
Alexandru Iosup, Otto Visser, Ana Lucia Varbanescu, Tim Hegeman, Jesse Donkervliet, etc.

Teaching is done by teams!
The “Leaky Faucet”

The main challenge for the future?
Every student counts!

- Top* technical university in the Netherlands
- “P-in-een” of an important BSc track <40%
- Completion “in time” of the BSc <50%
- (What do students think about it?)

Who Is Responsible For the Leaky Faucet?

- New generation of students
- New types of students, especially multi-culti
- It’s not you, it’s me
- New ambition of Dutch universities, but no selection

The main challenge for the future? Every student is different!
Let’s Look At Europe: 
The Workforce Gap in ICT

EU: -900k
EU: -500k
NL: -50k
NL: -25k

Source: e-Skills for Jobs in Europe, 2014

Does not start at 0!
Let’s Look At 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

Rhetorical Q:
What can we do about this?

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

Source: e-Skills for Jobs in Europe, 2014
What To Do About Higher Education?
Focus On …

- Content
- Didactics
- Structure
- Technology

Your homework

Topic 1 (15’)

http://goo.gl/8HygZe

Topic 2 (2’)

Topic 3 (2’)

http://goo.gl/32xRgA
Didactics: What is Gamification?
A: Game Thinking + Techniques

Q: What is gamification?
A: The use in non-gaming settings, e.g., in education, of thinking and techniques designed for gaming.

http://goo.gl/V97zSW

What is the intuition behind gamification?
How can gamification be used?

http://goo.gl/ILSNeb
Do You Know This Person?

By Eunice Szpillman, via Wikimedia Commons
Designing a course is like creating a complex puzzle
I in the Box
I in the Box
I in the Box
I in the Box
I in the Box
I in the Box
A Framework for Gamification in Higher Education

1. Decide on Learning Objectives and on core content*.  
* You already have this

2. Describe the perfect student.

3. Design the gamified experience for every student.

4. Playtest your design and check for fun!

5. Operate your gamified course.
A Framework for Gamification in Higher Education

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2. Design For the Perfect Student

Q: 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
Richard Bartle’s “Players who suit MUDs”
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Richard Bartle’s “Players who suit MUDs”

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

- **World**
  - Explorers
    - open/creative challenges

- **Players**
  - Socializers
    - team/discussion-based challenges

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

Q: Which best describes you?

Players

- Socializers: team/discussion-based challenges
- Winners: competitive/single-winner challenges

Acting

- Achievers: more/more difficult challenges
- Open/creative challenges

Interacting

World

- Explorers: open/creative challenges
Content Unlocked!

2 x

L

Z

I

→

Grid

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.
Q: What’s in a game?
A: 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. Aesthetics = Game Content*
puzzles, challenges, extra-projects, culture

* Art class pending.

Gamification should scale
### Possible Games for Teaching Facts, Concepts, Procedures, and Systems

<table>
<thead>
<tr>
<th>What?</th>
<th>How? Common teaching elements</th>
</tr>
</thead>
</table>
| Facts       | Story w terms, acronyms, and jargon  
               Taxonomies and Venn diagrams  
               Games of repetition, recognition, matching |
| Concepts    | Story w metaphors  
               Boundary examples (what is/is not)  
               Games to experience, classify, compare, sort |
| Procedures (Rules) | Top-to-bottom view, story w Why? What?  
              Role-playing (Mechanics + feedback) |
| Systems     | Simulations to experience  
               (Tutorials to experience under guidance) |
Gamification Mechanics & Dynamics in Our Courses

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

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

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

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

Designing a course is like creating a complex puzzle: you design its Mechanics, Dynamics, Aesthetics.
Does gamification work?
**(Meta-)Research on Gamification in Education Is Inconclusive…**

<table>
<thead>
<tr>
<th>Study</th>
<th>Meta-study of studies</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randel et al. (1992)</td>
<td>&gt;60</td>
<td>&gt;50% no difference if using games. &gt;30% significant improvement when using games.</td>
</tr>
<tr>
<td>Hays (2005)</td>
<td>&gt;100</td>
<td>Game <em>design must match learning objectives.</em></td>
</tr>
<tr>
<td>Vogel et al. (2006)</td>
<td>&gt;30</td>
<td>Games <em>can help</em> improve cognitive skills vs. traditional.</td>
</tr>
<tr>
<td>Sitzman (2011)</td>
<td>&gt;60</td>
<td>Playing <em>improves confidence.</em> Vs. traditional, better retention, declarative and procedural knowledge</td>
</tr>
</tbody>
</table>
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 a 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.
Designing a course is like creating a complex puzzle

Gamification framework: concept & intuition, mechanics & dynamics, ...

Gamification works!

Gamification framework:
- concept & intuition
- mechanics & dynamics
- ...

Gamification works!
What Can We Do About Education? Improve Everything, But Focus On

Content

- Your homework

Technology

Didactics

- Topic 1 (15’)
- http://goo.gl/8HygZe

Structure

- Topic 2 (2’)

- Topic 3 (2’)

- http://goo.gl/32xRgA
Maslow’s Hierarchy of Needs (1943) + Kenrick et al. (2010)

- Physiological
- Safety
- Affection/Belonging
- Status/Esteem
- Self-Actualize
- Parenting
- Mating
- Growth Needs

Abraham Maslow

The Hierarchy of Needs for Teachers
Alexandru Iosup (2015)

Parenting Needs
- Control
- Affection/Belonging
- Status/Esteem

Survival Needs
- Control
- Affection/Belonging
- Status/Esteem

Growth Needs
- Personal Optimum
- Directing a New Education Culture
- Education Family

Course objectives
- Design
- Delivery

Basics
- Monitoring
- Trade-offs

Sharing
- Joining

Mastery
- Ranking

Learn
- Create

All
- Teach teachers
What Can We Do About Education? Improve Everything, But Focus On

Content

Your homework

Topic 1 (15’)

http://goo.gl/8HygZe

Topic 2 (2’)

http://goo.gl/32xRgA

Structure

Didactics

Technology

Topic 3 (2’)

http://goo.gl/32xRgA
Gamers Must Be the Most Informed Citizens on the Planet

- Halo 3 is one of the many successful games

- Halo 3 produced and transferred to its players ~1.5PB/year
  - Detailed player profiles
  - Detailed usage stats
  - Ranking
  - Content details

- At the same time, CERN produced ~15PB/year
What If Students Were Truly Informed About Their Education Status?

The Personal Academic File: Ethical Use of Student Data

- Enable data access and processing to help students
- Develop automated tools to inform and, if possible, to suggest course of action
- Use data ethically: opt-in, etc.

Empowered = Engaged

- Student in control of own progress
- Detailed feedback becomes possible
- Student advisor can give better advice

ICT challenges

- Effective and efficient platform (cloud)
- Automated tools (mining)
- Access to data (privacy and security)

Content

Your homework

Technology: Ethical Use of ICT

Didactics: Gamification

http://goo.gl/8HygZe

Structure: Hierarchy of Needs

http://goo.gl/32xRgA
Thanks from our team.

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