Gamification Works! or How I Learned to Stop Worrying and Love to Teach

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The images used in this lecture courtesy of many generous content producers. See last slide.
The “Leaking Faucet”

• Major technical university in the Netherlands

• “P-in-een” of an important BSc track
• Completion “in time” of the BSc
• (What do students think about it?)

<40%
<50%

Exercise: The Blame Game

• Team work, first 2 minutes
  1. Form team of 2-3 persons
  2. Think about own experience
  3. Convince your team before proposing an answer

• Open discussion, next 2 minutes
  • Tell everyone the answer

Q: Who is responsible for the current yield of higher education?

Voting on best answer
We’re In This Together (My Answer)

• New generation of students

• New types of students, especially multi-culti

• It’s not you, it’s me

• New ambition of our faculty, but cannot select students
We’re In This Together (My Answer)

- New generation of students

- New types of students

The main challenges for the future?

Every student counts!
Every student is different!

- New ambition of our faculty, but cannot select students

https://quotablequoteunquote.files.wordpress.com/2008/08/walkingcomputergeek.jpg
Let’s Extrapolate to Europe:
The Workforce Gap in ICT

<table>
<thead>
<tr>
<th>Year</th>
<th>Demand Potential Total</th>
<th>Jobs Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>7,403,000</td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td>7,419,000</td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td>7,451,000</td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>7,503,000</td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>7,571,000</td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>7,657,000</td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>8,169,000</td>
<td></td>
</tr>
<tr>
<td>2019</td>
<td>8,343,000</td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>8,532,000</td>
<td></td>
</tr>
</tbody>
</table>

Source: e-Skills for Jobs in Europe, 2014

**NL: 20k**

**NL: 50k**

**910k**

**510k**
Let’s Extrapolate to Europe: The Workforce Gap in ICT

The main challenges for the future?

Every student counts!

Every student is different!

Source: e-Skills for Jobs in Europe, 2014
Let’s Extrapolate to Europe: The Workforce Gap in ICT

The main challenges for the future?
Every student counts!
Every student is different!

Rhetorical Q: Which teaching technique can help?

Source: e-Skills for Jobs in Europe, 2014
Agenda for Today or Gamification.
Because Every Student Counts!

1. Introduction
2. An intuition behind gamification

3. A practical framework for gamification in higher education
   (getting your courses gamified)
   1. Refresher on higher-education basics
   2. Understanding student types
   3. Designing the gamified experience, focus on the MDA* framework
   4. Designing the gamified experience, focus on dynamics and mechanics
   5. 
   6. Playtesting for fun and motivation
   7. Operating a gamified course

4. Does gamification work?
5. Wrap-up

Time Units
1 Time Unit (TU) ~ 7 minutes.
Total time 8.5 TUs ~ 60 minutes.

* Mechanics, Dynamics, Aesthetics
TUD Lectures on Education
What is Gamification?
A: Game Thinking + Techniques

<table>
<thead>
<tr>
<th>Q: What is gamification?</th>
</tr>
</thead>
<tbody>
<tr>
<td>A: The use of thinking and techniques designed for gaming in non-gaming settings, e.g., in education.</td>
</tr>
</tbody>
</table>

http://goo.gl/V97zSW

What is the intuition behind gamification?

How can gamification be used?

http://goo.gl/ILSNeb
Designing a course is like creating a complex puzzle.
Agenda for Today or Gamification. Because Every Student Counts!

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* Mechanics, Dynamics, Aesthetics
TUD Lectures on Education
A Framework for Gamification in Higher Education

1. Decide on Learning Objectives and related content.
2. Describe the perfect student.
3. Design the gamified experience*.
4. Playtest your design and check for fun!
5. Operate your gamified course.

* Mechanics, Dynamics, Aesthetics

(Assuming you want to gamify a traditional course.)
1. Decide on Learning Objectives and related content.

Have You Read These? Or Similar? Or Followed the BTQ (BKO) Courses?

- Learning how to learn
- Significant learning
- Group work
- Assessment
- Planning, team
- Grading
- From the trenches...
Course Design, In 5 Easy Steps...

1. Team work, first 2 minutes
   1. Form team of 2-3 persons
   2. Think about own experience
   3. Convince your team before proposing an answer

2. Open discussion, next 1 minute
   • Tell everyone the answer

Q: How do you design a course in higher education? (What do you show to your Director of Education?)

Voting on best answer
1. Decide on Learning Objectives and related content.

Decide on Learning Objectives etc.
(or, the basics of education)

1. **Goals**
   - High-level descriptions, e.g., “EDU601 Modern Education Techniques”

2. **Outcomes**
   - Low-level descriptions
   - Measurable verb + Limitations + Performance

3. **Teaching method(s)**
   - Teaching facts, concepts, procedures, systems
   - Lectures [, flipped classroom?], Lab, etc.
   - [Learning learning? Teaching teachers?]

4. **Assessment method(s)**
   - Of students. Of the course itself.
   - [Of the teaching methods?]

5. **Operation of the course**
   - Team, including SAs, co-teacher, etc.
2. Describe the perfect student.

What’s Wrong With the Perfect Student?

The perfect student does NOT exist.
(And yet we are all here.)

- Achieves all course objectives
- Explores new directions
- Socializes with students around
- Excels in all tests, early

https://quotablequotenquote.files.wordpress.com/2008/08/walkingcomputergeek.jpg
Richard Bartle’s “Players who suit MUDs”
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Richard Bartle’s “Players who suit MUDs”

- **Achievers**: more/more difficult challenges
- **Explorers**: open/creative challenges
Richard Bartle’s “Players who suit MUDs”

- **Acting**
  - Achievers
    - more/more difficult challenges

- **Interacting**
  - Socializers
    - team/discussion-based challenges
  - Explorers
    - open/creative challenges

- **Players**
  - World
Richard Bartle’s “Players who suit MUDs”

- **Winners**: competitive/single-winner challenges
- **Achievers**: more/more difficult challenges
- **Socializers**: team/discussion-based challenges
- **Explorers**: open/creative challenges

- **Acting**: 
- **Interacting**:
Exercise: The “Who Are You?” Game

Q: Which best describes you?

Players

Winners
competitive/single-winner challenges

Achievers
more/more difficult challenges

Socializers
team/discussion-based challenges

Explorers
open/creative challenges

Acting

Interacting

World

Richard Bartle’s “Players who suit MUDs”
Exercise: The “Who Are You?” Game

• Richard Bartle’s “Players who suit MUDs”, etc.

Q: How would you use other taxonomies of student types?
Content Unlocked!

2 x

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A Framework for Gamification in Higher Education

1. Decide on Learning Objectives and related content.

2. Describe the perfect student.

3. Design the gamified experience.
   - Gamification is not the BLT sandwitch of education
   - Focus on the Mechanics-Dynamics-Aesthetics Framework  
   - Focus on Mechanics and Dynamics
   - Focus on Assessment

4. Playtest your design and check for fun!

5. Operate your gamified course.
3. Design the gamified experience.

Gamification Is NOT Only:

- Playing a game in the classroom
- Points
- Badges
- Leaderboards

PBL = The BLT sandwich
Q: What’s in a game?
A: Over 250,000,000 active players

Social Gaming =
100,000k+ players who benefit from social engagement

1. Mechanics
   Explore, do, learn, socialize, compete +

2. Dynamics
   Player progress and interaction, ...
   +

3. Game Content*
   puzzles, challenges, extra-projects, culture

Gamification scales in practice
(better than traditional in-class methods)

* Art class pending.
Gamification Mechanics

- Mechanics = how the system turns inputs into outputs

Mechanics are applied directly, by the system (course staff), without further interaction from students.

- Points
- Badges
- Leaderboards
- Game states, such as winning, losing, cheating, etc.
- Challenges for each player type
- Rules, tutorials, guidelines, checklists
- Feedback
- Unlocked content
- … so many more

Q: Which mechanics have I already demonstrated in this session?

(Social) Gamification Dynamics

- **Individual dynamics** (so, regardless of what others do)
  - Students can spend their points for some reward
  - Students earn access to more advanced content

- **Group dynamics** (so, regardless of what students outside the group do)
  - Peer-reviews are discussed with the group (mechanic), and result in bonuses/additional discussion (dynamic)

- **Cohort dynamics** (so, all students acting)
  - Top-20% participate in extra lectures
  - Bonus/brownies for best student/group of the day
Gamification Mechanics & Dynamics in Our Courses

- Too many to list here
  - Scoring system is but one element
  - Badges? Only for B.Sc., some “random”

- Onboarding (mechanics)
  - Entry quiz
  - Story every lecture

- Social Learning (dynamics)
  - In-class teams, competing casually
  - Self-study as team effort
  - Involve Winners and Achievers in class
  - Involve Winners and Explorers in self-study

- Different player types → different MDA
  - Ladders, ranking, end-lecture quiz: mostly for Winners
  - Content unlocking (dynamics): Explorers and Achievers

*Manga cum laude

Assessment That Motivates!

10,000 points for a 10
+50 for good activity
+1,000 for most challenging activity

Badges, unlocked content
## Our Diverse Scoring System

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>10,000 for straight 10</strong></td>
<td>Start with 1</td>
<td>I will bake brownies for <em>you</em>! (but not force you to eat them)</td>
</tr>
<tr>
<td>+1,000 <strong>team</strong> self-study</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+1,000 lab bonus #2</td>
<td>Bonus Lab assignments</td>
<td></td>
</tr>
<tr>
<td>+500 lab bonus #1</td>
<td>Advanced topics (GPUs, clouds)</td>
<td></td>
</tr>
<tr>
<td>+300 correct exam Q</td>
<td>Discuss w Lecturer</td>
<td></td>
</tr>
<tr>
<td>+50 activity in Lab/Lecture/Tutorial</td>
<td>Propose Exam Qs</td>
<td></td>
</tr>
<tr>
<td>+25 correct end-lecture quiz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+500 entry quiz</td>
<td>Rec. letter</td>
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4. Playtest your design and check for fun!

5. Operate your gamified course.
4. Playtest your design and check for fun!

Playtest Your Own Course!

1. Fine-tune fun

2. Are you increasing student motivation? Mastery, Access, Autonomy, Higher Goal

3. Balance different paths of advancement
   Balance + (challenge ~ growth → flow)
Challenging and Diverse Content to Activate Diverse Students

<table>
<thead>
<tr>
<th>Learning Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Try something else</td>
</tr>
</tbody>
</table>

### Industry state-of-the-art

### Topics touch today’s research

### Social relevance

#### Photos:
- (left) courtesy Google Inc.
- (middle) [http://www.flickr.com/photos/dimitrisotiropoulos/4204766418/](http://www.flickr.com/photos/dimitrisotiropoulos/4204766418/)
- (right) personal library of A. Iosup.
5. Operate your gamified course.

Experience Operating Our Courses

- **Learning graph overview**
  - Analyze shortcuts
  - Make sure students know how to navigate the puzzle

- **Public overview (student’s view)**
  - Updates often & complete

- **Private overview (your & your team’s view)**
  - Statistics: how many and which students are lagging behind?
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Does gamification work?
>10+ Operational Years Since 2007

- **B.Sc. Courses**
  - **TI140x Computer Organization** (5+ years)

- **M.Sc. Courses**
  - **IN4392 Cloud Computing** (4+ years, co-teaching)
  - **IN4391 Distributed Computing Systems** (3+ years)

- **Main lesson: manage course dynamics**
Gamification works!

Extra work due to gamification, relative to traditional [% all students]

- Gamified, BSc 2014
- Gamified, BSc 2013
- Gamified, BSc 2012
- Gamified, BSc 2011
- Traditional, BSc 2010

Lab Extra-work [%]  
Group Study [%]  
In-class [%]

Bonus: Every year, we make the course more difficult.
What Happens When A Student Does Not Like the Course Topic?

I want to thank you for showing that even though I'm not that good at written exams, I still can excel at other points in my study. I'd love to have a copy of my badge, as physical reminder of a course that made me eager to learn about things. Even when some of those things will never really have my interest.

This course, and the way it was given, learned me a few things about what motivates me, and only for that reason it was totally worth getting up for every lecture.
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TUD Lectures on Education
Designing a course is like creating a complex puzzle
Gamification as concept & intuition, mechanics & dynamics, ...
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Gamification works!
Thanks from our team.

Alexandru Iosup
Gamification Researcher & Professor

Otto Visser
Gamification Engineer & Professor

Ana Lucia Varbanescu
Gamification Professor

Tim Hegeman
Gamification SA

Jesse Donkervliet
Gamification SA
References (Shortlist, brief info)

- I. Bogost: How to Do Things with Videogames (Electronic Mediations), 2011