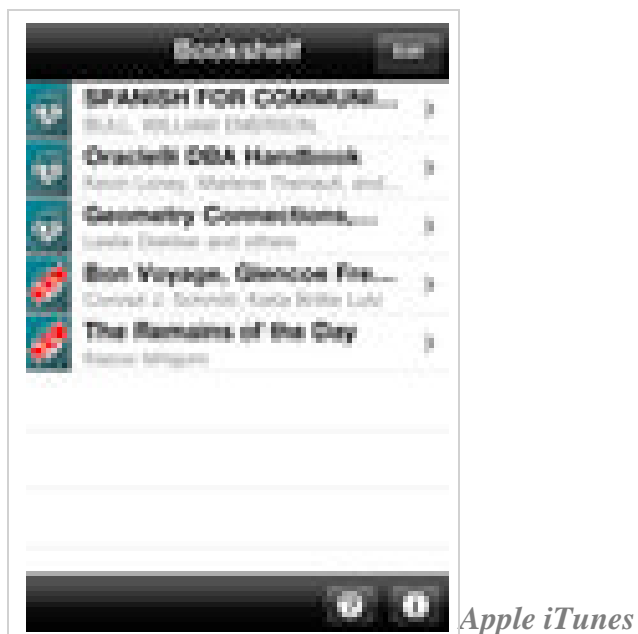
TalkingTag LV



TalkingTag™ LV enables users with visual deficiency to label everyday items with special coded stickers. Users can scan the sticker with the iPhone camera and via VoiceOver the label can be read aloud. The app is helpful for storing a DVD collection and labeling boxes during a move.

<http://itunes.apple.com/us/app/talkingtag-lv/id378075110?mt=8>

Learning Ally



Apple iTunes

Image 19 Learning Ally sample Book shelf

The Learning Ally app enables users to access Learning Ally's library that contains more than 70,000 audio books. The Learning Ally's library is a resource both for K-12 and college students. <http://itunes.apple.com/us/app/rfb-d-audio/id418888450>



A Learning Ally membership per year is required.

GoodReader

GoodReader app reads PDF, text, MSEXcel, MSWord document, MSPower point files, HTML, and Safari web searches. The app reads sticky note, books, maps, movies and pictures. Also, users can manage files: transfer, copy and paste.

<https://itunes.apple.com/us/app/goodreader-for-ipad/id363448914?mt=8>

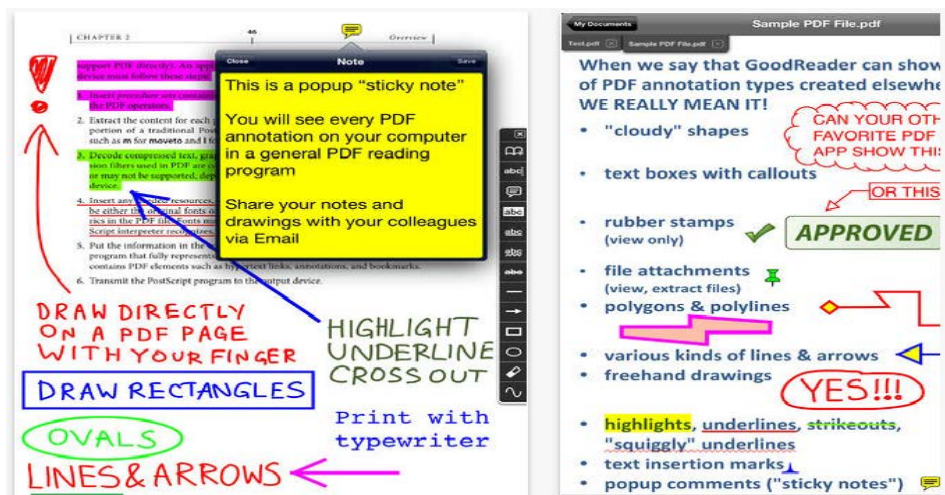


Image 20 GoodReader reads sticky notes, pictures, labels and PDF files

Hearing Impairment Accessibility Features

Closed Captioning

Often closed captioning, open captioning, and subtitling supplement the viewer with information about what is going on in the story. The captions run on the bottom of the screen on TV, movie and web pages.



How to enable closed captioning

1. Users have the option of buying or renting movies from the iTunes store.
2. Several programs are available for purchase. Programs such as Compressor (Final Cut Studio production suite) and Vitac.com provide subtitling and captioning (web and broadcast). Television (TV) sets greater than 21" have built in captioning. Individuals can customize the setup of TV or call their provider.

http://www.youtube.com/watch?feature=player_detailpage&v=Yoit9NAwoxw



Image 21 Closed captioning (CC) on Apple mobile devices

Compatibility of Add on Hardware

Hearing devices such as wireless remote headset are compatible to iPhone, iPad and iPod Touch.



How to connect a hearing device

1. Hearing devices can be connected via USB.

Mono Audio

Head Phone Jack



Image 22 **A sample head phone jack**

People with hearing impairment can enjoy the sounds of the channels in both left and right ear buds. Users can adjust the sound between channels. Users who can hear better in the right ear can set the volume to the right ear channel or vice versa. Bluetooth 2.1 technology supports Mono Audio.

<http://www.apple.com/accessibility/ios/#hearing>



How to change to Mono Audio

1. Settings
2. General
3. Accessibility
4. Mono Audio

Password-Protected Volume Limit Controls

Password protection for volume limit is very innovative because it protects the volume level being tampered. Over time, people who listen to loud music using earphones develop hearing loss. By installing the password protection, the individual can set the volume that he/she feels comfortable.



How to set the password-protected volume limit controls

1. Settings
2. General
3. Restrictions
4. Enable Restrictions
5. Type in Password



Users can turn on and off password from unnecessary changes.

Applications

Tap Tap

Tap Tap enables individual to react to sounds and alerts the individual when there is noise. The app vibrates and flashes to alert the user. For instance, the user can be notified when a smoke alarm goes off.

<https://itunes.apple.com/US/app/id369747181?mt=8>

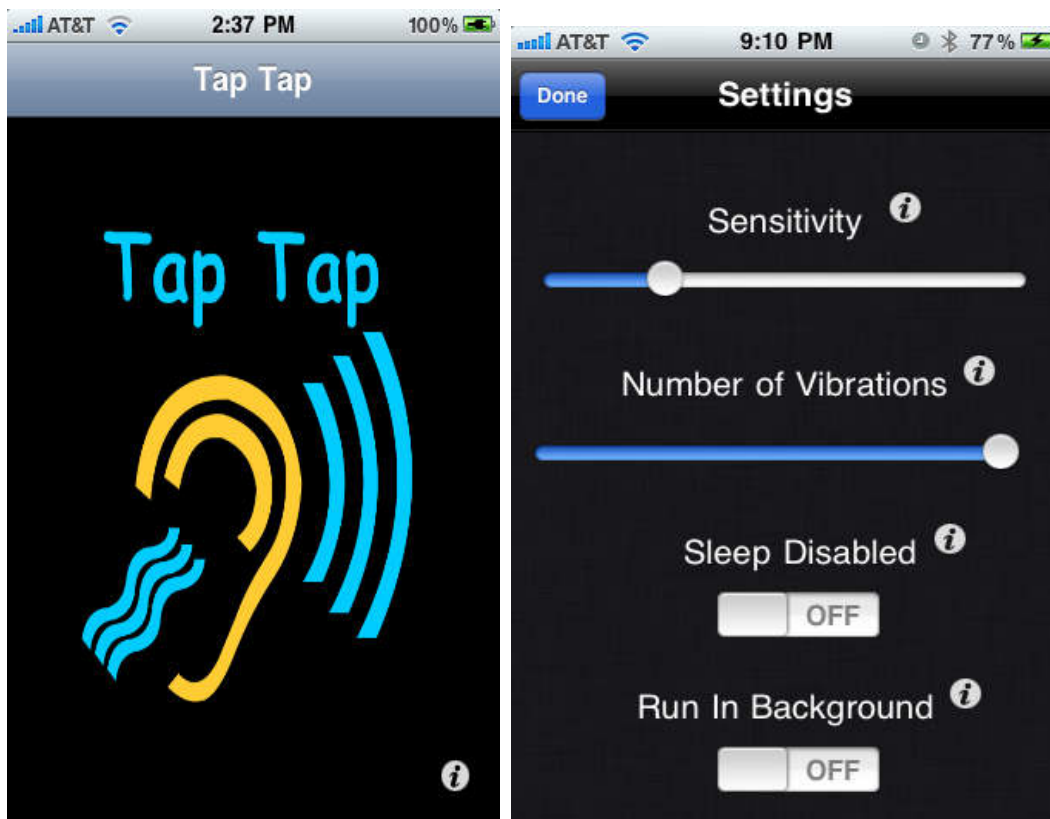


Image 23 Tap Tap settings



This app can use a lot of battery power.

ASL Dictionary

ASL Dictionary allows users to exchange communication by using the videos, expressions and pictures with other mainstream individual and individuals who are hard of hearing. The app features a replay, next and previous button that is helpful during conversations. Also the app is good for beginners and seasoned interpreters.

<https://itunes.apple.com/us/app/asl-dictionary/id353574642>

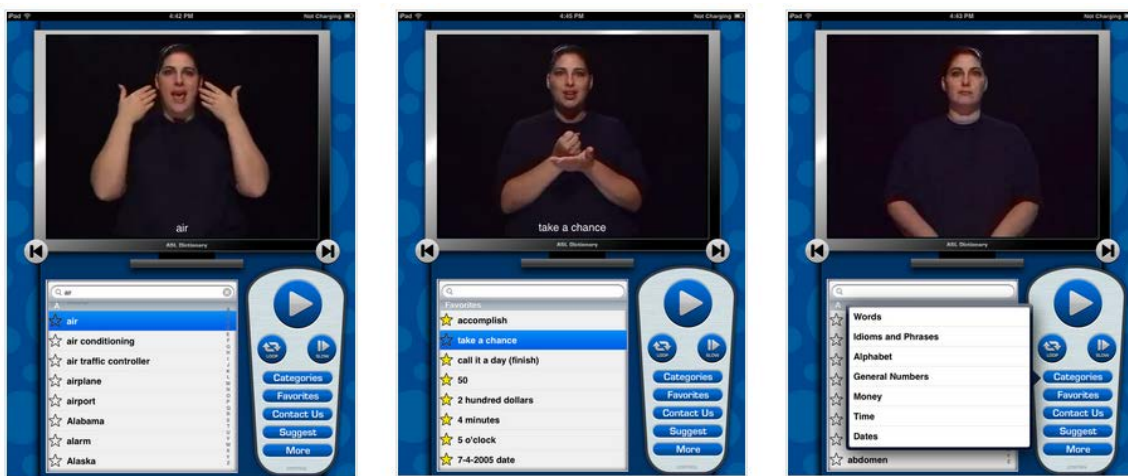


Image 24 ASL showing a sign language

iASL

Users can translate multiple English words into American Sign Language. The app provides translator, dictionary and category. Users can type five words and the matching ASL sign will be provided. In case users want to search for a word, the dictionary tool can be used to search for the word and the categories contains variety of choices such as emotions, and other actions.

<http://speechieapps.com/2012/03/26/iasl/>



Image 25 iASL showing how to type words



Image 26 iASL showing the word “love”

Z One Stop



Z One Stop is a resource for people who are deaf and hard of hearing. Individuals can search topics of interest: National Geographic, Photo of the day, phone numbers frequently accessed services, blogs, camps, captioning and government agencies.

<http://www.zvrs.com/products/softwareapps/onestop-for-ios>



Image 27 **Z One Stop menu**

Purple Communications



Purple Communications enables users to make video phone calls. Users have the option to be connected to an operator who types the message and the response of the recipient or vice versa. <http://www.purple.us/>

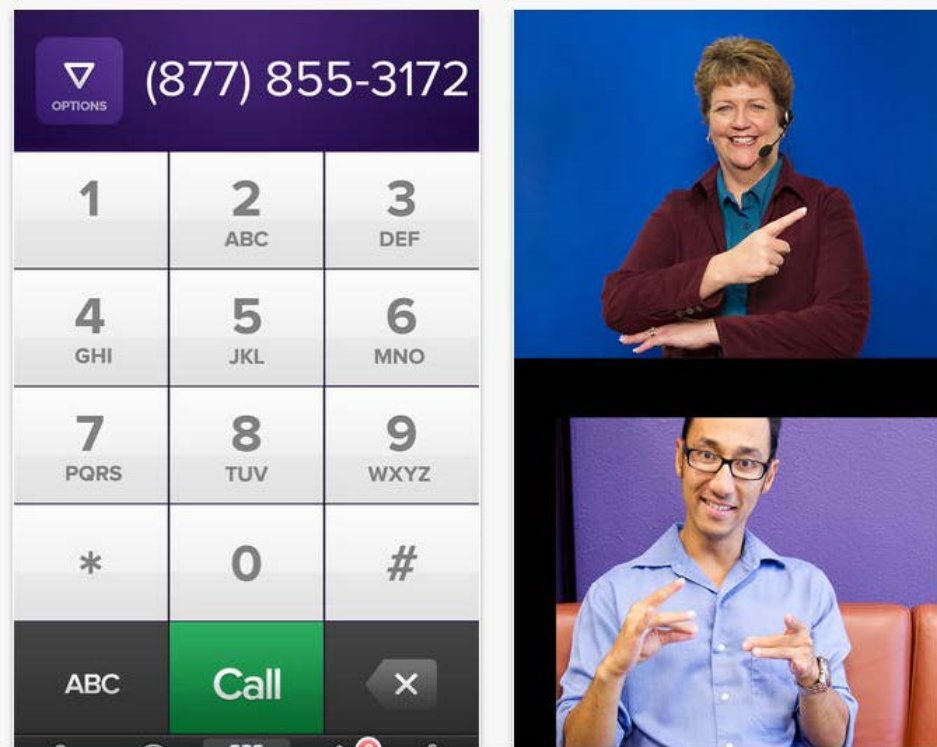


Image 28 Purple Communication demonstrating American Sign Language

eBuddy



eBuddy is a multifunction message app that works with Yahoo, Windows Live Messenger, and Google Talk. Users can chat with friends in real time and customize the picture, themes and notifications. <https://ebuddy.zendesk.com/home>



The app requires Internet service.



Image 29 eBuddy showing real time communication with friends in GTalk and MSN.

SoundAMP R

SoundAMP R acts similar to hearing aids. The app amplifies the sound coming from the outside and can be repeated with the repeat button. The program allows the user to record, customize the volume, tone, and adjust background sound levels.

<https://itunes.apple.com/us/app/soundamp-r/id318126109?mt=8>



Image 30 Users can adjust the volume settings either on right or left ear

Sign 4 Me

Sign 4 Me is a 3D animated app that teaches sign language. Just by typing a word, sentence, letter, or phrase, the 3D character provides the corresponding signs. Users can zoom in and out, and rotate the character for better viewing. Users can combine and communicate with peers using the 11,500 words. Other programs from the same company are Sign Smith Ultimate ASL, Signing Science Pictionary in American Sign Language, Signing Science Dictionary in American Sign Language and Sign Smith.

<https://itunes.apple.com/us/app/sign-4-me-for-ipad-signed/id383462870?mt=8>

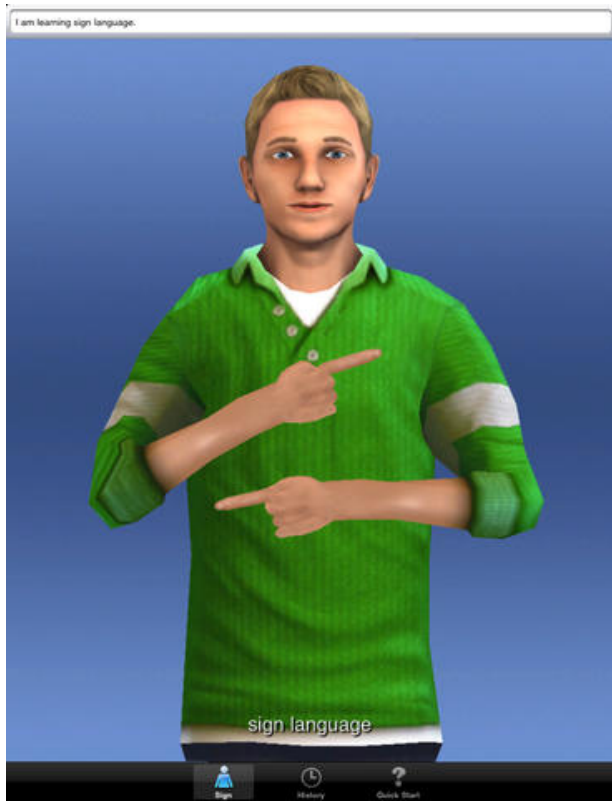


Image 31 **Sample Sign4Me ASL**

Physical and Mobility Impairment Accessibility Features

Tactile Buttons

iPad contains physical buttons that are easy to recognize. For example, the Sleep/Wake button found on the top edge; the screen rotation lock switch and volume-control buttons are found on the upper-right edge; and the Home button directly below the display.

External Buttons and Controls



Image 32 Tactile buttons in iPhone

Speak Selection

VoiceOver and Speak Selection have similar functions. By double tapping, an individual can highlight the text, copy, cut, and paste the text in another application or within the document. If VoiceOver is not enabled, Speak Selection will speak the selected text. For example if you want to copy text from website, mail or notes simply highlight the text and copy it.

**How to set up Speak Selection**

1. Settings
2. General
3. Accessibility
4. Speak Selection

iTunes

iTunes allows users to download music, movies, and TV programs to iPod, iPhone and iPad anytime and anywhere. Additionally, the individual can purchase music, apps, and movies from iTunes store.



How to set up iTunes

iTunes is a built in program that allows users to purchase movies and music.



Must have iTunes account to purchase music, TV shows, and movies

Applications

Speaktoit

With Speaktoit users can get help with notifications, and searches for the information requested. For example users can speak the request for services over the microphone and the app remembers the most common tasks.

<http://www.speaktoit.com/>

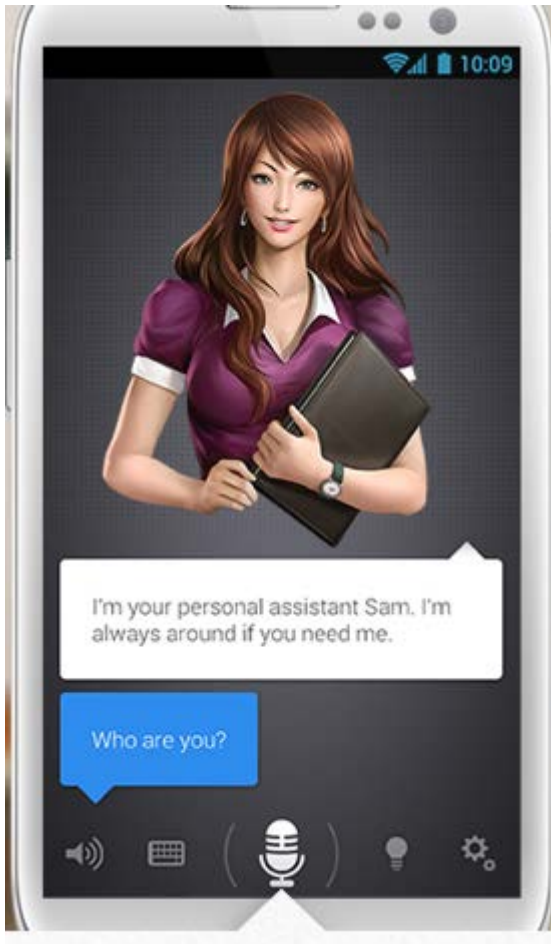


Image 33 Speaktoit app ready for request

Parking Mobility



Parking spots for people with disability can be easily identified by using the Parking Mobility app. Available parking spots are indicated by a pin marking the available site. People with a disability searching for the spot can immediately know where the available space is. Also, you can help limit abuse of parking spot for disability when someone occupies a spot that does not have a plate for disability.

<http://appshopper.com/navigation/parking-mobility>

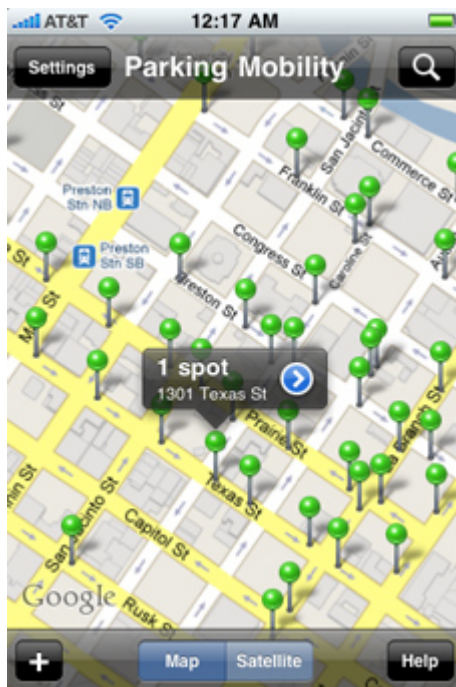


Image 34 Parking Mobility app shows available parking spots

Voice Dream Reader – Text to Speech



With Voice Dream Reader users can control the sound and adjust the size and fonts of text suitable to the individual's needs.

<https://itunes.apple.com/us/app/voice-dream-reader/id496177674?mt=8>

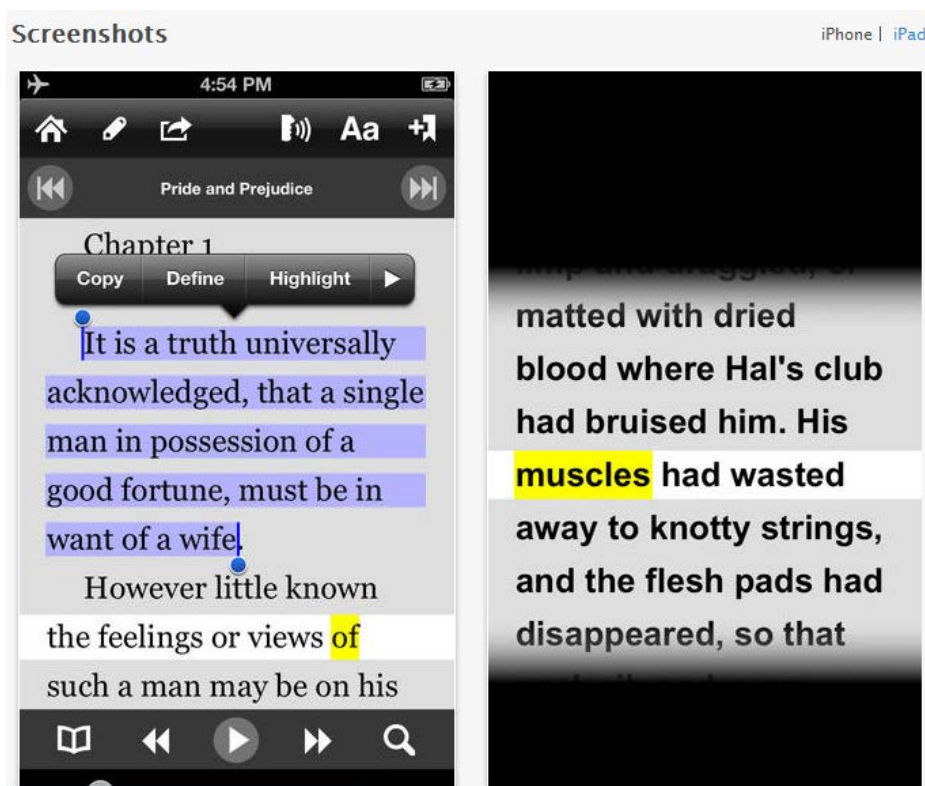


Image 35 Voice Dream Reader highlights text and reads the word aloud

Learning Disability

Accessibility Features

VoiceOver

Individuals with learning disabilities can benefit from the built in VoiceOver program. For example, students with dyslexia can use the VoiceOver built in option to hear the selected text instead of having to read it. For example, with American Speller, the individual can type the word the way it sounds and the app provides the proper spelling and definition. Another app such as “Cool Reader” reads eBooks (<http://dyslexiahelp.umich.edu/tools/apps>). Additionally, Apple has apps for a variety of categories, such as Productivity and Entertainment, (<http://www.apple.com/webapps/productivity/>).



How to set up VoiceOver

1. Settings
2. General
3. Accessibility
4. VoiceOver.

Calculator

Having a built in calculator is helpful in assisting individuals in daily activities such as calculating budget, cost of items when marketing, and other activities. Having an accessible calculator can help in solving math problems and reinforcing math skills.

iTunes

iTunes encourages creativity and motivates users to share their passion in arts, movies, videos, music and creating projects. For these reasons, individuals can express their creativity, become more sociable, and improve their skills in working on their projects. With iTunes users can also listen to favorite music and access multiple radio stations.



How to set up iTunes

1. iTunes is a built in program
2. Downloading music, TV programs and movies may be free or for purchase.

iTunes login information is required.

eReader

Individuals struggling in reading materials can benefit from eReader, a built in program. eReader (electronic reader) reads the eBook (electronic book). People can flip through pages of the eBook, select a particular chapter, and annotate passages. For example, eReader in Apple mobile devices are called the iBook that allows individuals to select an eBook, bookmark, or write notes to the favorite passages.



How to set up eReader

1. Download iBook app from Apple store
2. To download an eBook simply choose the desired eBook.



Use of Apple account is required.

Siri

Siri is a built in program available in iPhone 4S. Siri is very user friendly because users can use their voice to request for help. For example, you can ask Siri the weather condition, closest fast food and other information. By using your voice, you can send messages, schedule meetings, place phone calls, and conduct other actions.



How to activate Siri

1. Tap Home (Center button)
2. Select Settings
3. Select General
4. Turn on Siri (Slide ON or OFF)

Calendars

Students can keep track of their busy schedule by using calendars. With calendars built in program students can set reminders for variety of events: homework due dates,

examinations, medical appointments, and other social events such as birth days, anniversaries and family reunion.



How to Setup Calendar

1. Touch Calendar
2. Set the desired event
3. Set time and location
4. Set the desired date
5. Set the desired ring tone
6. Set the remaining options when needed

GPS (Navigation)

MotionX GPS Drive

MotionX GPS Drive is an app that provides information on current speed limits, highway interchanges, exits, intersections, and provides a visual speed limit warning when a person using the app exceeds the speed limit.

Google Maps

Individuals will find Google Maps beneficial if the person needs directions or a map of a specific address or geographic location. Google Maps provides a 3D visual view of the destination such as streets, buildings, offices and other landmarks. Also, it provides location information for businesses such as shopping malls, gas stations, and restaurants.

Maps

With built in Maps users can get directions from anywhere, anytime and for whatever they want to find. For example, either by foot or car, directions are easily provided, or if you are looking for a café, information is readily available via Wi-Fi connections. Additionally, users can use their voice to search for information.

Applications

iThoughts



iThoughts (“mind mapping tool”) allows user to put ideas add pictures to the information such as a diagram. iThoughts is ideal for “brain storming, project planning, goal setting, concept mapping, course notes/revision and meeting notes”.

<http://itunes.apple.com/us/app/ithoughts-mindmapping/id294144368?mt=8>

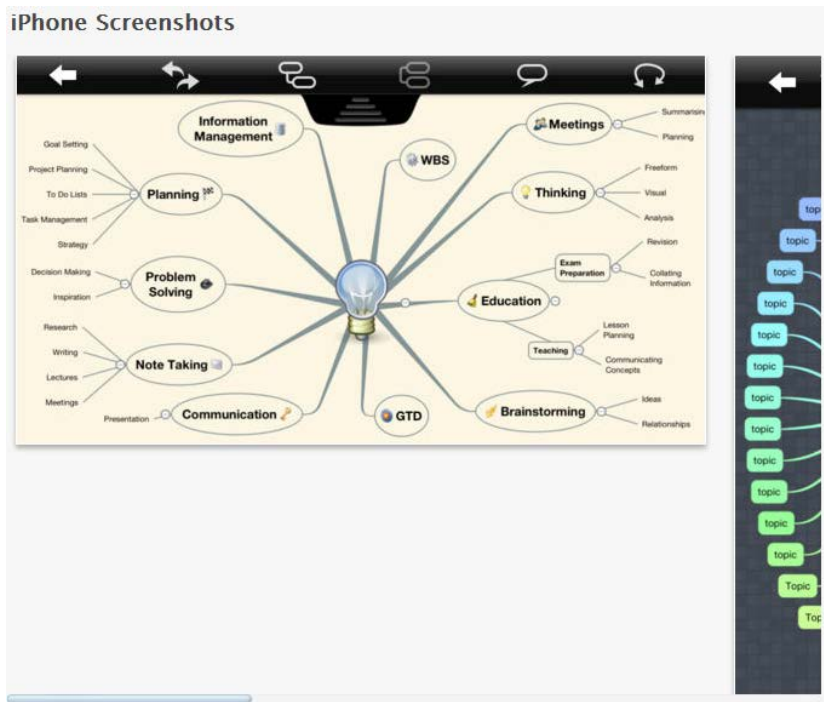


Image 36 iThoughts showing mind mapping

Red Laser



With Red Laser users can scan the barcode and be able to obtain information about the product such as pricing, stores that carry the item and other information.

<http://www.redlaser.com/>

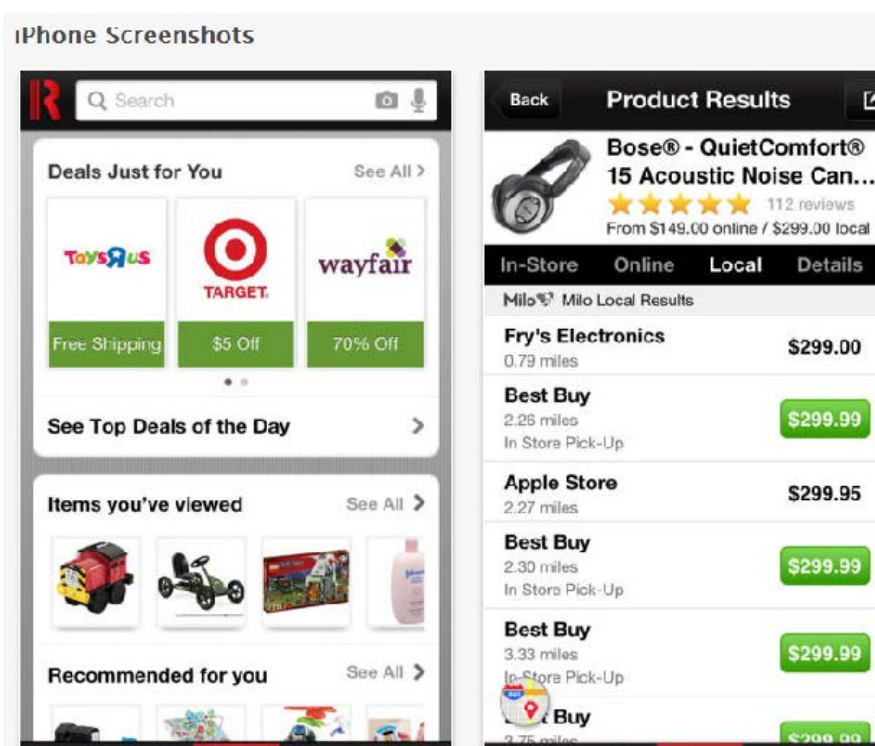


Image 37 Red Laser scans product barcode

Audio Note



Audio Note notes allow users to record notes and audio, organize notes and saves time instead of handwriting notes. Users can highlight notes and sync with audio.

<http://itunes.apple.com/us/app/audionote-notepad-voice-recorder/id369820957?mt=8>

Screenshots

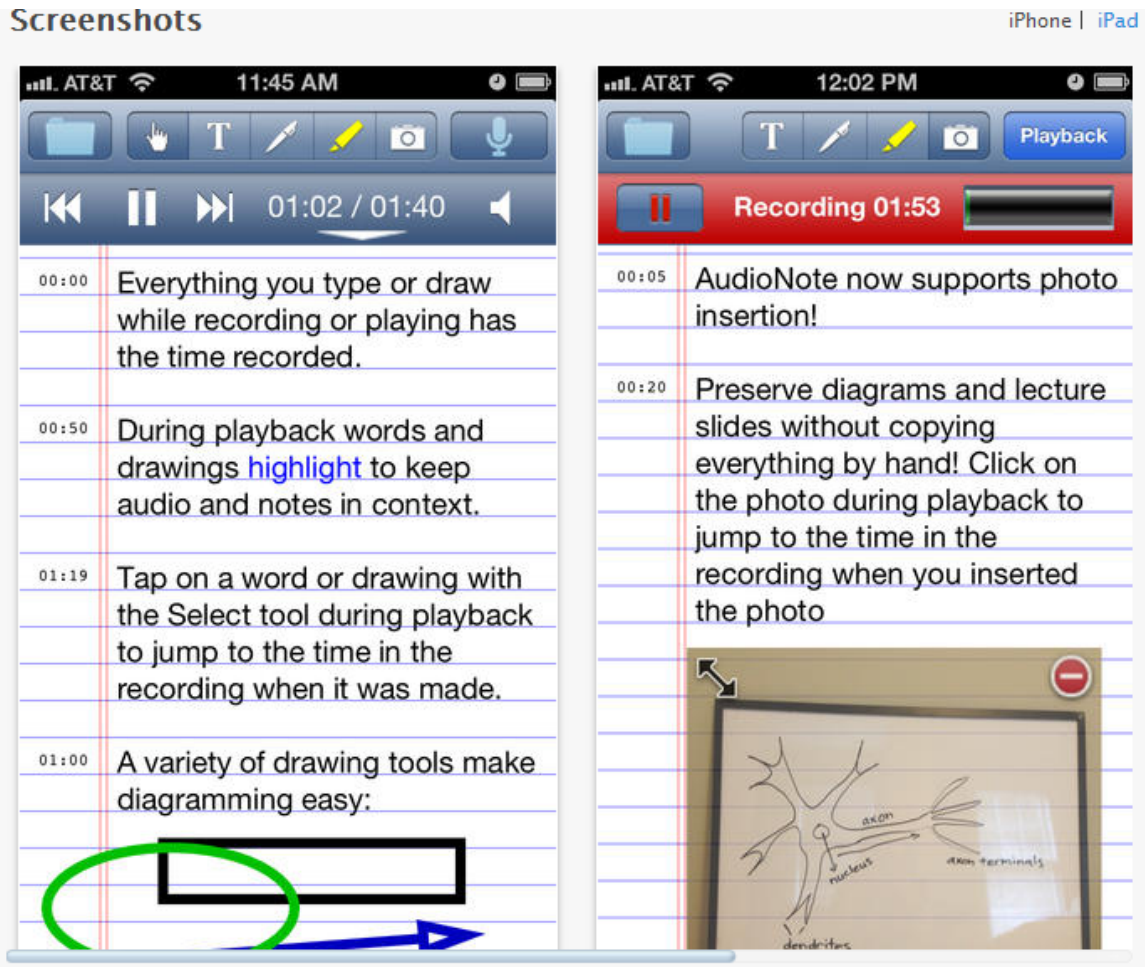


Image 38 Audio notes recording lecture with time stamp

Notability

Notability is a simple app that allows users to annotate PDF files and to use handwriting when taking notes, typing, recording, and organizing notes. Users can also sign contracts, sketch ideas and label and annotate pictures.

<https://itunes.apple.com/us/app/notability/id360593530?mt=8>

Example

Given: Two blocks of different materials are assembled as shown.
The densities of the materials are: $\rho_A = 150 \text{ lb/ft}^3$
 $\rho_B = 400 \text{ lb/ft}^3$

Find: The center of gravity of this assembly

Baker Beach Hike

Start at the top of the beach (look for the Coastal Trail sign pictured here) for the totally unexpected "reverse bridge" view of the Golden Gate.

Then take the Sand Ladder steps to scenic Baker Beach.

Take your time, and remember to:

- Feel how cold the Pacific Ocean is.
- Enjoy the view of the Golden Gate Bridge.
- Turn around and see the amazing views of the homes on the hills opposite the bridge.
- Make sure to ask the fishermen what they are catching.
- Leave some time to relax and people watch.

Wish you were here!

Image 39 Notability records lecture even handwriting

Drop Box

Users will be able to bring their photos, documents, videos and other files anywhere. Users will be able to read the documents and flip through the photos whenever and wherever they want to.

<https://itunes.apple.com/us/app/dropbox/id327630330>

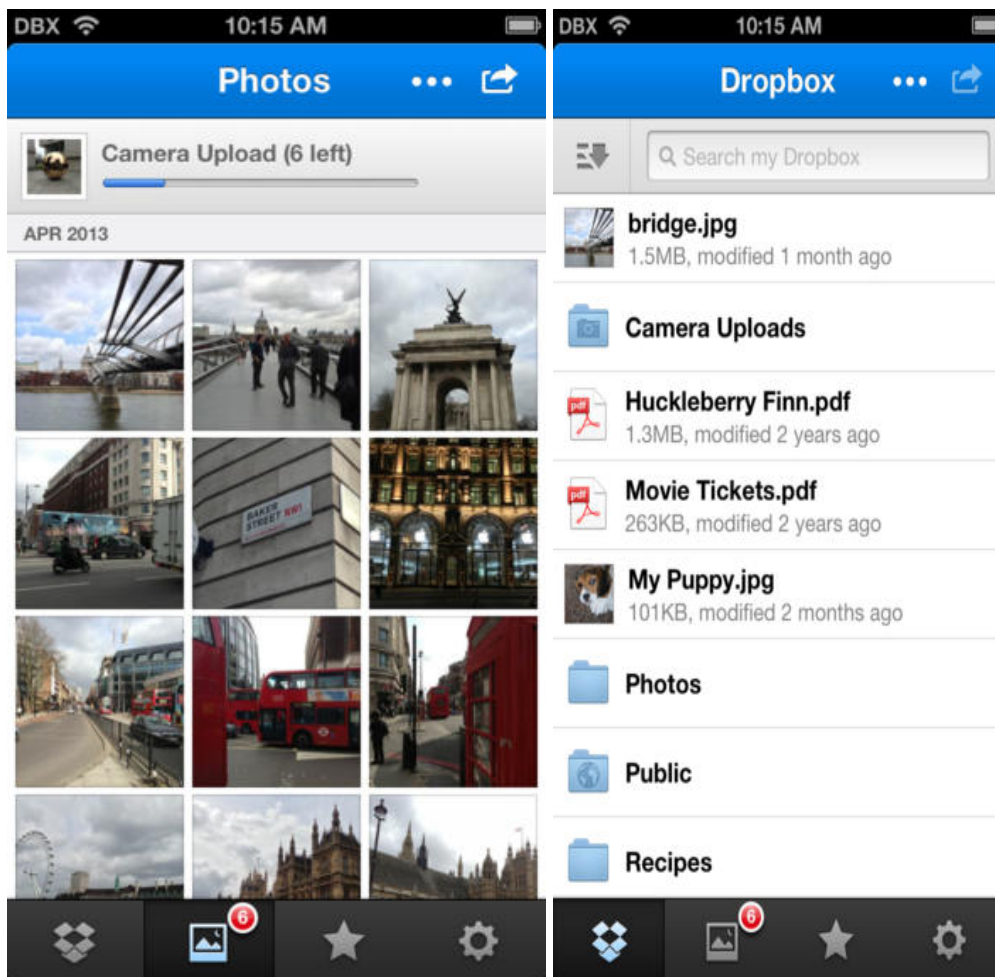


Image 40 **DropBox allows users to share files with login information required**

Speller - Free Spell Checker



Speller allows users to type the word the way it sounds and the app will respond with the proper spelling and definition of the word. The app is helpful for individuals with dyslexia.

<https://itunes.apple.com/us/app/speller-free-spell-checker/id305997247?mt=8>

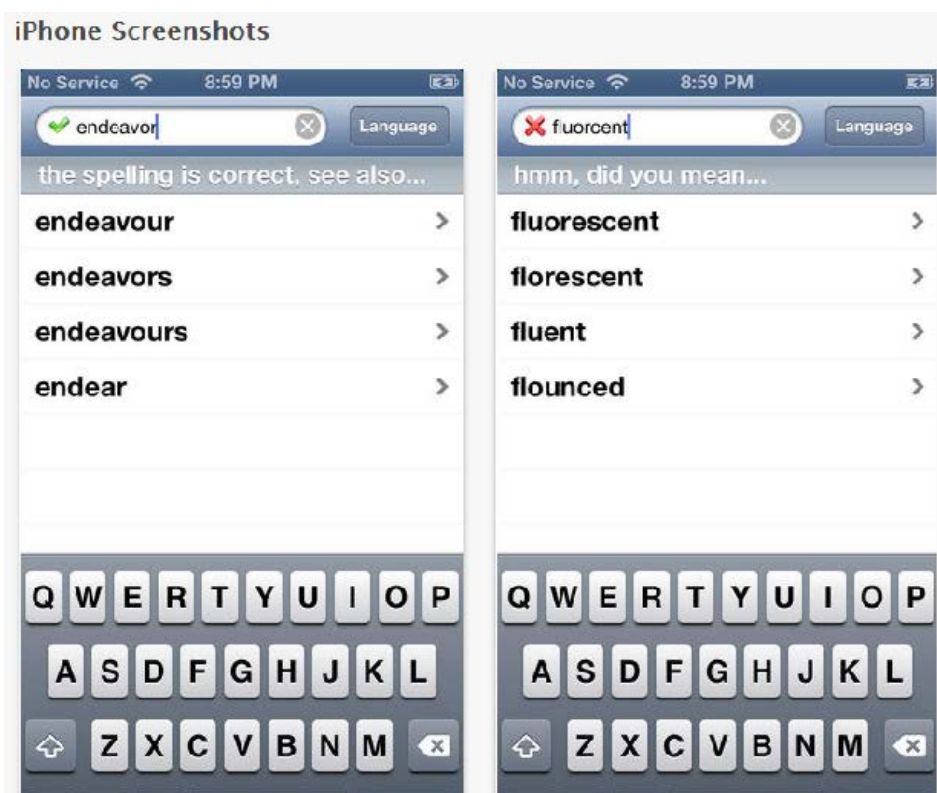


Image 41 Speller helps users in providing the proper spelling of the word

Duolingo

Helps users learn Spanish and other languages such as “French, German, Portuguese, Italian, and English” free. Visit iTunes to download the app.

<https://itunes.apple.com/us/app/duolingo-learn-languages-for/id570060128?mt=8&>

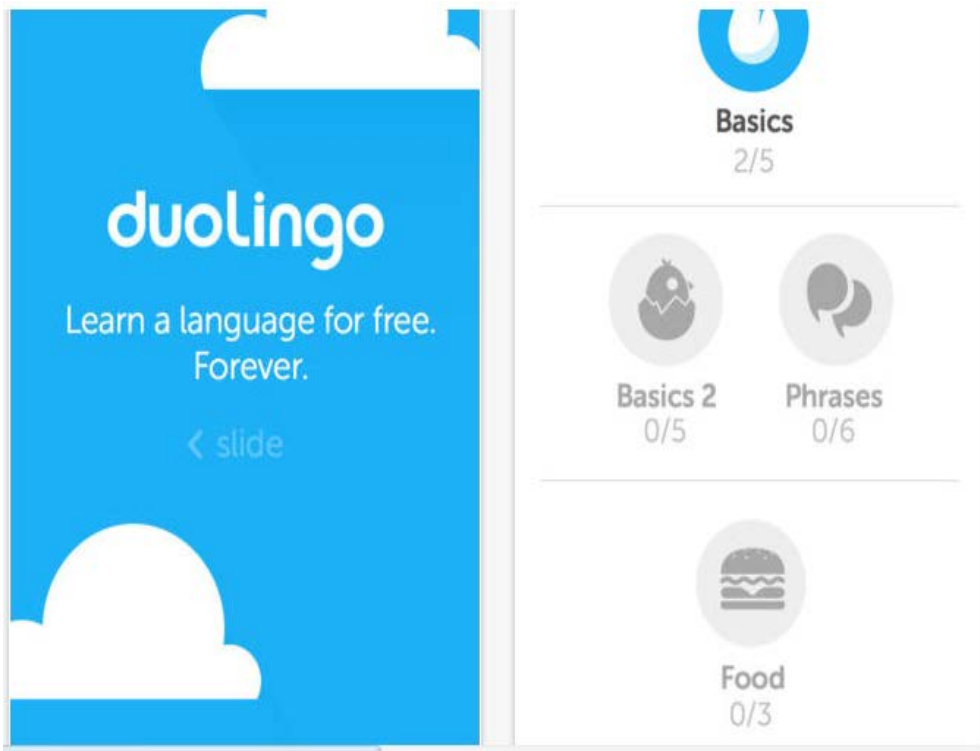


Image 42 Duolingo app shows different categories in learning the language

iBooks

iBooks is an eReader that provides eBooks in a broad spectrum. Users can highlight notes, make study cards to reinforce learning, search and annotate. Enjoy an interactive reading with colorful videos and pictures. Download the app from the App store.

<https://itunes.apple.com/us/app/ibooks/id364709193>

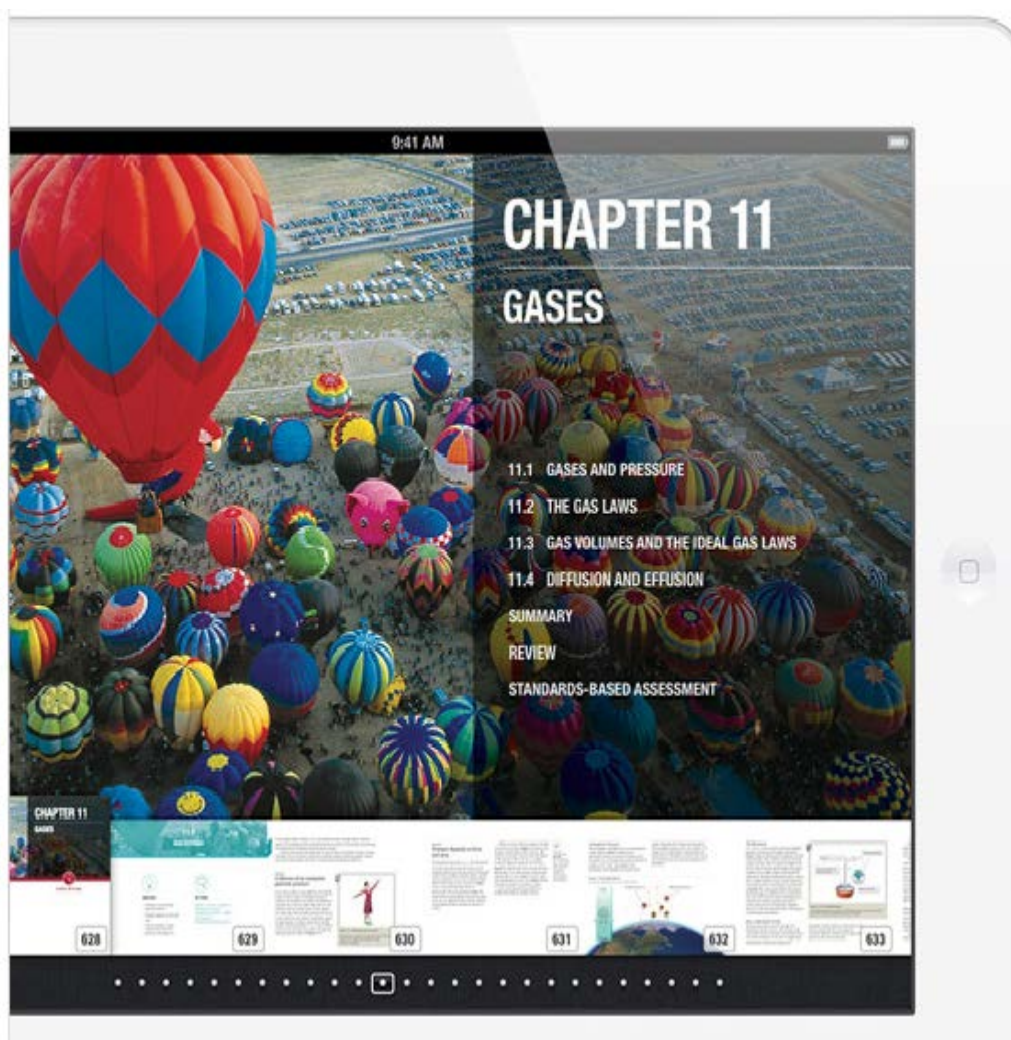
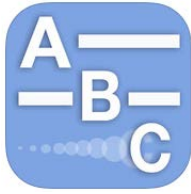


Image 43 iBook showing Chapter 11 of the eBook

Brevity - The Ultrafast Text Editor



Brevity is helpful for people having difficulty with proper spelling of words. By typing the first consonant and succeeding letters Brevity will list the possible words. Other options the app offers include: supports dictionaries “built-in word lists containing thousands of words for the following languages: English, Spanish, Portuguese, Russian, German, French, Italian, Dutch”, Czech and Swedish”, auto-expansion – remembers words that are not contained in the dictionary (e.g. slang), sorting of words is a breeze, supports email, text messaging, copy and paste to other programs, undo option, saving documents, eliminates misspelled words, and adjusts font size.

<https://itunes.apple.com/us/app/brevity-ultrafast-text-editor/id424431516?mt=8>

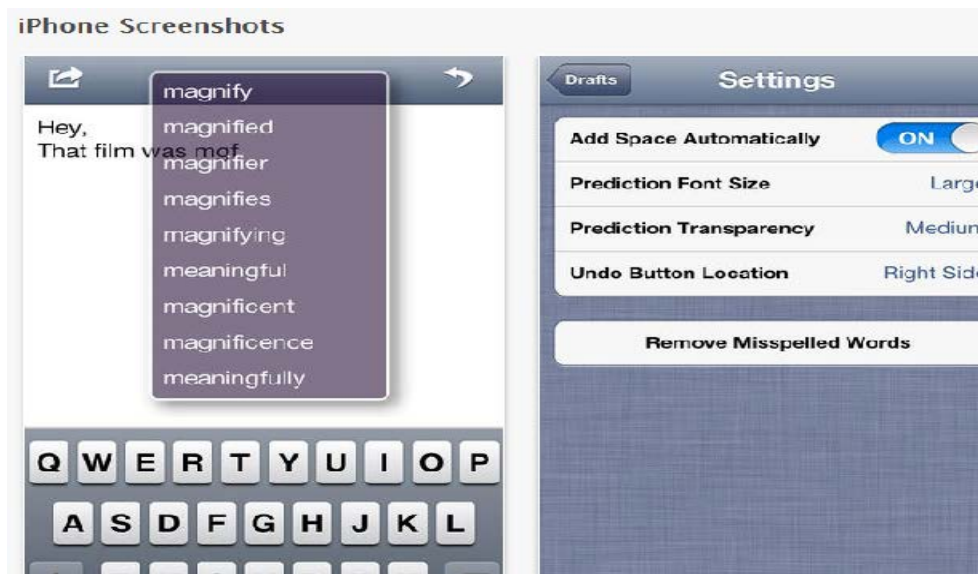


Image 44 Brevity provides several word options

Any.Do

Any.Do makes scheduling an easy task for students with learning disability. The app features sync of calendar via cloud, text to speech, place and time reminders and gesture action recognition. <https://itunes.apple.com/us/app/any.do-task-to-do-list/id497328576?mt=8>

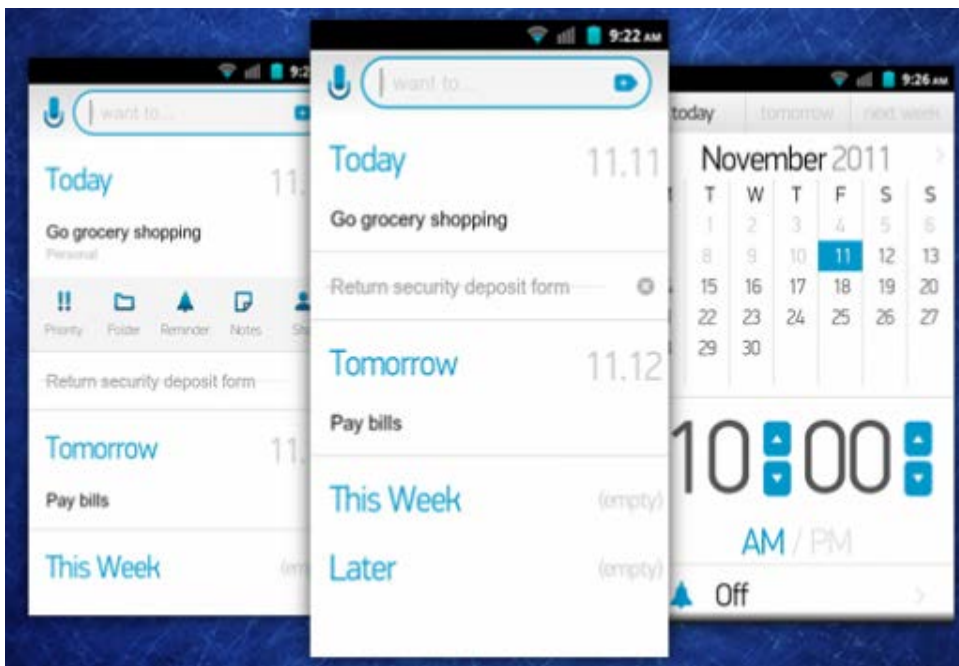


Image 45 **Screen shots showing schedules of daily activities**

Speech Impairment Accessibility Features

Messages

With Messages text can be read aloud. Also, the text can be in blue color making the text be easily distinguishable by the reader.

Face Time

Face Time is calling via Wi-Fi similar to Skype. With Face Time On, you can send and receive video relay calls to other people. Face Time requires Internet connection and Apple ID.

Siri

Siri is very user friendly because users can use their voice to request help. Siri is only available with Internet access on. For example, users can ask Siri the weather condition, closest fast food and other details. Users can speak the command such as send messages, schedule meetings, and place phone calls.

iBook

iBooks is an eReader that provides eBooks in a broad spectrum. Users can highlight notes, make study cards to reinforce learning, search and annotate. Also, users can enjoy an interactive reading with colorful videos and pictures. Download the app from the App store.

Speak Selection

Speak Selection works like Voiceover. By double tapping, an individual can highlight the text, copy, cut, and paste the text into another application or within the

document. If in case Voiceover is not enabled, Speak Selection will speak the selected text. For example if the user wants to copy text from Safari, mail or notes simply highlight the text and copy it. Also, users can have Speak Selection read emails.

Applications

MyTalkTools Mobile



MyTalkTools Mobile for the iPhone, iPod touch and iPad is one of the AAC communication apps that enable people with speech impairment to communicate their wants, needs, and messages to friends, family, and teachers. Individuals can press the pictures that match their messages. MyTalkTools Mobile includes: TTS, adjustment of male and female voice, video w/ auditory scan (must purchase Acapela Voices), enlarging fonts: 10-60, zoom images (OFF or ON) Zoom out, drag and drop movement, searching web images, full sentence construction and library search. The app can be purchased at iTunes.

<http://www.mytalktools.com/dnn/Products.aspx>

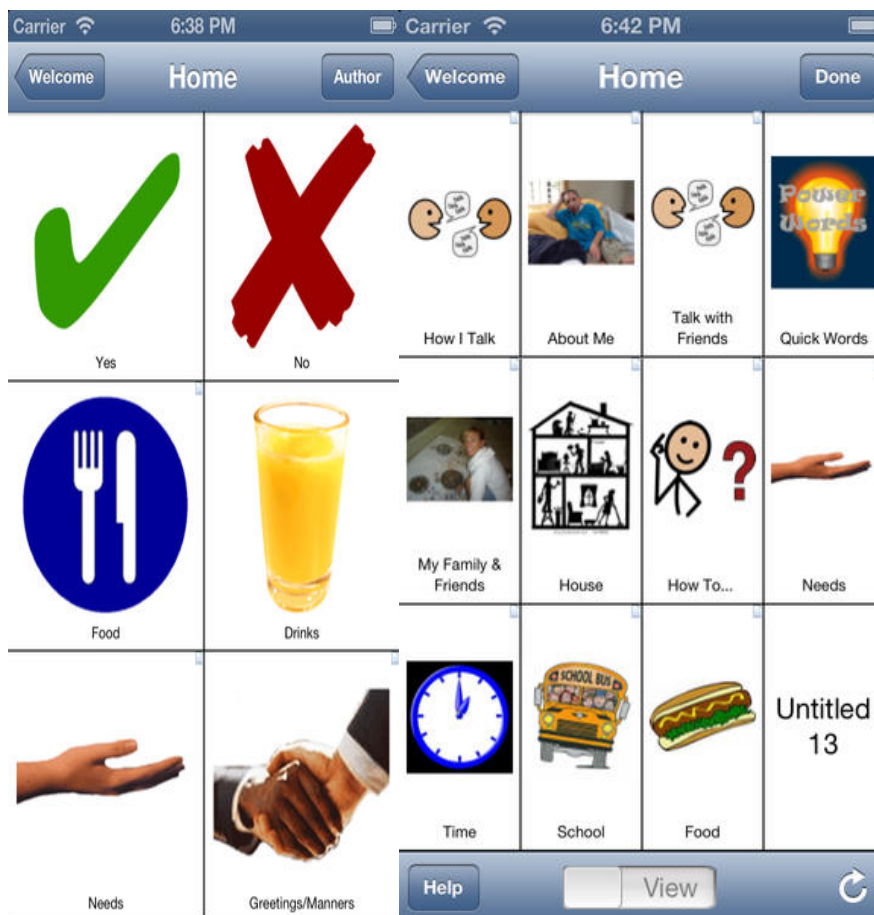


Image 46 Pictures used for communication with non-verbal individuals

Predictable



Predictable uses text to speech option that enhances word prediction. Users can improve sentence constructions and word building. With Predictable users can easily modify sentence and adjust the voice suitable to the user.

<https://itunes.apple.com/us/app/predictable/id404445007>

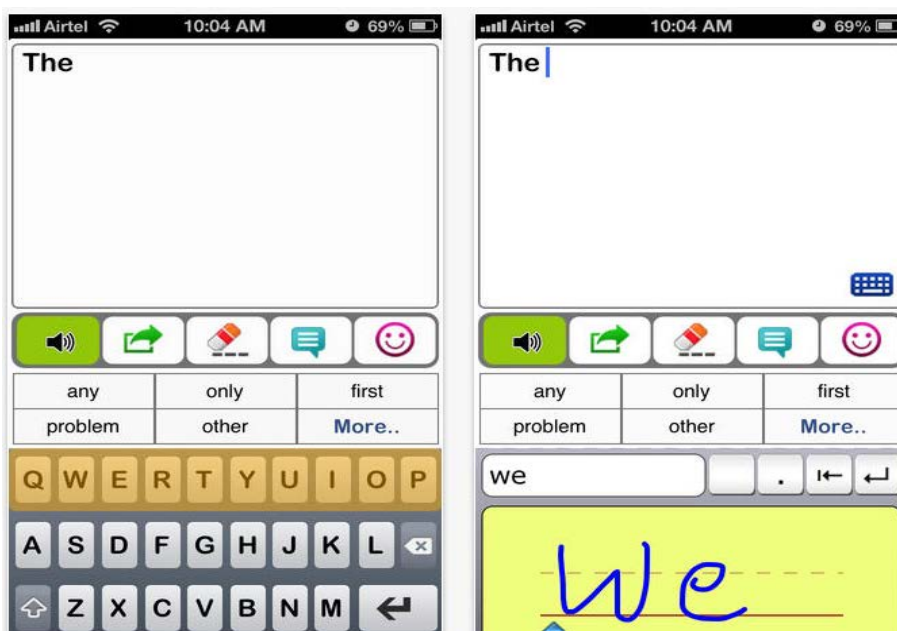


Image 47 Predictable showing word suggestions

Spanish Articulation Probes



This app contains 500 flashcards that allow users to practice pronunciation and proper articulation of Spanish language. This app allows conversation with Spanish speaking and non-Spanish speaking individuals. Also this app is helpful for multicultural students particularly in building proper conversation in Spanish language.

http://download.cnet.com/Smarty-Speech-Spanish/3000-20415_4-75135603.html?tag=sideBar;downloadLinks



Image 48 Spanish Articulation menu

Conjugation Nation



Users can learn how subject-verb agreement in Spanish language is formed. The user is given a verb and a pronoun and must type the correct verb conjugation.

<https://itunes.apple.com/app/conjugation-nation-spanish/id320530591?mt=8>

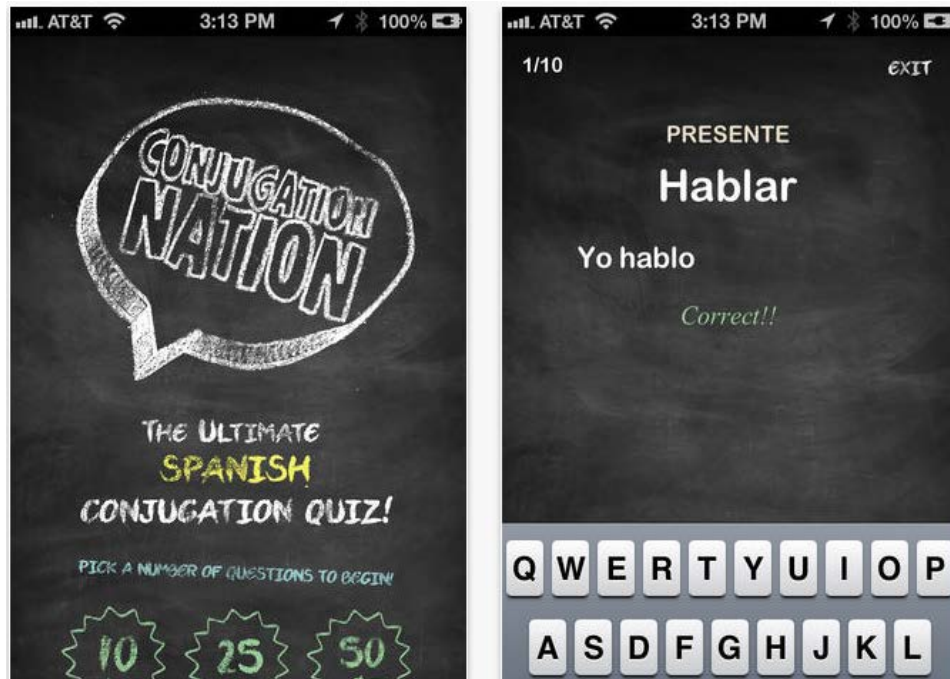


Image 49 Sample quiz in Conjugation Nation

Verbally



Verbally is a communication app that helps people with speech disabilities caused by Apraxia, ALS, stroke, traumatic brain injury, Parkinson's, Cerebral Palsy, autism spectrum disorder or muscular dystrophy. With the text to speech enabled users can tap the word and Verbally speaks the word. Also, the app learns the frequently used words, core words and provides word prediction.

http://verballyapp.com/about_us.html



Image 50 Verbally screen layout

QuickVoice® Recorder

Quick Voice Recorder records ideas by typing the text, voice memos, voice email, lectures, and classes. The app works in the background while other apps are running.

<https://itunes.apple.com/us/app/quickvoice-recorder/id284675296>

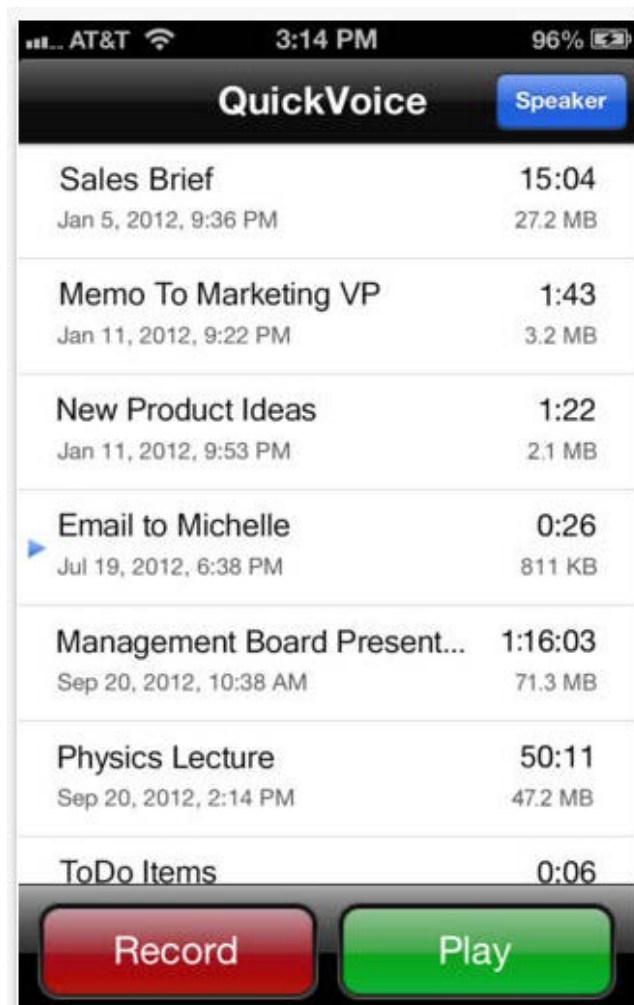


Image 51 Quick Voice Recorder shows different task recorded

Voice Reader Text to Speech

VoiceReader Text to Speech reads the text aloud. Users can copy and paste the text and the device will read the text and other documents such as PDF files.

<https://itunes.apple.com/us/app/voice-reader-text-to-speech/id422829104?mt=8>

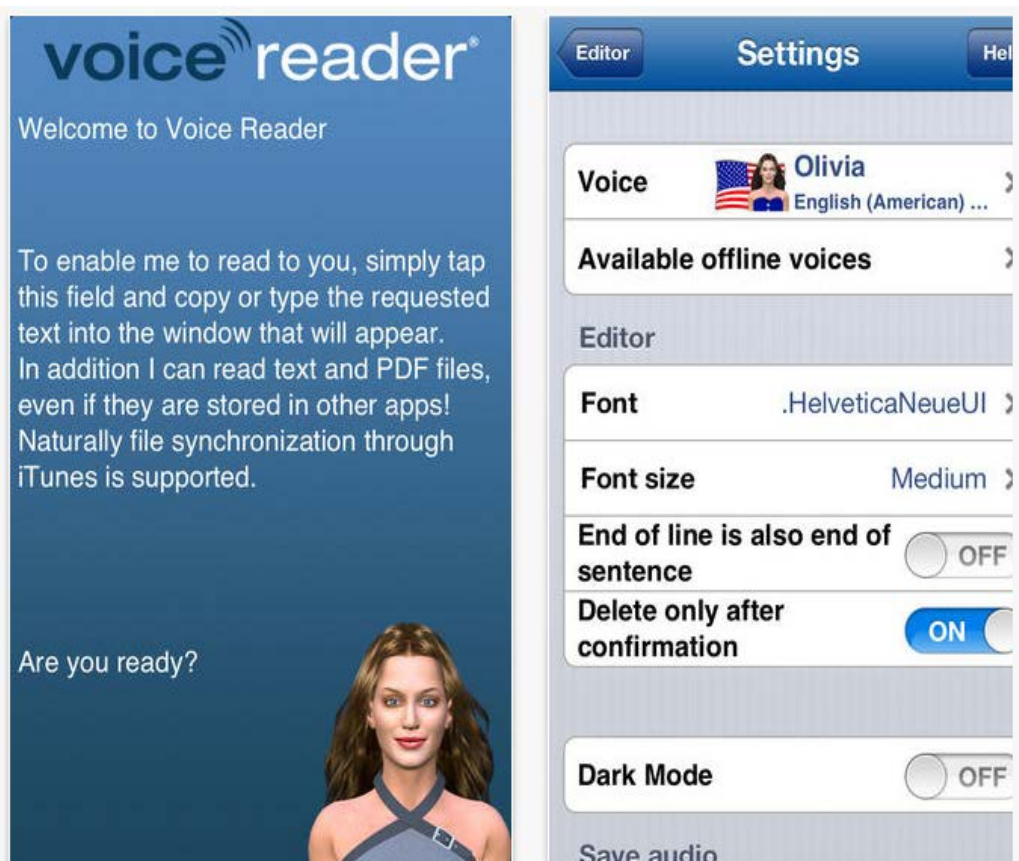


Image 52 Voice Reader Text to Speech settings

Speak it!

The Speak it! app is a text to speech program that uses a human quality voice.

Users can customize the volume control, rate of the voice, and the gender of the voice.

Additionally, users can type or paste text from another program, insert the voice-file into the app, create audio files, and save audio or text files.

<https://itunes.apple.com/us/app/speak-it!-text-to-speech/id308629295?mt=8>

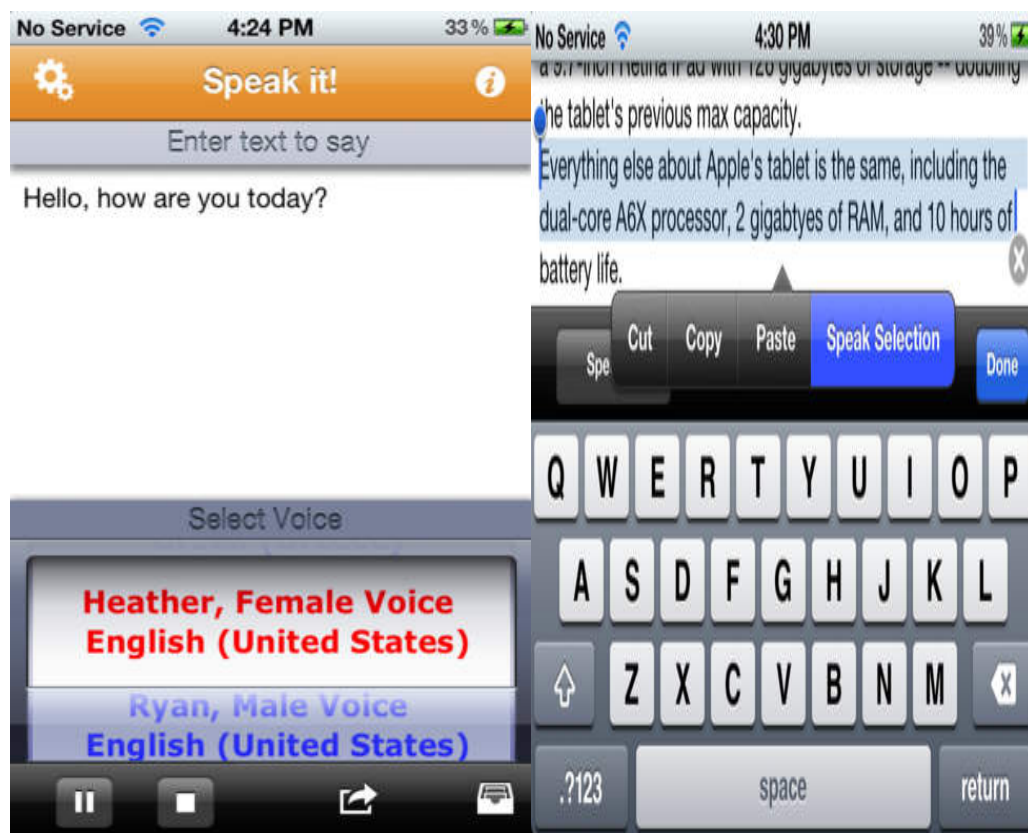


Image 53 Speak it speaks the highlighted text

Audio Note Lite

Another program that enables students to record their presentations is Audio Note Lite. This app is especially useful when the students with speech impairment feel nervous about speaking in front of the class. Additionally, the app allows users to take notes, and save the sound file and play it later.

<http://luminantsoftware.com/>



Image 54 **AudioNote task pad**

Speak it To Me

Speak it To Me is an app that speaks the text the user types. The user can copy and paste the message or text in emails, web pages and other word processing programs such as MSWord. For instance, students with speech impairment can copy and paste the text when sending an email message using Yahoo or Gmail.

<https://itunes.apple.com/us/app/speak-it-to-me/id400582836?mt=8>



Image 55 Sample Speak it To me message

Proloqou2go

Proloqou2go is an AAC software that helps people respond through the use of pictures. Proloqou2go provides a text to speech voice that is similar to human voice. It has a 7000 word vocabulary that is easy to customize and works on mobile devices. The user can also maintain a backup by uploading to iCloud. Even if the device breaks, or you accidentally lose the device, your information is stored safely in iCloud, which you can then later easily reinstall to a new device.

<http://www.orin.com/access/Proloquo2Go/>

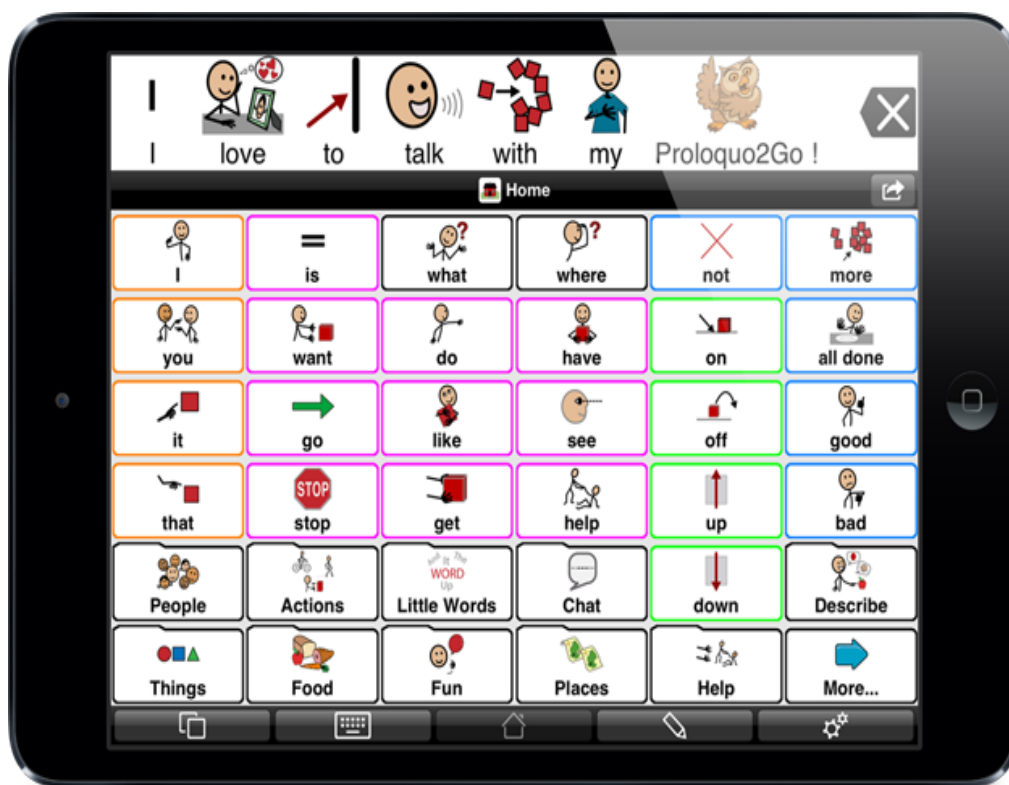


Image 56 Pictures used for communication



Featured Links:

| DESCRIPTIONS | LINKS |
|----------------------|---|
| VoiceOver Tutorial | http://www.youtube.com/watch?v=K-G9IEhnlG |
| How to set up iBooks | http://www.youtube.com/watch?v=NQMkllkGdks |
| iPad Tips and Tricks | http://www.youtube.com/watch?v=pArkIv46TEo |
| iMessage overview | http://www.youtube.com/watch?v=RM-z9kCBvPg |

SECTION II: ACCESSIBILITY FEATURES OF ANDROID MOBILE DEVICES



Visual Impairment Accessibility Features

Android mobile devices provide users with visual impairment the following accessibility features:

Magnification

Users can magnify the screen to see the icons better and read the information clearer. When magnification is on a rectangle shape is visible, users can use gestures to navigate the screen. With the use of two fingers users can zoom in and out of the screen.



How to magnify the screen

1. Touch Settings
2. Choose System
3. Select Accessibility
4. Select Magnification gestures

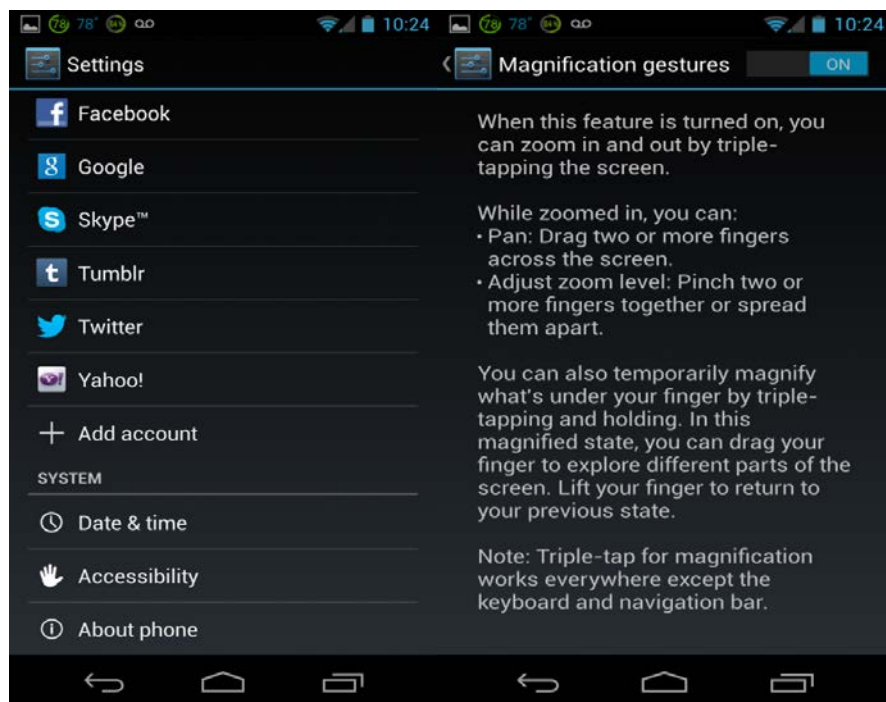


Image 57 **Setting up magnification**

Enlarging Text

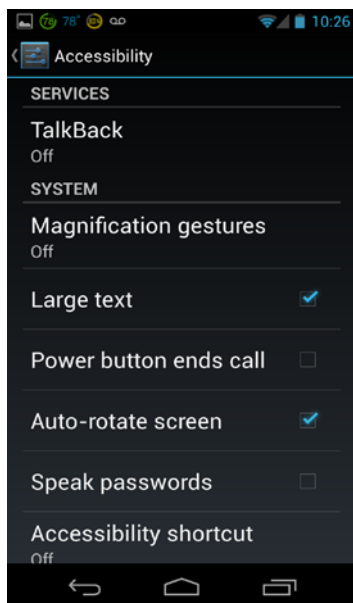


Image 58 **Setting up enlarging text**



How to enlarge text

1. Select Settings
2. Select Accessibility
3. Select Large Text

TalkBack (Text to Speech - TTS)



Students can hear the labels read aloud by enabling TalkBack. Also users can activate items and navigate the screen by gestures.



How to set up TalkBack

1. Settings
2. Select Accessibility
3. Enable Accessibility checkbox
4. Enable TalkBack checkboxes

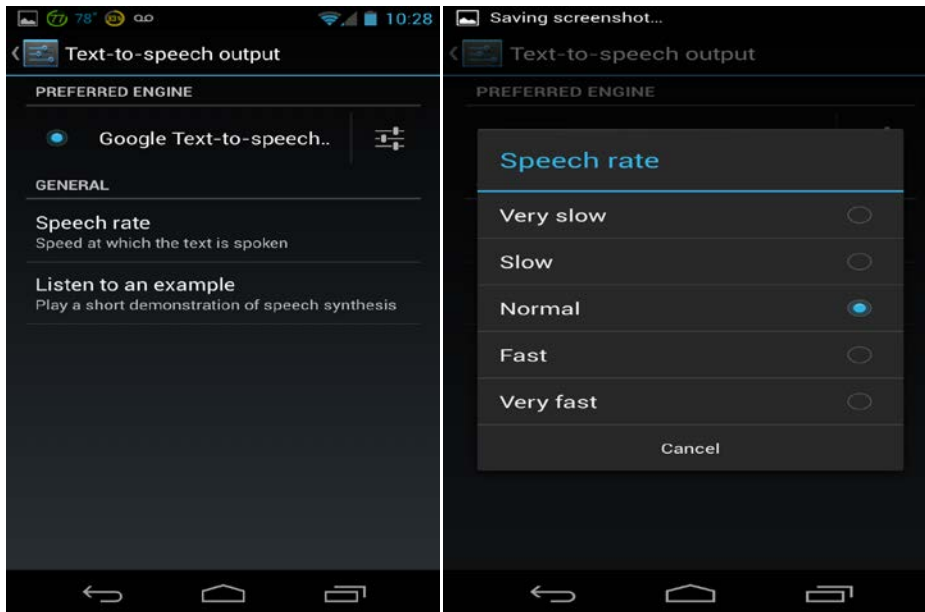


Image 59 **Text to Speech setting**

Color Contrast

Users can adjust the brightness or lightness of color suitable to reading.



How to adjust contrast

1. Settings
2. Display
3. Brightness (Adjust the brightness accordingly)

Explore by Touch

A program that works hand in hand with TalkBack enables users to touch the phone's screen and hear what's under the finger such as reading the menu or speaking the keystroke.

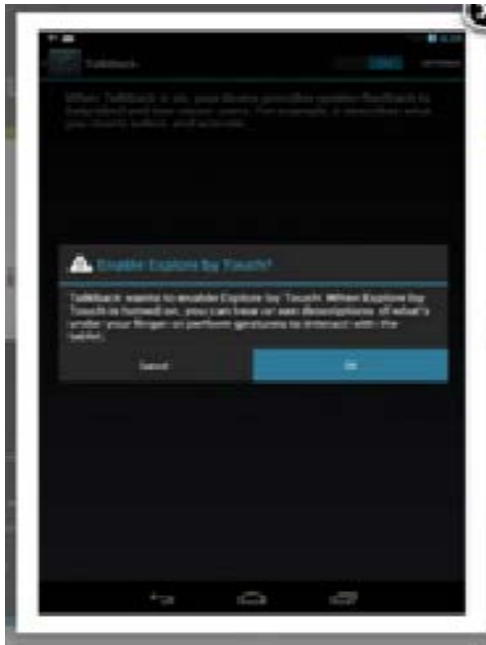


Image 60 Explore by Touch setting

Instant dictation

Enables users to do multiple activities such as search the web, call a contact, and write a message. Use of headset is required because TalkBack may become in conflict.



How to set up Instant dictation

1. Speak to the microphone and issue the request such as calling one of the contacts.



Sometimes the microphone does not respond to the request due to the inability to understand the words, but as technology progresses voice recognition technology gets better.

Google Maps



Google maps provide turn by turn guidance of directions and works with Talk Back. With Google Maps users can find direction on foot, by car and public transportation.



How to get directions

1. Select Google Maps
2. Type the desired destination in the search box or speak the destination into the microphone.



Start and ending destination is required to get direction

Notifications

Notifications is a built-in program that enables users to receive alert when a user receive a new email, new text or low battery warning and chat messages. Notification includes time stamp and the senders name and allows user to react on situations that require prompt attention.



How to set Notification

1. Settings
2. Notification is a built in program and customizing the notifications is helpful to avoid unnecessary notifications.

KickBack



KickBack provides a haptic vibrating response when the user performs an action on the phone such as receiving an email alert.



How to use KickBack

1. Go to Settings
2. Select Accessibility
3. Enable Accessibility checkbox
4. Enable KickBack checkboxes



Note: KickBack is included in TalkBack in Android 4.0

SoundBack



SoundBack provides a short sound when the user schedules events. Also when the user taps the home button a short sound can be heard. Users can customize the various sounds for each of the activities.

<http://developer.android.com/guide/topics/ui/accessibility/services.html>



How to setup SoundBack

1. Go to Settings
2. Select Accessibility
3. Enable Accessibility checkbox
4. Enable SoundBack checkboxes

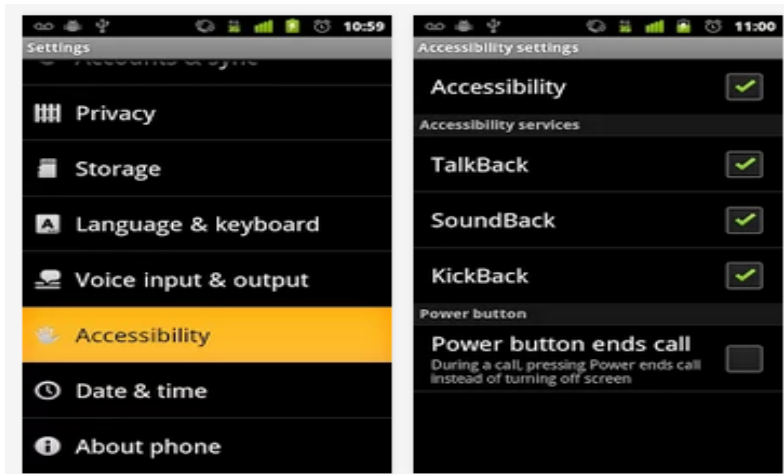


Image 61 **Setting up SoundBack**

Gesture typing

Users can glide over the letters that they want to type, word prediction completes the rest of the word, and voice typing allows users to type using their voice.

<http://www.android.com/whatsnew/>

Dial Pad

With Dial Pad, enabled users can get help by completing the names and numbers of the contact. For instance if they want to call John Doe as one of the contacts, a list of possible contacts that match the name will be suggested.



How to use Dial Pad

1. Settings
2. Turn on Dial Pad Auto Complete option
3. Type the desired phone number

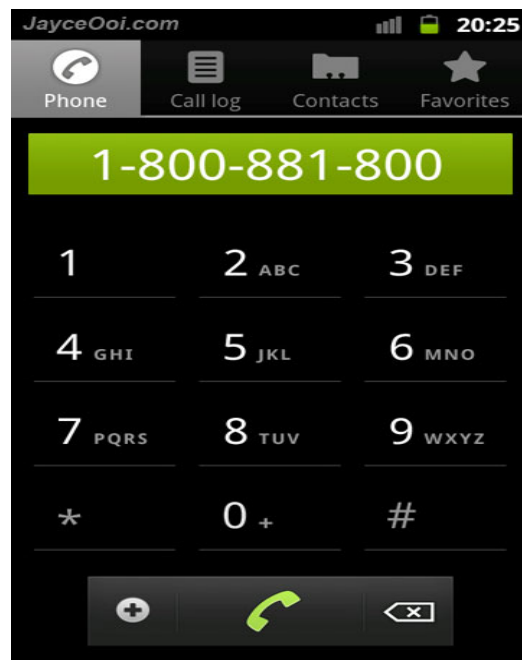


Image 62 Sample contact number

Clock



With the clock enabled users can use the clock as an alarm clock, stop watch, track time, count laps, and track the time in other parts of the globe. Setting reminders alerts the user of appointments, events and minimize the occasion being missed.



How to use Alarm Clock

1. Touch the Clock icon
2. Set the desired time and date of the event



Image 63 Alarm clock showing time

Google Now

Google Now helps the user manage the daily activities during the day such as appointments, travel itineraries and other events. Having Google Now assists users in keeping track of their daily schedules.



How to set up Google Now

1. Touch the Home button
2. Select “G” (Google) shortcut

Play Books



Play Books is a built in program that reads eBooks aloud by using text to speech option (TTS). With Play Books users can access a huge selection of eBooks anywhere and anytime.

How to use Play Books

1. Touch Play Books
2. Choose the eBook to read



Users can download eBooks free or purchase.

Applications

IDEAL Item Identifier[®]

Provides the user to take pictures of standard UPC and QR codes and reads aloud the description of the item using text to speech voices. Also enables the users to create talking barcodes.

More: <http://tinyurl.com/apps4android-iii-1>



Image 64 A sample QR code

IDEAL Magnifier[®]

Users can use their mobile device into handheld video magnifiers. Individuals with visual impairment can have a bigger and clearer picture of the object eliminating the need to carry a magnifier. The app can capture video image with color filters that helps users see and distinguish the colors. Also users can freeze the image and frame the image they want to capture.

More: <http://tinyurl.com/apps4android-im-1>

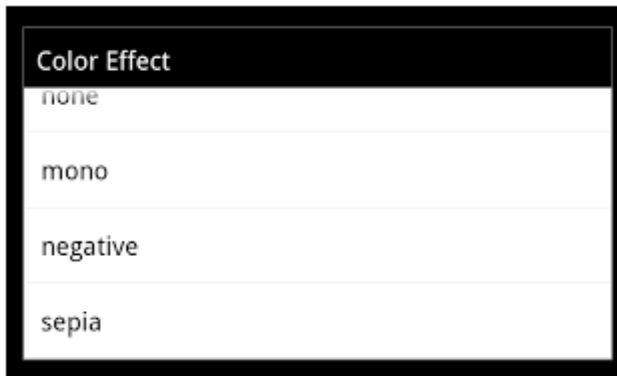


Image 65 IDEAL Magnifier showing choices of colors

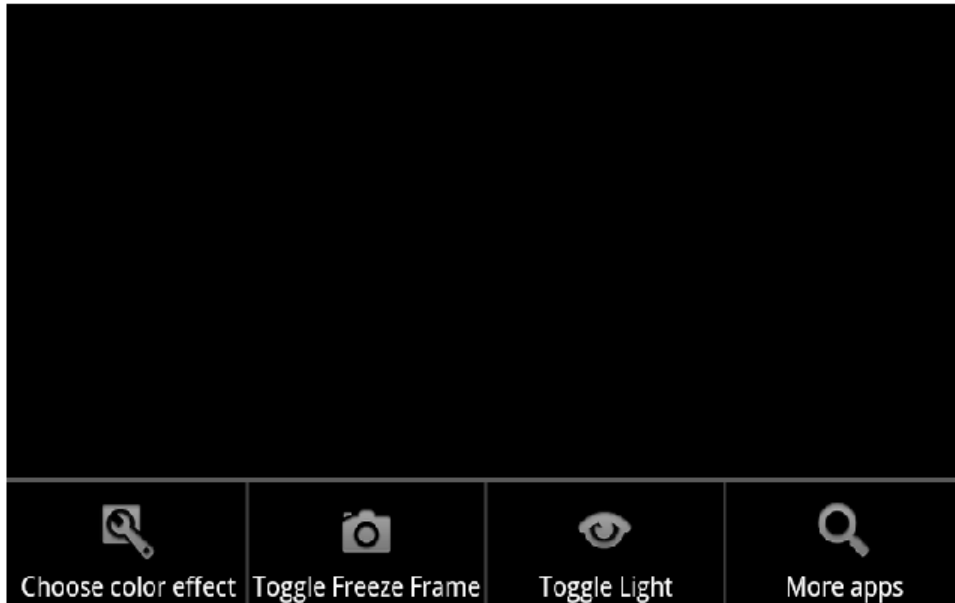


Image 66 A sample screen menu of IDEAL Magnifier

Dolphin (Web Browser)

Dolphin is an interactive and customizable app that enables users to browse the Internet faster. Users can set the sharing feature to share the web page with peers and customize the home page the way suitable to the users' needs.

<https://play.google.com/store/apps/details?id=mobi.mgeek.TunnyBrowser&hl=en>

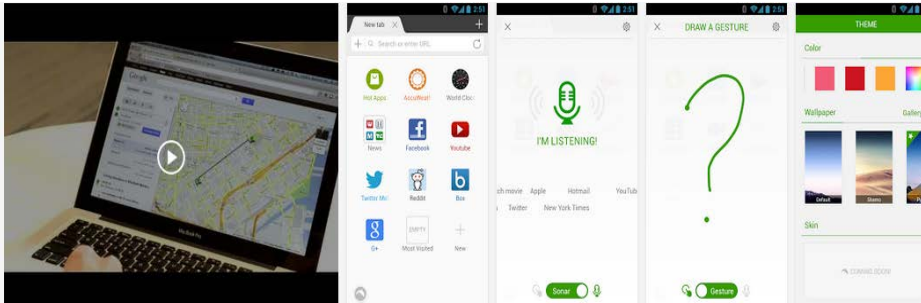


Image 67 Dolphin uses TTS that helps browsing more interactive

K-9 Mail® (Apps for Dog Walkers)

Users can receive and send e-mail messages and perform other functions such as attaching signatures and more. The app works like a yahoo mail that enables folder sync, bcc and transfer of mail to memory card.

More: <http://tinyurl.com/apps4android-k9-1>

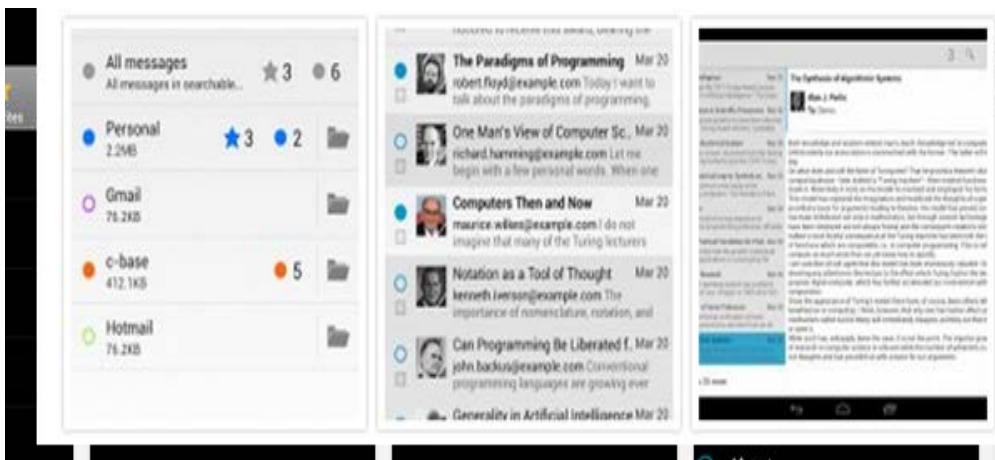


Image 68 K-9 showing email screen

Rock Lock

Individuals can listen to the radio even when the smart phone is locked. Users can still access their favorite music and radio station that can reduce their stress.

More: <http://tinyurl.com/apps4android-rl-1>

Pdf to Speech Pro

PDF to Speech Pro reads aloud PDF documents anywhere and anytime. Users can read eBooks, documents, research papers and proofread them while on the go. The app features a text to speech options that assists individuals with visual impairment.

<https://play.google.com/store/apps/details?id=com.practicalapps&hl=en>

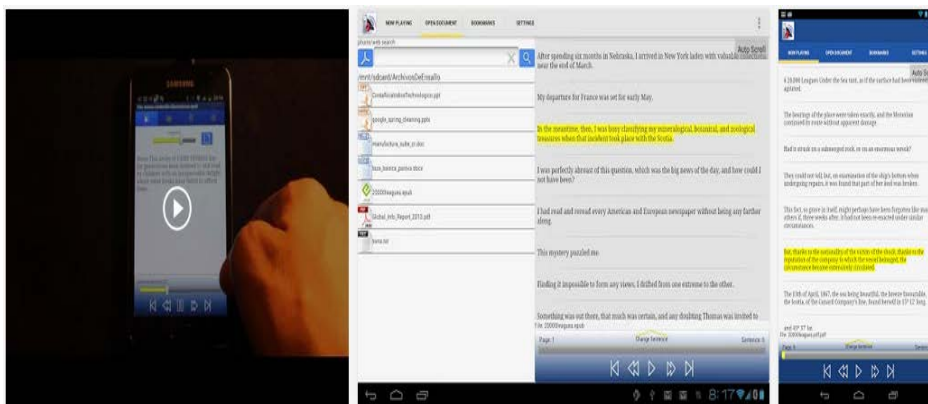


Image 69 Pdf to Speech Pro reading the document

Talking Dialer

Users can dial the phone the numbers of contacts in an eyes-free environment. Accessing the contacts is easy by sliding the finger to the desired contact numbers.

<https://play.google.com/store/apps/details?id=com.google.marvin.talkingdialer&hl=en>

Speak 2 Call

Speak 2 Call is voice enabled. Users need to have a quiet area when doing voice recognition so that the device can identify the proper contact. Training the voice and customizing the setting is simple.

<https://play.google.com/store/apps/details?id=com.jerby.speak2call&hl=en>

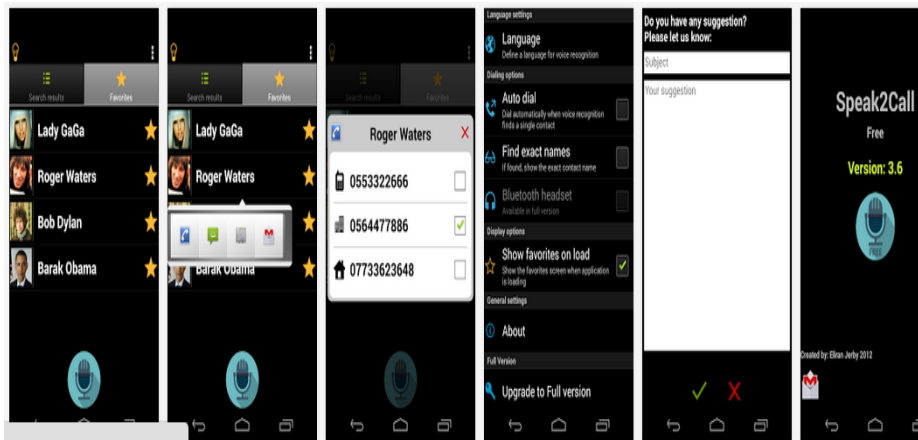


Image 70 Users can call one of the contacts using their voice

Walky Talky

Walky Talky updates the user of the current location and provides the current location of the friend provided with address. The app interfaces with other GPS enabled software such as Maps.

More: <http://tinyurl.com/apps4android-wt-1>

Intersection Explorer

The app includes text to speech option that speaks the streets by touching the map. Navigating the community using this app is beneficial to individual's visual impairment.

More: <http://tinyurl.com/apps4android-ie-1>

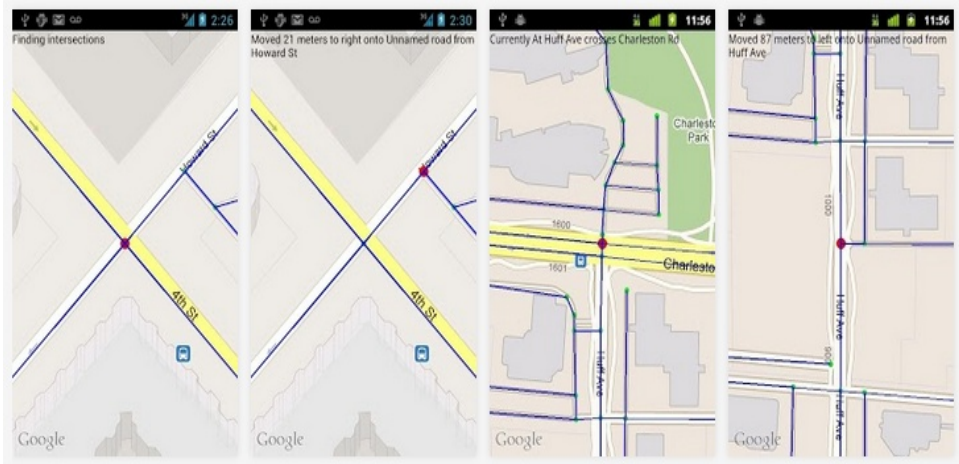


Image 71 Sample community map

DropBox



DropBox is a free cloud service that allows users to store files and share the files with other users as well and with other devices: computers, tablets and mobile phones.

<https://play.google.com/store/apps/details?id=com.dropbox.android&hl=en>



How to use DropBox

1. Sign up
2. Users can store and share files with others with login info

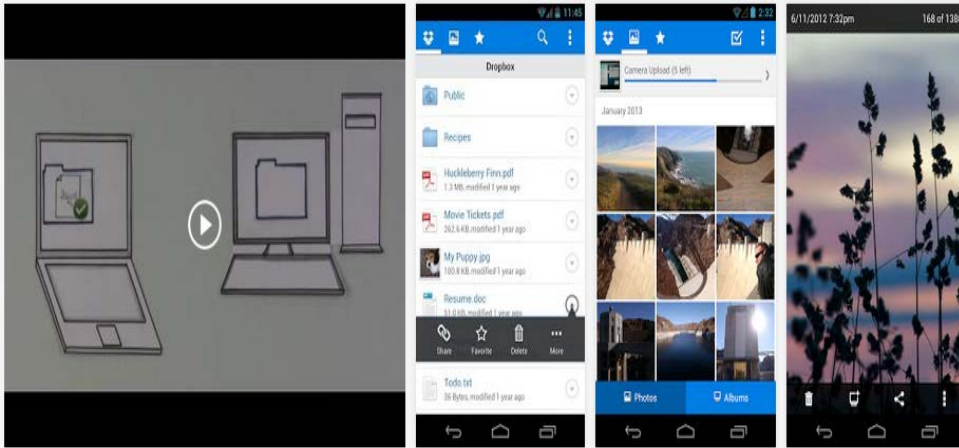


Image 72 Drop Box showing sharing of files and photos with other devices

Evernote

Users can take notes, organize and share notes with others. Text can also be read aloud with text to speech option.

<https://play.google.com/store/apps/details?id=com.evernote&hl=en>



Image 73 A short video showing the features of Evernote

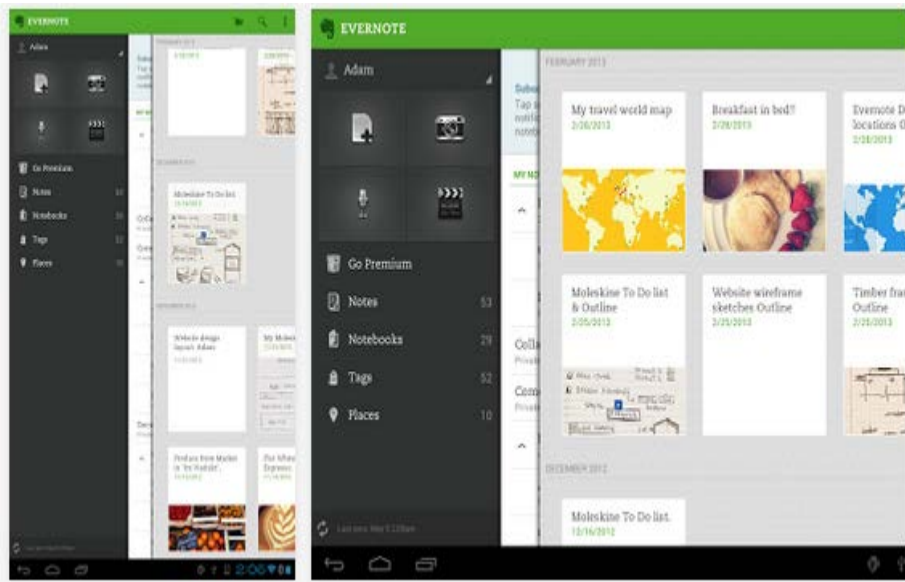


Image 74 Evernote captures photos and share the photos with peers

Talking Places

With Talking Places app users can get important information about their current location such as transportation and other details about the environment. The app uses text to speech option that speaks the current street and works with Google Maps and Open Street Map.

<https://play.google.com/store/apps/details?id=cz.papezzde.talkingplaces>



How to use Talking Places

1. Install the app
2. Tap the desired information such as Transportation



Image 75 Talking Places showing the current location

Hearing Impairment Accessibility Features

Mono Audio

Users can enable Mono Audio that helps adjusting the sounds in the left or right ear channels. For example when users hear better on left channel they can customize the channel suitable to their needs. Users would need to attach a headset.

How to set up Mono Audio

1. Tap the menu button
2. Tap Settings
3. Tap Accessibility
4. Scroll down to Mono audio
5. Tap Mono audio to enable

Text Messaging

Users can send and receive text from other individuals or vice versa. Also, users can copy and paste text messages to another date.



How to use Text Messaging

1. Touch the Text Message icon
2. Select the name from the contact or type the number
3. Start typing the message in the message box

Closed Captioning

With closed captioning enabled users can view the text on the bottom of the touch screen while the video is going on. Closed captioning program come hand in hand with the video that the users are viewing. For example if the user is viewing Media Player users would need to install a program appropriate for the Media Player.

How to set up closed caption

1. Users would need to purchase additional program

KickBack

KickBack provides a haptic vibrating response when the user performs an action on the phone such as receiving an email alert. Haptic is providing a feedback such as vibrating alert to the user to alert the user of certain events.



How to use KickBack

1. Go to Settings
2. Select Accessibility
3. Enable Accessibility checkbox
4. Enable KickBack checkboxes

Notifications

With Notifications on users can customize the Notification bar to avoid missing appointments and events that require prompt attention.

How to set up Notifications bar

1. Touch Settings
2. Sounds
3. Device Ringtone
4. Choose the desired ringtone

Applications

HandcentSMS/MMS



Full capability SMS that enables users to access composition, texting and security tools when sending messages.

https://play.google.com/store/apps/details?id=com.handcent.nextsms&feature=search_result

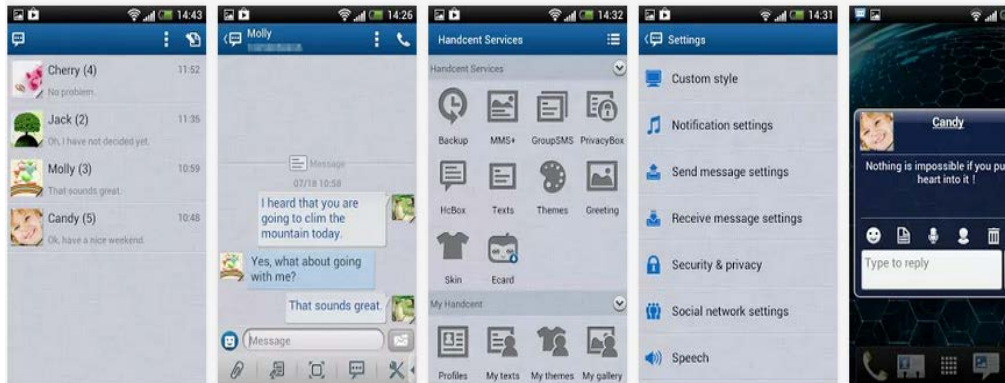


Image 76 A sample screen shot of HandcentSMS/MMS features

Purple VRS



With Purple VRS users can make phone and video calls. Also, users can view call history and fast loading and searching of contacts.

https://play.google.com/store/apps/details?id=us.purple.purplevrs&feature=search_result



Image 77 Purple Communication showing American Sign Language

Google Voice



Google Voice is a fully functional app that allows voice and group video calling. Also the app enables users to make international call rates may apply.

https://play.google.com/store/apps/details?id=com.google.android.apps.googlevoice&feature=search_result

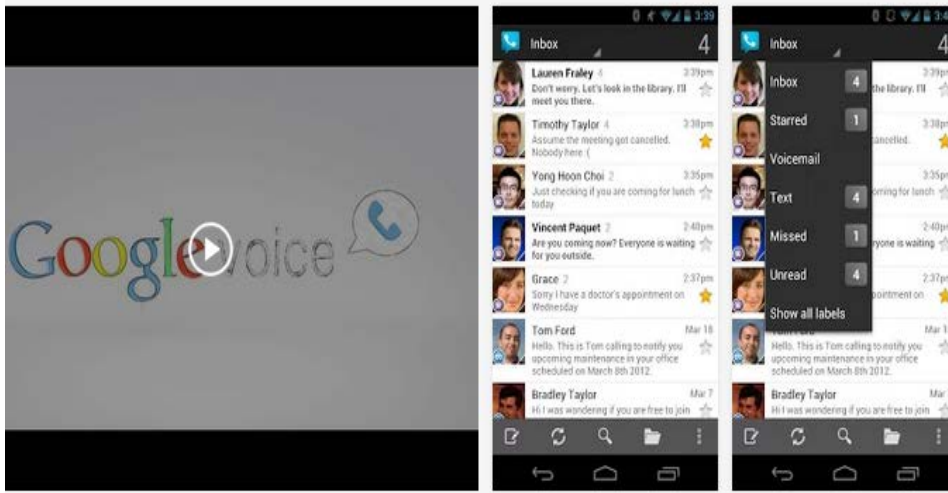


Image 78 Google Voice Contact page

American Sign Language (ASL)

The American Sign Language app enables users to communicate with other individuals by using the appropriate signs.

<https://play.google.com/store/apps/details?id=com.teachersparadise.aslamericansignlanguage&hl=en>



How to use ASL

1. Install the app
2. Select the appropriate icon for the message

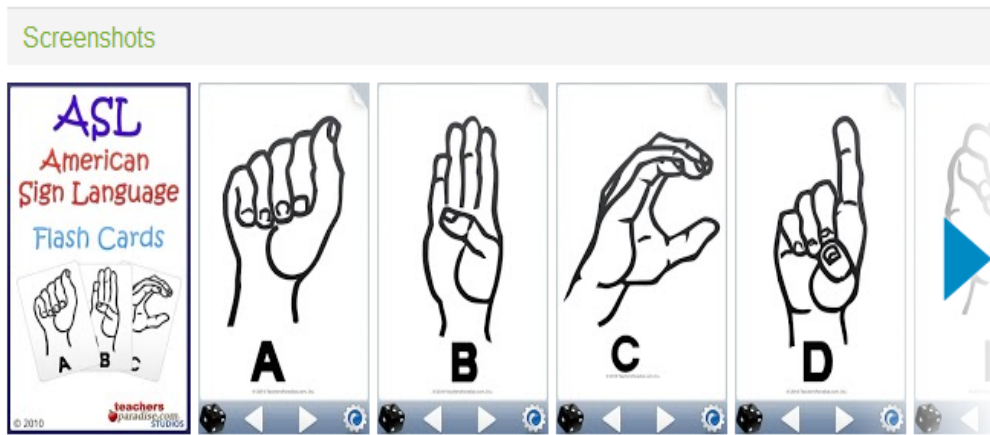


Image 79 Flash cards of American Sign Language

Skype

Skype and Google enable users to do video chat and call/group call. With Skype users can call anyone with Skype name anywhere in the globe. Users will need to create Skype login information.

http://www.downloadinfo.co/review/skype/?kw=skype&subid=DISKUS_S&cust=skype&type=skype&gclid=CL_m1J-wuroCFQZyQgodjlsARg&utm_campaign=DISKUS_S&fwd=1&rnd=9154f6b4b39dc6be5072c4370c9d5ed536ba1fc8&ts=1382992303



Image 80 Skype calling one of the contacts

ClearCaption

The Clear Caption is a closed caption app that enables users to read the other person message. For example the ClearCaptions app enables users to exchange communication with other individuals by reading the caption located at the bottom of the screen.

<https://play.google.com/store/apps/details?id=us.purple.cc&hl=en>

How to use Clear Caption

1. Users can purchase apps such as Clear Caption



Image 81 **ClearCaption screen menu**

Physical and Mobility Impairment Accessibility Features

Voice Search



Users can speak into the microphone and issue a request or ask a question. The app enhances performance by using the voice instead of using fingers. Users can copy, paste, text and email the information to peers, family and friends.

How to use Voice Search

1. Tap Voice Search
2. Speak into the microphone

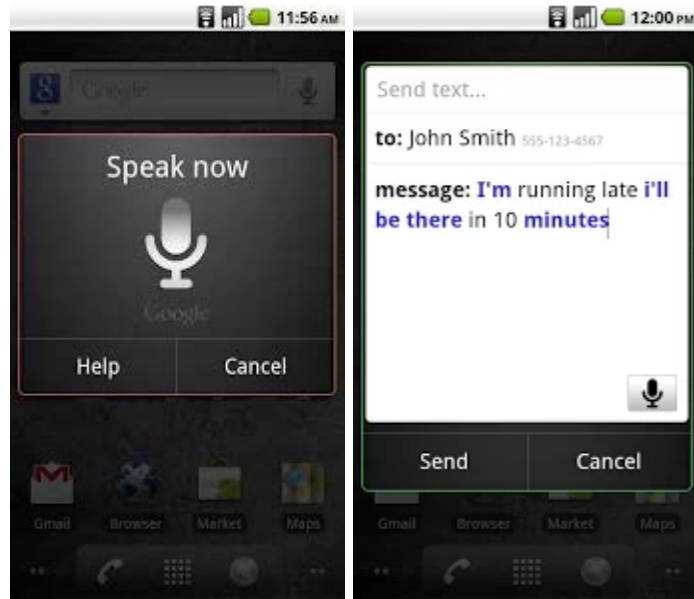


Image 82 Voice Search waiting for request

Dial Pad



With Dial Pad enabled users can get help by completing the names and numbers of the contact. For instance if they want to call John Doe as one of the contacts, a list of possible contacts that match the name will be suggested.



How to use Dial Pad

1. Settings
2. Turn on Dial Pad Auto Complete option
3. Type the desired phone number.

Play Books



Play Books is a built in program that reads eBooks aloud by using text to speech option (TTS).



How to set up Play Books

1. Tap Play Books
2. Select the eBooks desired



Image 83 Google Nexus Tablet showing an eBook

Applications

Start Talking



With Start Talking, users can text free hands. With the Text to speech options users can speak their message into the microphone and be able to send the message.

<http://www.starttalking.com/>

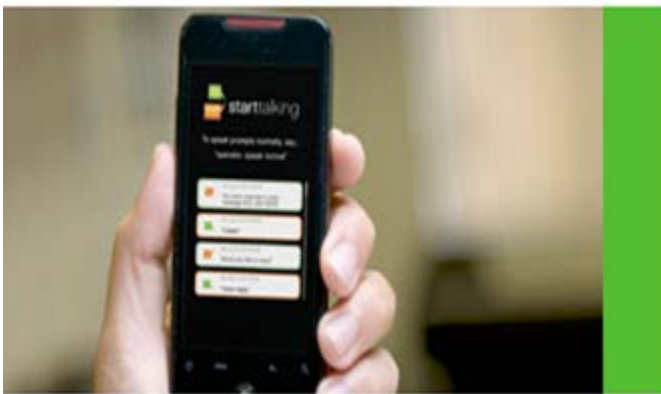


Image 84 A screen menu of Start Talking

Swiftkey 4.0

The app allows users to be able to remember the set of text and keystrokes the user often times used.

<http://www.techradar.com/us/news/phone-and-communications/mobile-phones/70-best-free-android-apps-2013-687252>

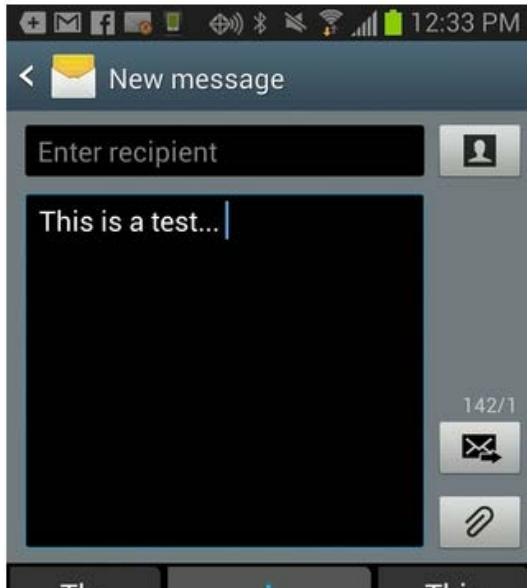


Image 85 **Swiftkey text message**

Hands Free



The app answers phone calls hands free. For example users can hear the person talking even without touching any button, automatically answers the call.

<https://play.google.com/store/apps/details?id=com.grichenko.android.handsfree&hl=en>

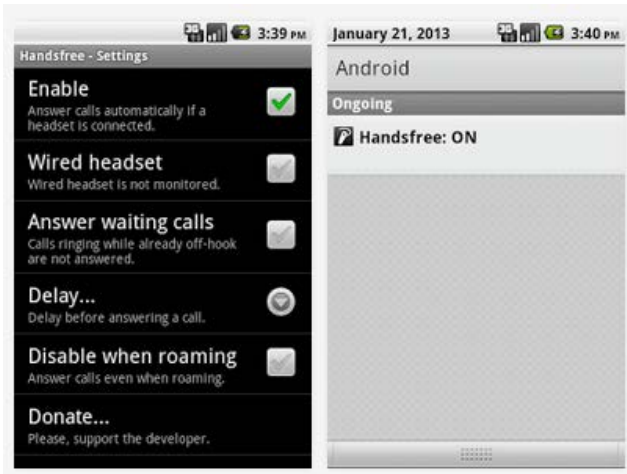


Image 86 Hands free settings menu

Google Now

With the help of Google Now users can manage the activities during the day such as appointments, travel itineraries and how to go around the community.

<https://play.google.com/store/apps/details?hl=en&id=com.google.android.googlequicksearchbox>



How to use Google Now

1. Install the app
2. Users can type or speak the question into the microphone.

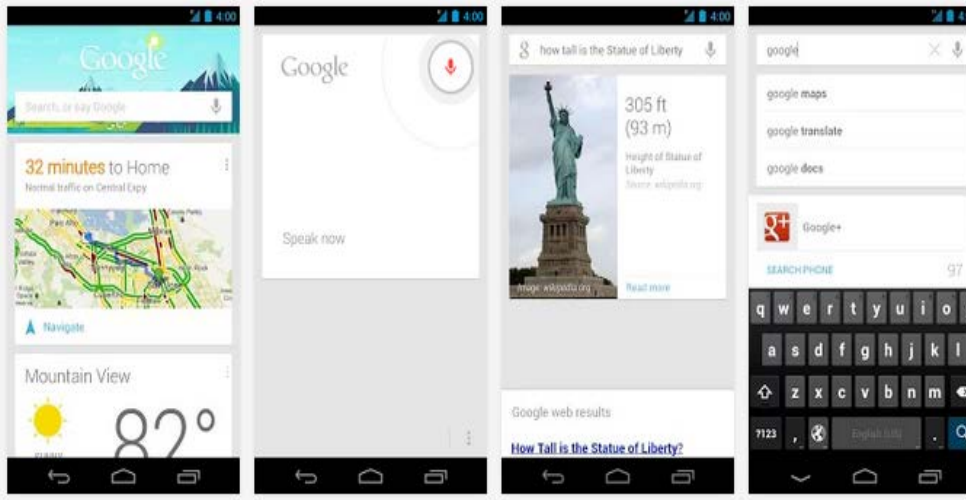


Image 87 Google Now helps keep track of daily activities organized

Learning Disability Accessibility Features

Dial Pad

With Dial Pad enabled users can get help by completing the names and numbers of the contact. For instance if they want to call John Doe as one of the contacts, a list of possible contacts that match the name will be suggested.



How to use Dial Pad

1. Settings
2. Turn on Dial Pad Auto Complete option
3. Type the desired phone number

Clock



With the clock enabled users can schedule alarms for school, work, and wake up time, stop watch and track the time in other parts of the globe. Setting the reminders for daily activities helps the user stay on schedule and eliminates the missed appointments.



How to use Clock

1. Tap the clock icon
2. Set the desired time of an event such as dates, recurrent time and ringtones

Play Books



How to use Play Books

1. Tap Play Books
2. Select the eBooks desired



Image 88 Google Nexus Tablet showing an eBook

VoiceRecorder



Users can record the lecture of the teacher, record their voice and share the message to peers. Recording the lectures allows the user to listen and replay the important lectures eliminating the need of writing.



How to use VoiceRecorder

1. Touch the Voice Recorder icon
2. Touch Record button

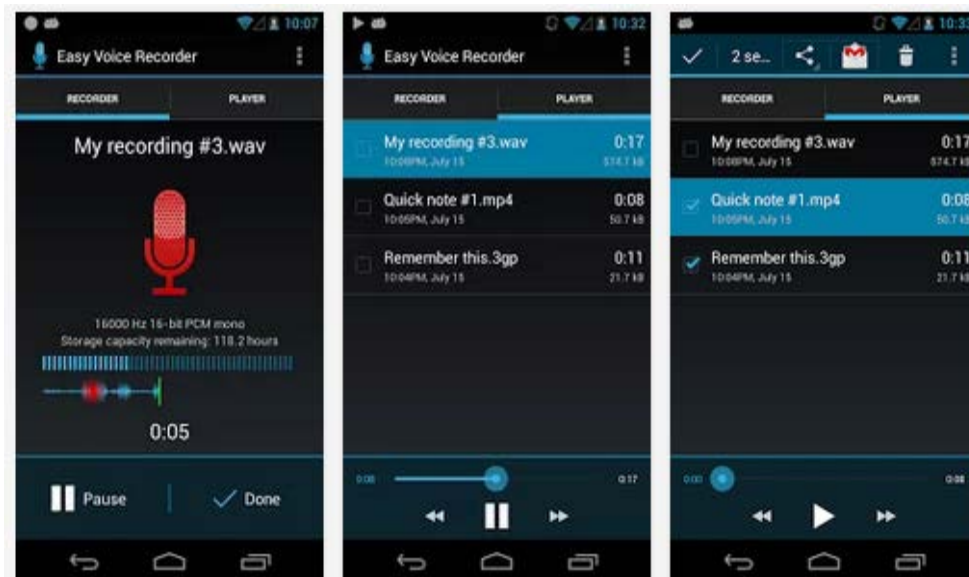


Image 89

Voice Recorder recording audio file and list the files in order

Notification

Notifications is a built-in program that enables users to receive alert when a user receive a new email, new text or low battery warning and chat messages. Notification includes time stamp and the senders name and allows user to react on situations that require quick attention.

**How to set up Notifications**

1. Settings
2. Notification is a built in program and customizing the notifications is helpful to avoid unnecessary notifications.

Calendar

With Calendar busy schedules can stay organize and helps keep track of upcoming events. Users can alleviate the stress of missing appointments and important dates. Users can also sync the calendar to their desktop and cloud for easy access.

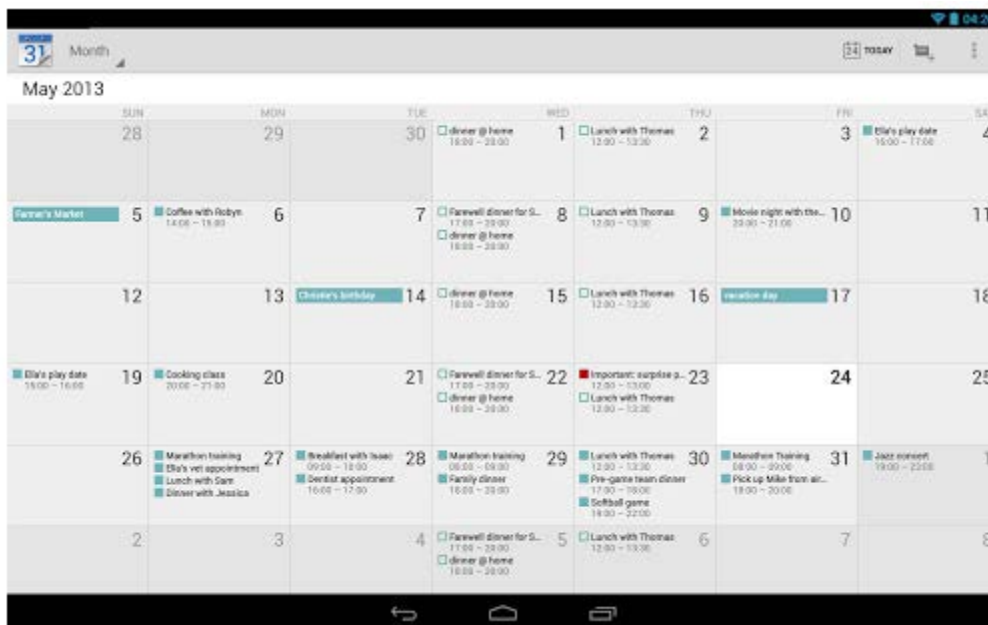


Image 90 **Setting up calendar helps keep track of appointments**

Google Now

With the help of Google Now users can manage the activities during the day such as appointments, travel itineraries, weather conditions, sports news and more.



How to use Google Now

1. Install the app
2. Users can type or speak the question into the microphone

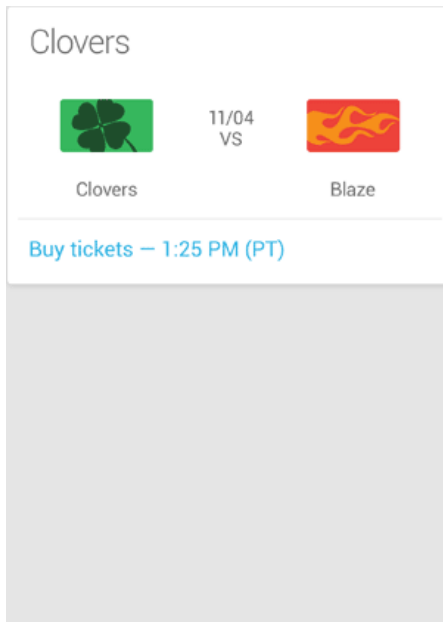


Image 91 Google Now provides sports information

Camera



Users can use the camera in variety of ways such as attaching photo/video in a project, creating a scrapbook, taking photos for college newspaper and many other activities. Using a camera develops creativity and improves skills.

Applications

Alarm Clock Ultra

Allows users to set alarm for different purposes such alarm for school, repeat time and stop watch and alarm clock for different activities.

<http://www.alarmclockultra.com/>



How to use Alarm Clock Ultra

1. Install the app
2. Set the desired alarm



Image 92 Alarm Clock Ultra has multiple uses: timer, stop watch and alarm clock

Google Translate

Users can translate English words into other language such as German, French, Spanish and other language. With Google Translate multicultural individuals will improve on vocabulary skills.

<http://translate.google.com/>



Image 93 Google Translate ready to translate the word into another language

OfficeSuite7

Users can create word document, spread sheet, presentation and also reads PDF files. Also OfficeSuite7 allows sharing of files and sync the file in Google cloud.

[https://play.google.com/store/apps/details?id=com.mobisystems.editor.office_registered
&hl=en](https://play.google.com/store/apps/details?id=com.mobisystems.editor.office_registered&hl=en)



How to use OfficeSuite7

1. Install the app
2. Tap the OfficeSuite7
3. Create the desired document

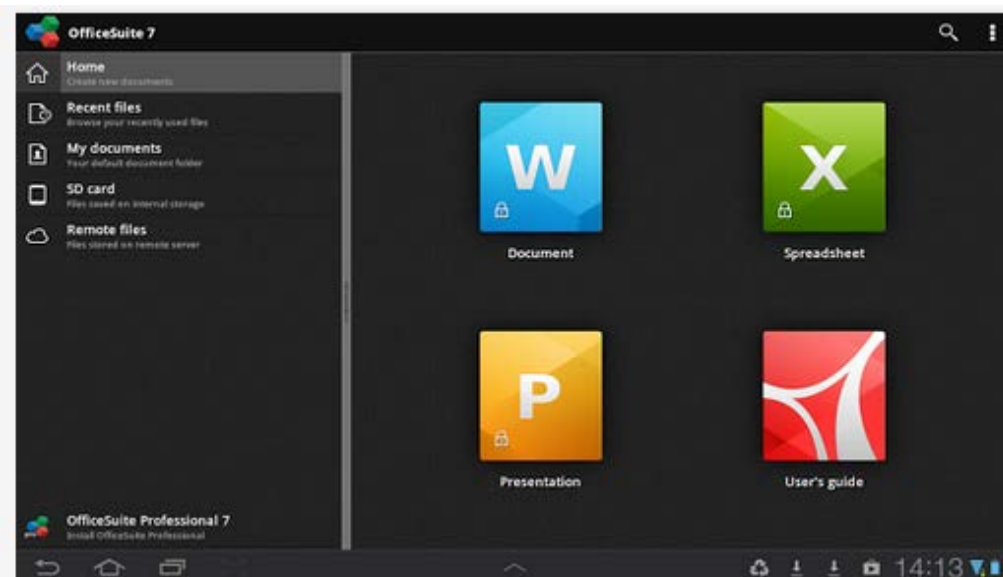


Image 94 OfficeSuite7 menu and file storage settings

My Script Calculator

Users can handwrite the equation and obtain digital results. Writing of formula can be easily converted to a digital form and calculated in real time. The simplicity of app improves the skills of users struggling with mathematics.

<https://play.google.com/store/apps/details?id=com.visionobjects.calculator&hl=en>

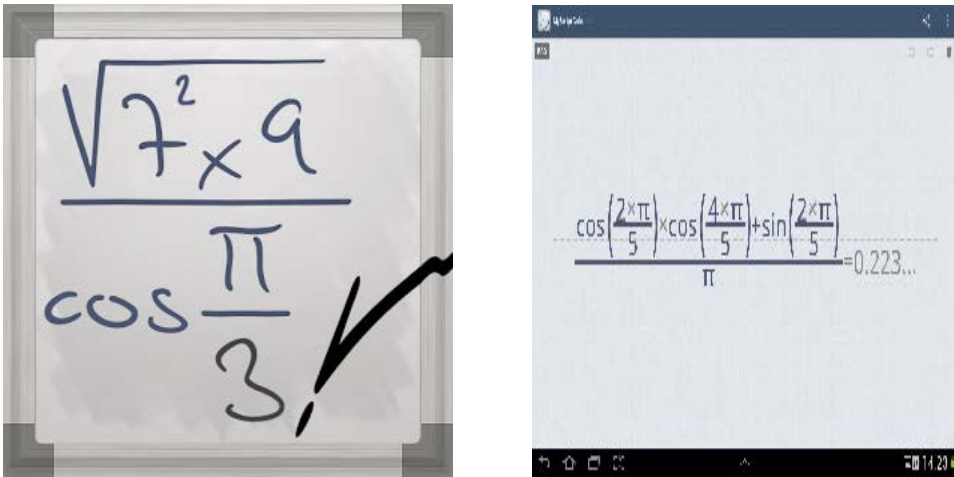


Image 95 My Scrip Calculator showing handwritten formula

Free Zone – Free WIFI Scanner

Users can connect to Hotspots that allows users to browse the Internet. Users can access Internet sites by having WIFI capability without having a data connection. For instance a student can have access to the school Internet, a café and fast food sites.

<https://play.google.com/store/apps/details?id=net.alouw.alouwCheckin&hl=en>

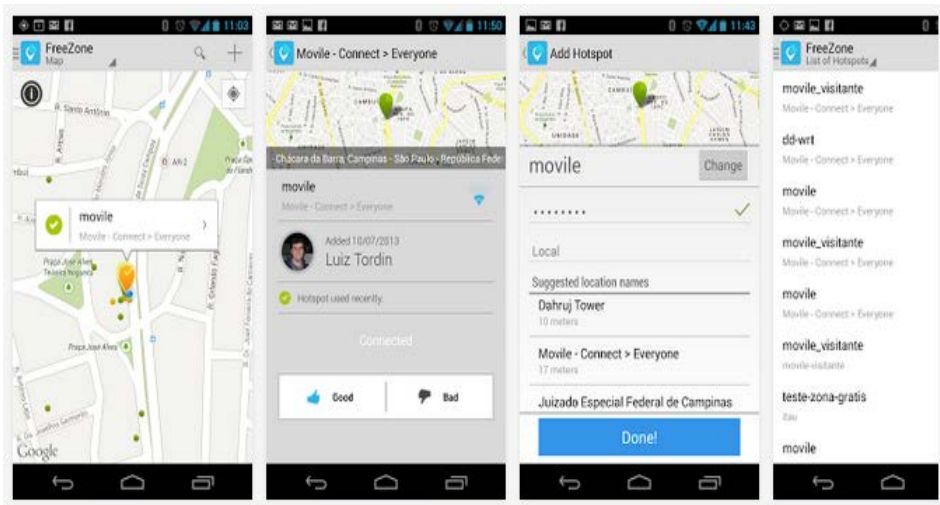


Image 96 Sample hot spots scanner



Users can access helpful videos about android mobile devices that can enhance and improve performance of activities of daily living. Users can watch video tutorials about Android mobile devices such as accessibility features of android mobile devices, <http://www.youtube.com/watch?v=hYCEUNHZjF8>.

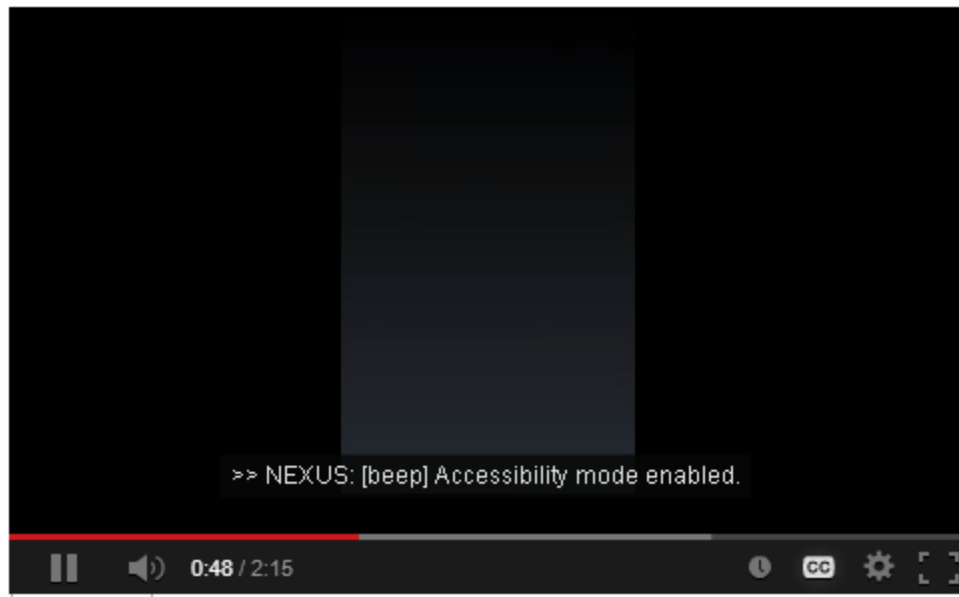


Image 97 **A video about Turning on Accessibility features on Google Nexus Tablet**

Speech Impairment Accessibility Features

Text Messaging

Users can send and receive text from other individuals or vice versa. Also, users can copy and paste text messages to another date.



How to use Text Messaging

1. Touch the Text Message icon
2. Select the name from the contact or type the number
3. Start typing the message in the message box

TalkBack (Text to Speech - TTS)



Students can hear the labels read aloud by enabling TalkBack. Also users can activate items and navigate the screen by gestures.



How to set up TalkBack

1. Settings
2. Select Accessibility
3. Enable Accessibility checkbox
4. Enable TalkBack checkboxes

Play Books



Play Books is a built in program that reads eBooks aloud by using text to speech option (TTS). With Play Books users can access a huge selection of eBooks anywhere and anytime.

How to use Play Books

1. Touch Play Books
2. Choose the eBook to read



Users can download eBooks free or purchase

Explore by Touch

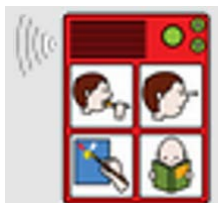
A program that works hand in hand with TalkBack enables users to touch the phone's screen and hear what's under the finger such as reading the menu or speaking the keystroke.



Image 98 **Explore By Touch setting**

Applications

AAC Speech Communicator



AAC Speech Communicator allows communication between non-verbal and verbal individuals. By pressing the corresponding picture that depicts the message the person can understand the response of the other person. Other options text to speech, pictures that can be easily customized and sync with other devices: tablets and mobile devices.

https://play.google.com/store/apps/details?id=com.epfl.android.aac_speech



Image 99 Pictures used for communication with non-verbal individuals impairment

AAC Talking Tabs



Simple and customizable pictures that allows building of sentences.

<https://play.google.com/store/apps/details?id=it.ac19.aac&hl=en>

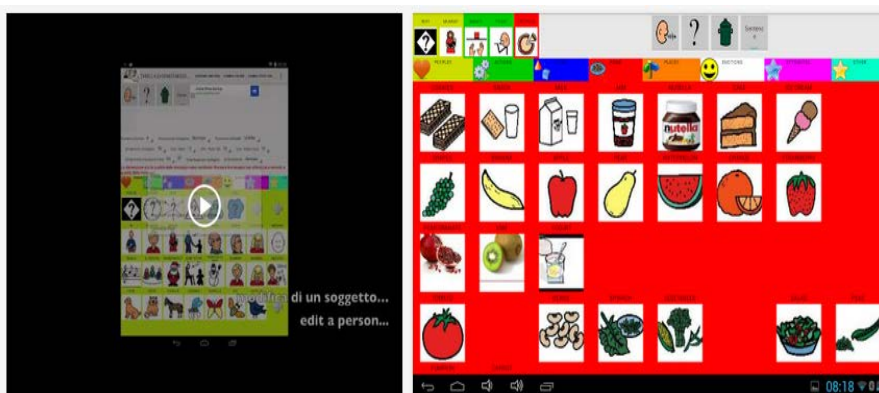


Image 100 Pictures used for exchanging communication

Speech Assistant AAC



The app enhances individuals with speech impairment to express their thoughts by using the pictures, words and letters.

<https://play.google.com/store/apps/details?id=nl.asoft.speechassistant>

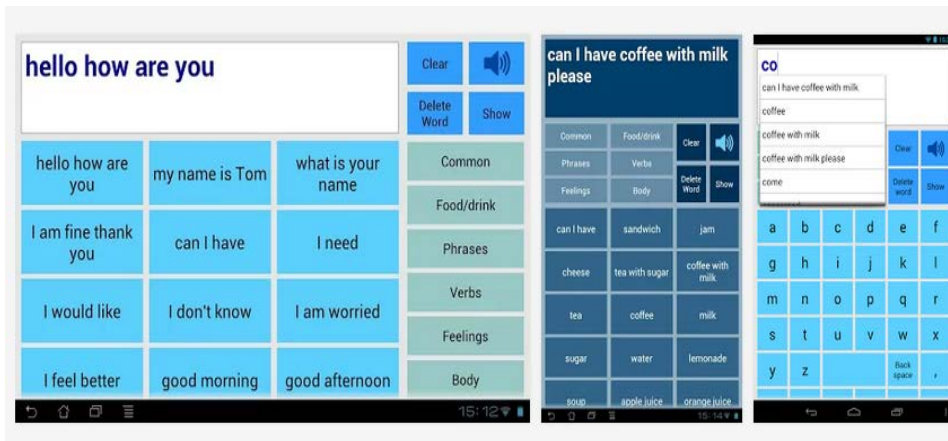


Image 101 Screen layout of Speech Assistant AAC

American Sign Language (ASL) Translator

Users can use ASL to convey the message to verbal and non verbal individuals using the appropriate ASL.

<https://play.google.com/store/apps/details?id=com.asltranslator&hl=en>



How to use ASL

1. Install the app
2. Touch the sign that matches the message

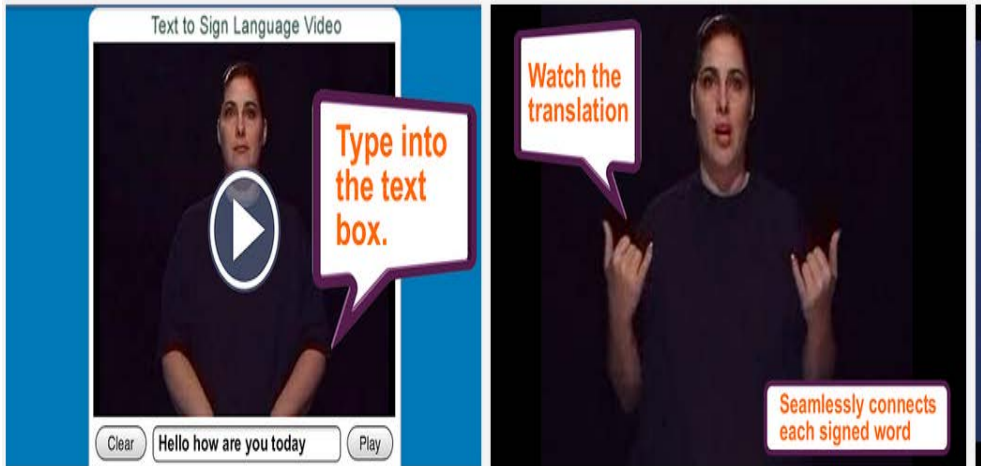


Image 102 ASL Translator



Featured Links:

| DESCRIPTIONS | LINKS |
|---|---|
| Android phones Tutorial (Part 1) | http://www.youtube.com/watch?v=tp3fc6cM9Nc |
| Android phones Tutorial (Part 2) | http://www.youtube.com/watch?v=87YBLGG0nc4 |
| How to Copy and Paste using Android phones | http://www.youtube.com/watch?v=suMpg3OJYkQ |
| How to set up Google Now | http://www.youtube.com/watch?v=TPw4ZJGy4xk |

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