Can smartphones make people smarter?
Challenges and opportunities for the design and use of mobile educational games

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New media, old questions...

THE SIMPLE ANSWERS
TO THE QUESTIONS THAT GET ASKED
ABOUT EVERY NEW TECHNOLOGY:

| WILL ___ MAKE US ALL GENIUSES? | NO |
| WILL ___ MAKE US ALL MORONS?   | NO |
| WILL ___ DESTROY WHOLE INDUSTRIES? | YES |
| WILL ___ MAKE US MORE EMPATHETIC? | NO |
| WILL ___ MAKE US LESS CARING?   | NO |
| WILL TEENS USE ___ FOR SEX?     | YES |
| WERE THEY GOING TO HAVE SEX ANYWAY? | YES |
| WILL ___ DESTROY MUSIC?         | NO |
| WILL ___ DESTROY ART?           | NO |
| BUT CAN`T WE GO BACK TO A TIME WHEN– | NO |
| WILL ___ BRING ABOUT WORLD PEACE? | NO |
| WILL ___ CAUSE WIDESPREAD ALIENATION BY CREATING A WORLD OF EMPTY EXPERIENCES? | WE WERE ALREADY ALIENATED |

www.xkcd.com
Serious games

“A serious game is a game in which education (in its various forms) is the primary goal, rather than entertainment” (Michael & Chen, 2006, p. 17)

“Serious games have more than just story, art, and software, however. (...) They involve pedagogy: activities that educate or instruct, thereby imparting knowledge or skill. This addition makes games serious” (Zyda, 2005, p. 26)

“As a starting point we define serious games as any form of interactive computer-based game software for one or multiple players to be used on any platform and that has been developed with the intention to be more than entertainment“ (Ritterfeld, Cody, & Vorderer, 2009, p. 6)

“games with a purpose“ (Watt, 2009, p. 374)

“games with a purpose beyond play“ (Klopfer, Osterweil, & Salen, 2009, p. 20)
Gamification

“Gamification refers to: a process of enhancing a service with affordances for gameful experiences in order to support users’ overall value creation.” (Huotari & Hamari, 2012, p. 3)

“Gamification is the use of game design elements and game mechanics in non-game contexts” (Domínguez et al., 2012, p. 380)
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Serious Games & Friends I

Rankin & Sampayo Vargas, 2008, p.3
Serious Games & Friends II


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### Where does gamification fit in?

<table>
<thead>
<tr>
<th></th>
<th>Game</th>
<th>Serious Game</th>
<th>Game for Learning (G4L)</th>
<th>Game-Based Learning (GBL)</th>
<th>Gamification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basic Definition</strong></td>
<td>This term includes all the other categories except gamification.</td>
<td>A game designed for purposes other than or in addition to pure entertainment.</td>
<td>A game designed specifically with some learning goals in mind.</td>
<td>The process and practice of learning using games.</td>
<td>The use of game elements in a non-game context.</td>
</tr>
<tr>
<td><strong>Purpose</strong></td>
<td>Can be for any purpose.</td>
<td>Change in behaviour, attitude, health, understanding, knowledge.</td>
<td>Normally connected with some educational goals.</td>
<td><strong>Not a game</strong> - this is an approach to learning.</td>
<td>Often used to drive motivation, but can also be used to make something more playful and gamelike.</td>
</tr>
<tr>
<td><strong>Primary Driver (why used)</strong></td>
<td>Can be either play or rewards (or both).</td>
<td>To get the message of the game.</td>
<td>To learn something.</td>
<td>To improve learning.</td>
<td>Depending on how it's implemented, it can tap into extrinsic or intrinsic rewards (or both)</td>
</tr>
<tr>
<td><strong>Focus</strong></td>
<td>Player Experience (how)</td>
<td>Content / Message (what)</td>
<td>Content / Message (what)</td>
<td></td>
<td>User Experience (how)</td>
</tr>
</tbody>
</table>

Adding mobile

• Mobile…
  – educational games
  – serious games
  – game-based learning
  – gamification
  – …
Popularity of mobile games

• change of/in media use: *permanently online, permanently connected* (POPC; Vorderer, 2015)

• according to BITKOM (2014): *smartphone = most popular gaming platform in Germany*
  – 78% of people who play games (also) play on smartphones

• 25% of German children aged 6 to 13 own a smartphone (KIM study 2014)
  – 61% play mobile games at least occasionally

• 92% of German teenagers aged 12 to 19 own a smartphone (JIM study 2015)
  – 76% play mobile games at least occasionally
The case of QuizClash

- **mobile quiz game** for Android, iOS, Windows Mobile
- original (Swedish) title: *Quizkampen*; German title: *Quizduell*
- available in **11 languages**, downloaded more than **23 million times** via the Google and Apple stores until March 2014 (source: Wikipedia)
- database with around **30,000 questions** (German version)
- even had its own show on German TV for a while
- **one-on-one duels** between players
  - **6 rounds, 3 questions** per round: **4 options, 20 seconds** per question
  - players alternately **choose one of three categories** (19 in total)
  - **scoring system** based on **ranking of players**
  - integrated **chat function**
  - players can submit their own questions
Why is *QuizClash* so popular?

- basic version is **free**
- **simple to use** + **short duration** of duels
- duels against **other players** (e.g., friends & family)
- ranking → **competition**
- test of general knowledge

- option to submit own questions?
- learning?
Mobile games for learning (MG4L)

• (potential) application areas
  – K12 education (a.k.a. primary & secondary)
  – higher education (e.g., university)
  – vocational training
  – awareness campaigns
  – …
Advantages of MG4L

- **reduced** production **costs** (in comparison to console or PC games)
- **availability of/access to devices** (student ownership of smartphones)
- learning in the **classroom, at home** or virtually **anywhere** else → self-directed learning
- use of additional **(user) data** (and sensors) is possible: e.g., location or movement
Challenges in the design of MG4L

- development for **multiple OS and devices** (e.g., smartphone vs. tablet)
- restrictions of **small screens** and computing power
- rapid **technological development** (e.g., new sensors or network standards)
- need for **mobile internet** connection?
- **privacy/data protection**
- licenses, **rights, & distribution**
- (sustained) **support**
Challenges in the use of MG4L

- (optimal) balance between “purpose beyond play” and enjoyment/entertainment
- chocolate broccoli problem
- transfer
- compulsory vs. voluntary use
- in the classroom vs. at home/elsewhere
- long-term motivation
  - (additional) incentives?
  - evidence for payoff?
Existing work on MG4L

1. **Focus on technology/design**, e.g.:
   - development and testing of a mobile learning games framework (Busch et al., 2015)
   - pedagogy-based recommendations for the design and choice of educational apps (Hirsh-Pasek et al., 2015)
   - content selection in spaced repetition games (Schimanke et al., 2013)

2. **Case studies** of specific games, e.g.:
   - historical knowledge (Huizenga et al., 2009)
   - English as a second language in primary school (Sandberg, Maris, & de Geus, 2011)
   - problem-solving skills for secondary education (Sánchez & Olivares, 2011)

3. **Few reviews/overviews**, e.g.:
   - evaluation of mobile learning projects (Frohberg, Göth, & Schwabe, 2009)
   - research on and with mobile SG & GBL (Hobitz & Müller-Lietzkow, 2012)
Potentials effects of (M)G4L

- creating **awareness**
- sparking/generating **interest**
- increase **motivation**
- enhance/repair **mood**
- satisfy **needs** (e.g., competence or relatedness)

- improve **learning** outcomes (e.g., knowledge or skills)
The effects funnel

Attention ➤ Interest ➤ Attitudes ➤ Behavior
Design vs. use

“From serious games to serious gaming”
(Jenkins et al., 2009)

↓

Mobile?
Emotional and motivational effects

• several studies have shown that digital games can...
  – be used to improve/repair mood states (e.g., Bowman & Tamborini, 2012; Rieger et al., 2014)
  – increase productivity (Reinecke 2009a, 2009b)
  – satisfy basic human needs, such as competence, autonomy or relatedness (e.g., Tamborini et al., 2011; Rieger et al., 2014)
QuizClash & mood repair

- **experimental study** (BA thesis co-advised by Diana Rieger and me) on
  QuizClash, mood repair, and motivation \( (N = 99) \)
  - positive or negative feedback in general knowledge test
  - *QuizClash* against another participant (win vs. lose)
  - main DV = **mood** (valence, arousal, dominance) & **motivation** (for a similar or dissimilar task)
  - preliminary results:
    - winning increases mood repair after negative feedback
    - increased motivation for similar task after negative feedback & winning

- replication/additional data collection at Osnabrück University
  (BSc thesis advised by M. Rohangis Mohseni)
Project Quizard

- development and evaluation of a mobile quiz game for higher education (university)
- funded by the University of Cologne (Innovations in teaching program): winter term 2015/2016 – winter term 2016/2017
- cooperation with the Competence Center E-Learning of the University of Cologne and the university clinic (clinical chemistry) + informal cooperation with University Osnabrück
- integration with the e-learning platform ILIAS
- authoring tool for teachers
- mobile app for Android & iOS
  - QuizClash as a template
Quizard research questions

1. Does the use of a mobile quiz app positively affect motivation, interest in the topic, and learning?

2. Will it increase learning motivation and outcome if explanations for the correct answers are provided (in case of incorrect responses)?

3. Does the option to play against other students (from the same class) improve learning motivation and outcome?
Das ILIAS-MobileQuiz: Ein Tool für Präsenzlehre und Selbststudium


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ILIAS Quiz user data I

Quizzard Test-Test

<table>
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<tr>
<th>Name</th>
<th>Benutzername</th>
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December 10th, 2015
Next steps in the project

• evaluation of the web quiz
  – experimental manipulation of feedback: a) # of correct answers at the end, b) # of correct answers and correct answers + short explanations for questions that were answered wrongly, c) direct feedback after each question

• development of the mobile app
  – 1st evaluation in a field phase in media psychology classes targeted for summer term 2016
Future directions

- quiz app (+ content) for students with other majors (and at other universities?)
  - integration with University of Cologne app
  - integration with other e-learning platforms?
- (international) collaborative project on mobile learning games
  - e.g., Horizon 2020: ICT24 – 2016 Gaming and gamification
- establishing an interdisciplinary and international research network on mobile games for learning
References


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