Healthcare Educators

Mobile Learning in Health Care: Present Possibilities and Future Trends

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CEO, i5 Research
Agenda

1. Understand the definition, scope, benefits and challenges of mobile learning
2. Articulate the differences between presentation of training and performance support using mobile devices
3. Review case studies where mobile learning has been successfully used in health care
4. Describe some of the exciting possibilities of the future of mobile learning in health care
5. Connect the affordances of mobile learning with the needs of their own health care organization
1. Understanding the definition, scope, benefits and challenges of mobile learning
Mobile learning is . . . “the intersection of mobile computing and eLearning: accessible resources wherever you are, strong search capabilities, rich interaction, powerful support for effective learning, and performance-based assessment . . . e-learning independent of location, time and space.” (Quinn, 2000)
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“Mobile learning is the process of a person learning on the move, while remaining connected to cloud-based information sources and communications facilities.” (Woodill, 2010)
Mobile Devices
An **affordance** is a quality or feature of an object, or an environment, which allows an individual to perform an action.
Affordances

How are the affordances of mobile learning technologies different from those of the classroom or self-paced e-learning?
3 Learning Technologies

Physical/Virtual Classroom

• Teacher control
• Learner is immobile
• Learner is NOT in context
• Information is presented
• Books main external source of information
• Assessed with exams, homework, observation
3 Learning Technologies

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Self-Paced eLearning

- Software control
- Learner is immobile
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- Information is interactive
- TV, computers, monitors main external source of information
- Assessed with quizzes, games, tracking of results

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3 Learning Technologies

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**mLearning**
- Learner control
- Learner is mobile
- Learner is usually in context
- Information is pulled
- Social networking on mobile phones, tablets main external source of information
- Assessed with quizzes, games, behavior tracking, location, sensors, portfolios
- New affordances of mobile

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### Some Affordances of Current Mobile Devices

- Camera
- Document viewer
- Geolocation
- Internal sensors
- Media viewer / playback
- Microphone
- Notifications
- Search / Browse Internet
- Short-range communication
- Messaging
- Touchscreen interaction
- Voice / phone communications

- Portability/Mobility
- Ubiquity
- Clock
- Networking/ Addressability
- Cloud storage
- Microprojection
- External Sensors
- Input/Output Peripherals
- Supplemental Memory
- Computing Functions/Apps
- Wearability
- Embodiment

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How can we use these affordances to design learning and development?

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Learning Design has become more complex

**Objectives + Technologies + Activities = Learning Design**

<table>
<thead>
<tr>
<th><strong>Learning Objectives</strong></th>
<th><strong>Learning Technologies</strong></th>
<th><strong>Learning Activities</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Memorization of specific content</td>
<td>Classroom, PowerPoint</td>
<td>Drill and Practice</td>
</tr>
<tr>
<td>Perform a skilled operation</td>
<td>eLearning simulation</td>
<td>Watch a model, imitate, practice</td>
</tr>
<tr>
<td>Feel empathy for others</td>
<td>Video of person in tragedy</td>
<td>Watch video, discuss in group</td>
</tr>
<tr>
<td>Discover results of mixing chemicals</td>
<td>Laboratory</td>
<td>Mix 2 chemicals with guidance</td>
</tr>
<tr>
<td>Learn to interact in an online group</td>
<td>Web conferencing</td>
<td>Take part in an online discussion</td>
</tr>
<tr>
<td>Create a work of electronic art</td>
<td>Tablet, art software</td>
<td>Produce art on tablet</td>
</tr>
<tr>
<td>Solve a problem with information</td>
<td>Google, smartphone</td>
<td>Search for information</td>
</tr>
</tbody>
</table>
The Mobile Learning Ecosystem

Possible Elements of a Mobile Learning Ecosystem

- **Devices**
  - Smartphones
  - Personal Digital Assistants
  - Digital Cameras
  - Optical Tag Readers
  - Tablet Computers
  - Rfid Devices
  - GPS
  - Internet Radio
  - Multi-touch Screens
  - Gesture Recognition
  - Digital Ink Paper
  - Instruments and Sensors
  - Retinal Projections
  - Accelerometers
  - Location Sensing Devices
- **Content**
  - Messages - SMS
  - Interactive Messaging
  - Voice-based Content
  - Rich Media
  - Assessments
  - Reference Materials
  - Courseware
  - Interactive Media
  - Information Sources
  - Symbian
  - BlackBerry
  - iPhone
  - Linux
- **Platforms**
  - Windows Mobile
  - Palm
  - Google Android
  - Java J2ME
  - .NET/C#
  - C++ or JavaVM
  - Java
  - Objective-C
  - WML
  - WebOS
  - Adobe Flash for Mobiles
  - VoicexML
  - CTAD
  - Cord slate
  - Captivate
  - Geckos
- **Tools**
  - Dreamweaver
  - Articulate
  - Chalk Fastcast
  - Acrobat
  - HTML
  - Kaltura
  - Hot Text
  - Impression
  - PowerPoint
- **Concepts**
  - Augmented Reality
  - Individual Attribute
  - Near Field Communications
  - The Internet of Things

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### Scope

#### Information Retrieval
- Just-in-time information
- Customer education
- Digital media consumption
- Alerts for new information
- Mobile Content Libraries
- Location-based applications
- Unstructured data mining
- Augmented reality
- Results of algorithms

#### Communicating, Interacting & Networking
- Collaborative Learning
- Games, Simulations & Virtual Worlds
- Mentoring & Performance Support
- Text messaging
- Personal Media Production
- Social Media and Networking
- Haptics and Gesture Recognition
- Continuous speech recognition
- Interaction with machine intelligence (robots)

#### Information Gathering
- Assessment and Evaluation
- First-person documentation
- Monitoring and Trend Tracking
- Research and Data Collection
- User-Generated Information
- Behaviour tracking
- Sensor networks

#### Managing Learning with Mobile Devices
- Classroom Uses – presentations
- Emergency and Health-Care Uses
- Knowledge/Content Management Systems
- Learning Management Systems
- Mobile Team Management
- Personal Organizers
- Test and Assessment Tracking

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Mobility is just one attribute/ affordance of the emerging world of digital learning...
The CHAMPIONS Framework

C - Contextual
H - High-speed
A - Ambient
M - Mobile
P - Personal
I - Interactive
O - Open
N - Networked
S - Social

} Learning

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Challenges

“We look at the present through a rear-view mirror. We march backwards into the future.”

- Marshall McLuhan
Example: Information Presentation

Add to Favourites
Technical Challenges

• Connectivity and battery life
• Screen size and key size
• Bandwidth for fast streaming
• Multiple standards, screen sizes, operating systems, and carriers
• Converting e-Learning materials to mobile
• Limited memory
• Risk of sudden obsolescence
• Security
• Data tracking by third parties
Social Challenges

- Accessibility and cost barriers for end users
- Assessment and evaluation of learning
- Supporting learning across many contexts
- Privacy
- Distraction and “continuous partial attention”
- No developed theory of learning for the mobile age
- Complexity of digital learning
2. Different types of mobile learning content
12 Types of mobile learning content

1. One-way text-based messages
2. Multi-directional text and data messages
3. Voice-based content and/or responses
4. Presentation materials
5. Just-in-time information to be searched and retrieved
6. Rich media
7. Interactive and immersive media
8. Collective/collaborative communications
9. Computation of algorithms
10. Sensory data
11. Contextual interactions
12. User generated content
3. Use cases of mobile learning in healthcare
Use Case 1 – Medical/Healthcare Education

The nervous system is small, yet it is perhaps the most complex of all the body’s systems. Its function is to detect and integrate a complex array of sensory information and then respond to this information by sending signals that control both movement and the release of chemical messengers, such as neurotransmitters and hormones, throughout the body. The nervous system is also responsible for the higher mental faculties, such as thought, behavior, and memory.

This learning program begins with an introduction to the cells of the nervous system. You will then learn about the main components of neurons and about the classification of neurons and neuroglia. You will also learn about the major structures and components of the central nervous system (CNS) and the peripheral nervous system (PNS).

Progress checks throughout the program will help reinforce key concepts. A final assessment at the end of the program will evaluate your ability to meet the learning objectives.

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Use Case 1 – Medical/Healthcare Education
Use Case 1 – Medical/Healthcare Education

https://www.youtube.com/watch?v=Vycvec8TI7I

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Use Case 1 – Medical/Healthcare Education
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http://www.youtube.com/watch?v=SM-ESDxArlI

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Use Case 2 – Performance Support

“Learning at the point of need”
Use Case 2 – Performance Support

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Use Case 2 – Performance Support

Text BABY to 511411

Regular checkups help keep baby healthy!
Take baby for her next checkup when she's 4 months old. For free or low-cost care, call 877-543-7669.

Get support throughout your pregnancy and baby's first year. You'll get FREE messages each week on topics like prenatal care, labor signs and symptoms, nutrition, breastfeeding, safety, baby's development, and more.

Click to Sign Up
Learn More

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Use Case 2 – Performance Support

Text message surgery saves teenager's life

onto chest wall
immed anterior and
divide Pec maj
origin from
remaining clav.
Divide pec minor
insertion and (very
imp) divide origin

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Use Case 3 – Patient Education

Discharge Instructions for Patients with a Permanent Pacemaker
Use Case 3 – Patient Education
Use Case 3 – Patient Education

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Use Case 3 – Patient Education

InstantMe – mobile version of PatientsLikeMe network
Use case 4 – Public health and education

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Use case 4 – Public health and education

https://eatery.massivehealth.com/

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Use case 4 – Public health and education

Bird Flu – Imminent or Preventable?
Use Case 5 – Trend Tracking

**HealthMap**

Global Health, Local Knowledge

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“Outbreaks Near Me”
Use Case 5 – Trend Tracking

Improved Response to Disasters and Outbreaks by Tracking Population Movements with Mobile Phone Network Data: A Post-Earthquake Geospatial Study in Haiti

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Abstract

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Use Case 5 – Trend Tracking

Estimated population movements between settlements (red points, major settlements labeled). The map shows the total predicted number of trips lasting up to one week over the course of a year using a gravity model built on mobile phone call data (in this case using data from Kenya, though data from Senegal and Cote d’Ivoire produces almost identical models). In Nigeria, black lines are shown to represent where more than 30,000 trips between settlements (farther than 20km apart) are estimated. For the remaining countries, a blue line is shown if more than 10,000 trips between locations over 20km apart are estimated.

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Use case 6 – Self-tracking

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Use case 6 – Self-tracking

![HealthAchieve](https://example.com)

**Recording Status**

*Recording...*

**Sleep-Snore/Apnea/Talk**

**Sleep-Cycle Wake-up Window**

From 7:30 am to 7:45 am

**Diary**

**Today**

- **Goal**: 1,490
- **Food**: 298
- **Exercise**: 16
- **Remaining**: 1,208

**Breakfast**

- Oatmeal Squares Cereal - Brown Sugar: 210 kcal
- Nonfat (fat free or skim) Milk, 1 cup: 86 kcal
- Brewed from grounds Coffee, 1 cup: 2 kcal

**Add Food**

**Lunch**

**Add Food**

**Dinner**

**Add Food**
Use case 6 – Self-tracking
Use case 6 – Self-tracking
Use case 6 – Self-tracking
Use case 7 – Diagnostics
Use case 7 – Diagnostics
Use case 7 – Diagnostics
Researchers use iPhone accelerometer to diagnose Parkinson’s disease tremor, test remote diagnosis potential

Feb 07, 2011 by Illifaat Husain, MD

Fig. 1. iPhone wireless accelerometer application for characterizing Parkinson’s disease tremor.

“Implementation of an iPhone for characterizing Parkinson’s disease tremor through a wireless accelerometer application” in “Conference Proceedings: Engineering in Medicine and Biology Society”.

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Use case 7 – Diagnostics
4. The near future of mobile learning in healthcare

https://www.youtube.com/watch?v=ChgT3K0z3sU
Predicting the Future

Products → Applications → Services

Applications Innovation Curve (Content/Processes)

Technology Innovations Curve

Services Innovations Curve

Mobile Health about here

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Multi-function apps

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Intelligent apps
Big Data

1. A gigantic leap in the amount of data
2. New kinds of data
3. New methods of data analysis for learning
Mashups

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The Internet of things

HealthAchieve
The Internet of things

HealthAchieve
Sensors

HealthAchieve
Sensors

HealthAchieve
Wearables

https://www.youtube.com/watch?v=88L1oW13O4A#t=103

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Embedded Devices

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5. Matching the affordances of mobile learning with the training needs of your organization
Develop a roadmap
What are your mobile learning needs in healthcare?
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