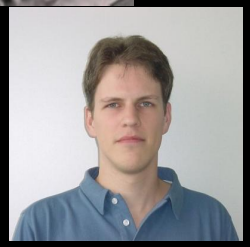
Gamification Works! or How I Learned to Stop Worrying and Love to Teach

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





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 <40%
- Completion “in time” of the BSc <50%
- (What do students think about it?) ELSEVIER

* THE-QS world rankings, 2013—2016.

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

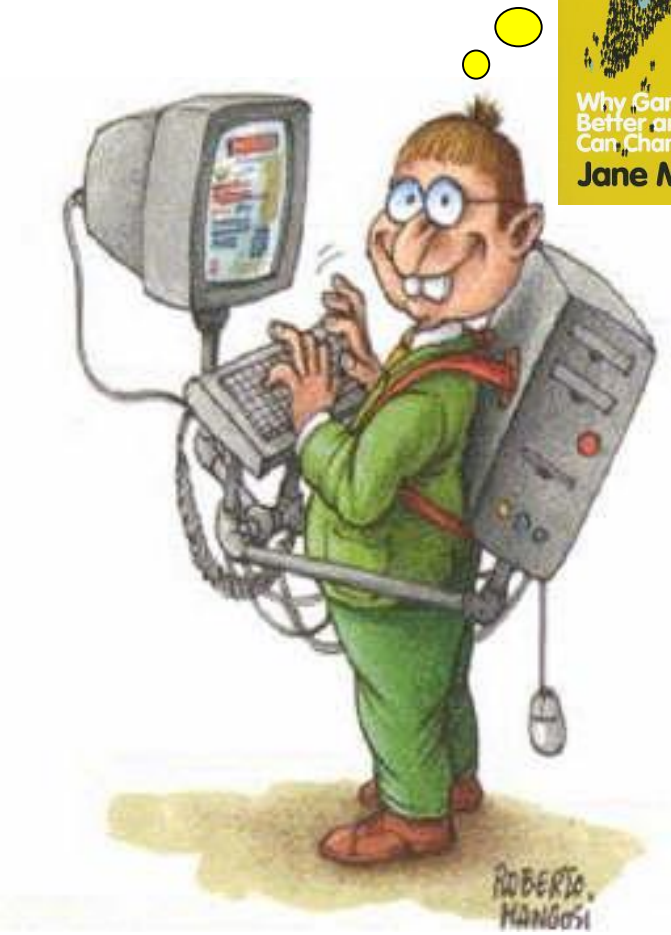
- Open discussion, next 2 minutes
  - Tell everyone the answer

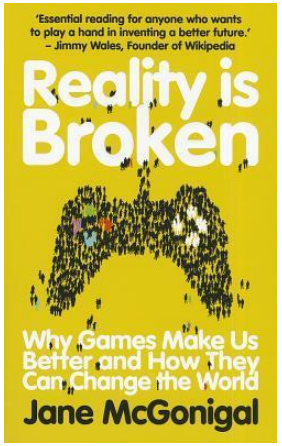
Q: **Who is responsible** for the **current yield** of higher education?

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





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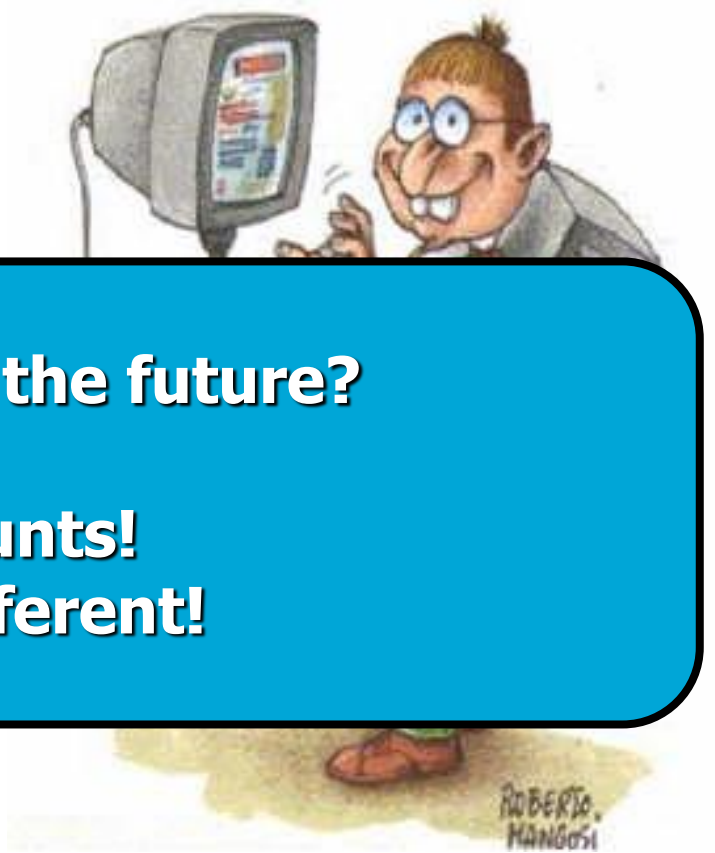

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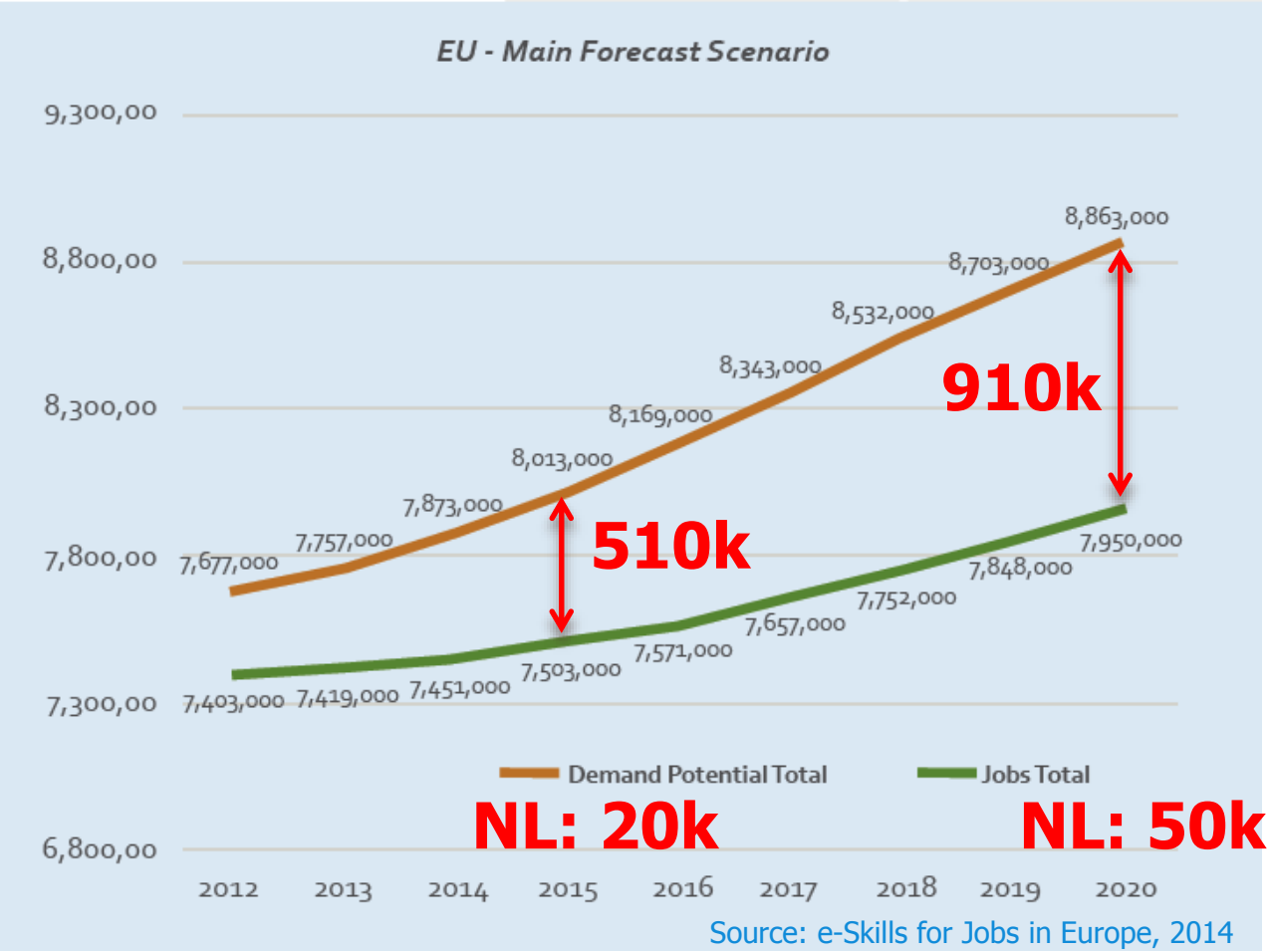
The main challenges for the future?

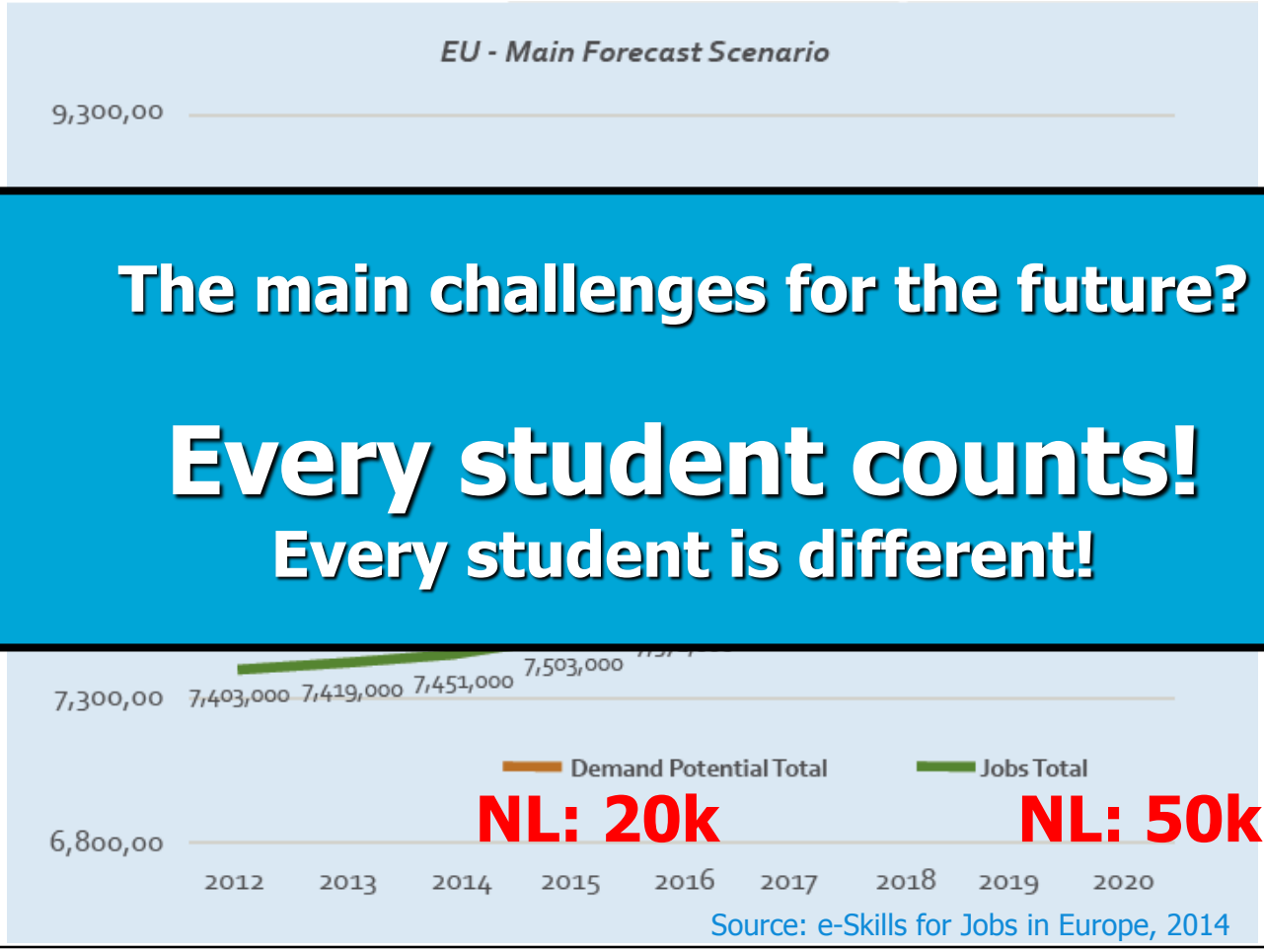
Every student counts!
Every student is different!

Let's Extrapolate to Europe: The Workforce Gap in ICT



Source: e-Skills for Jobs in Europe, 2014

Let's Extrapolate to Europe: The Workforce Gap in ICT



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Every student is different!

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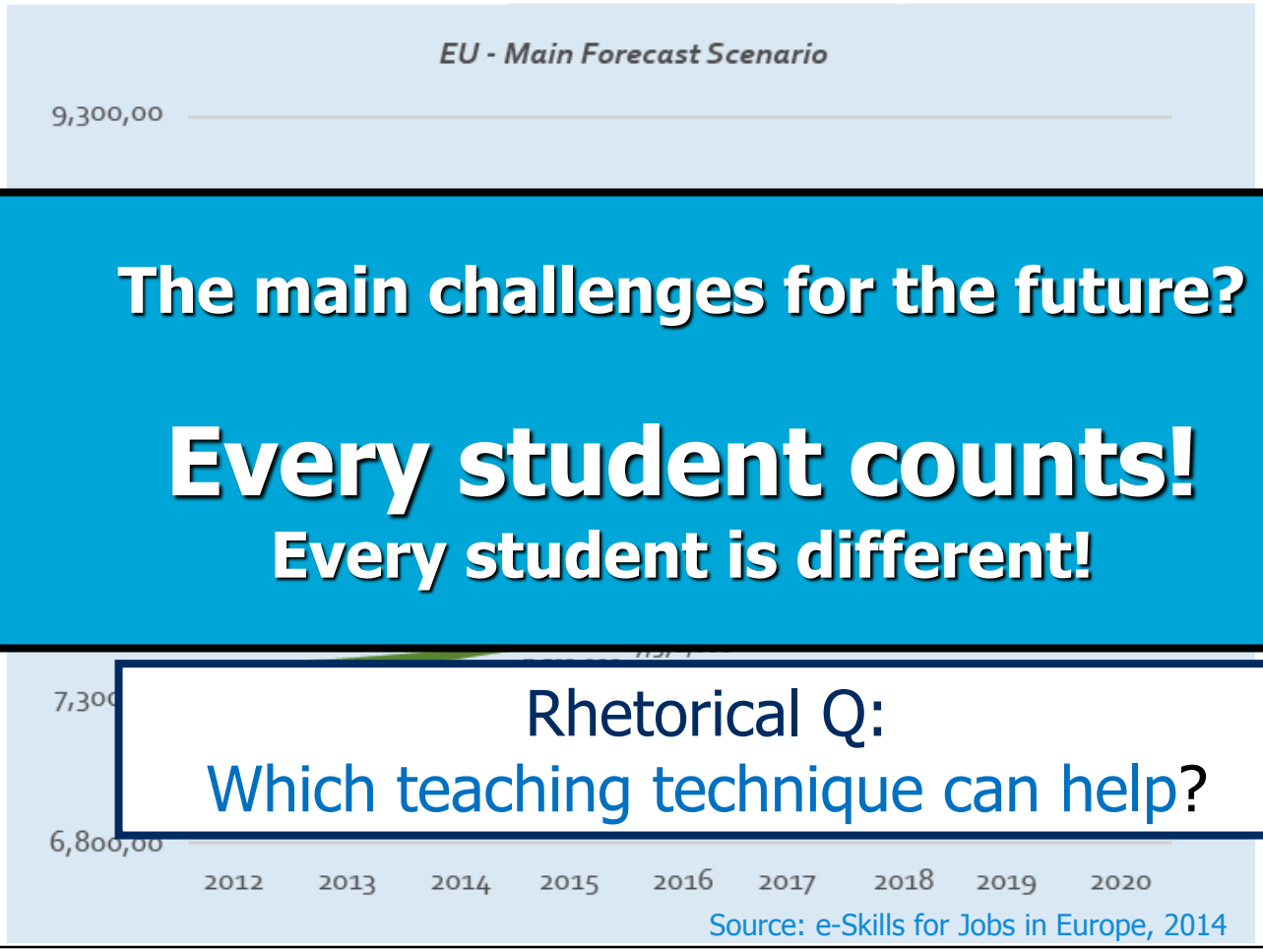


Source: e-Skills for Jobs in Europe, 2014

The main challenges for the future?

Every student counts!

Every student is different!

Rhetorical Q:
Which teaching technique can help?

Agenda for Today or Gamification. Because Every Student Counts!

		Time Units
1.	Introduction	1
2.	An intuition behind gamification	1
3.	A practical framework for gamification in higher education (getting your courses gamified)	5½
1.	Refresher on higher-education basics	½
2.	Understanding student types	1
3.	Designing the gamified experience, focus on the MDA* framework	½
4.	focus on dynamics and mechanics	½
5.	focus on assessment	1
6.	Playtesting for fun and motivation	1
7.	Operating a gamified course	1
4.	Does gamification work?	½
5.	Wrap-up	½

1 Time Unit (TU) ~ 10 minutes.
Total time 8.5 TUs ~ 90 minutes.

* Mechanics, Dynamics, Aesthetics

What is Gamification?
A: Game Thinking + Techniques

Q: What is gamification?

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

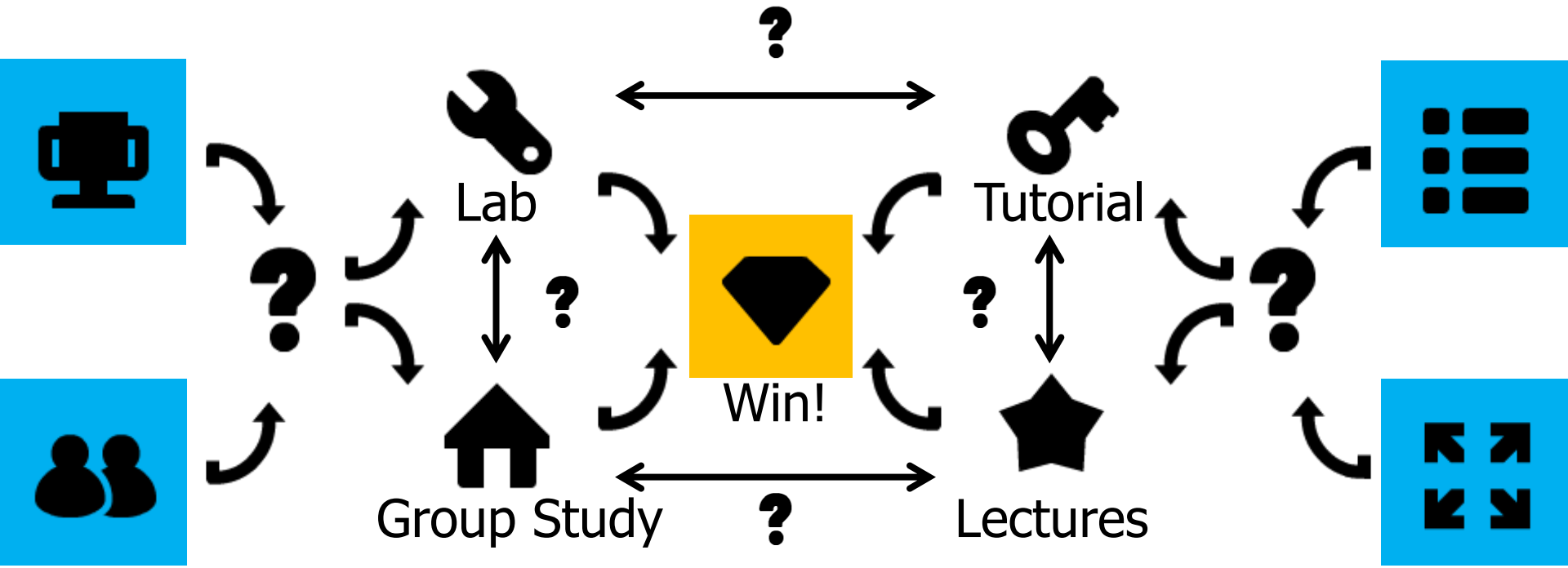
http://goo.gl/V97zSW

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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6. Playtesting for fun and motivation	1
7. Operating a gamified course	1
4. Does gamification work?	½
5. Wrap-up	½

* Mechanics, Dynamics, Aesthetics

This Gamification Masterclass

- "By taking this course, **you** will be able to"

1. Identify student types and
   design their paths of advancement.

2. Identify and explain the mechanics and
   dynamics that are most likely to motivate students.

3. Design assessment that is most likely to
   challenge students yet avoid common pitfalls.

4. Understand basic concepts in how to
   construct, playtest, and operate a gamified course.

5. Try out your gamification skills, in short exercises.

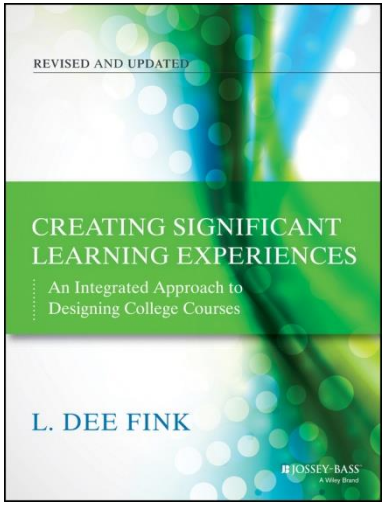
A Framework for Gamification in Higher Education

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.

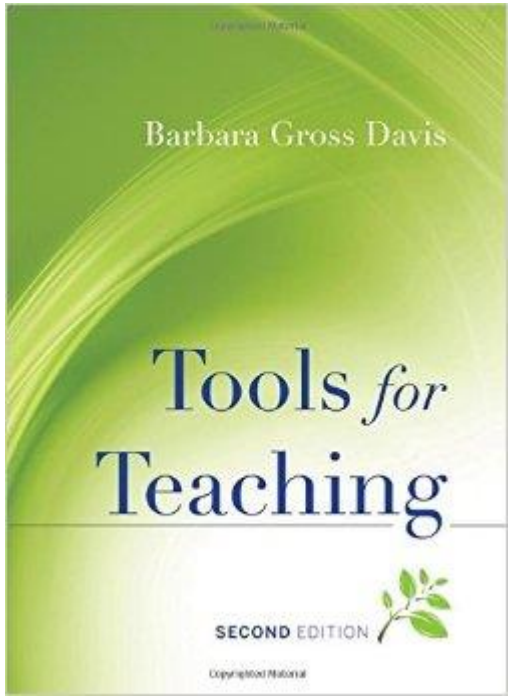
* Mechanics, Dynamics, Aesthetics

(Assuming you want to gamify a traditional course.)

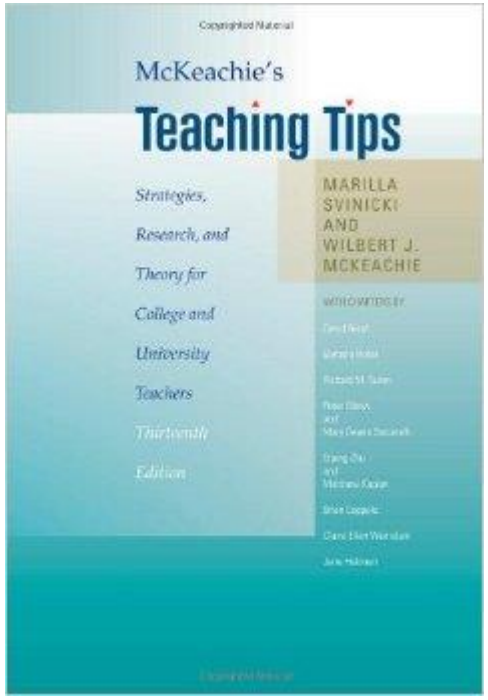
Have You Read These? Or Similar? Or Followed the BTQ (BKO) Courses?



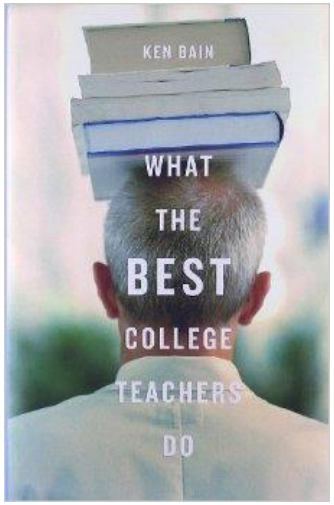
Learning how to learn
Significant learning



Group work
Assessment



Planning, team
Grading



From the trenches…

Course Design, In 5 Easy Steps…

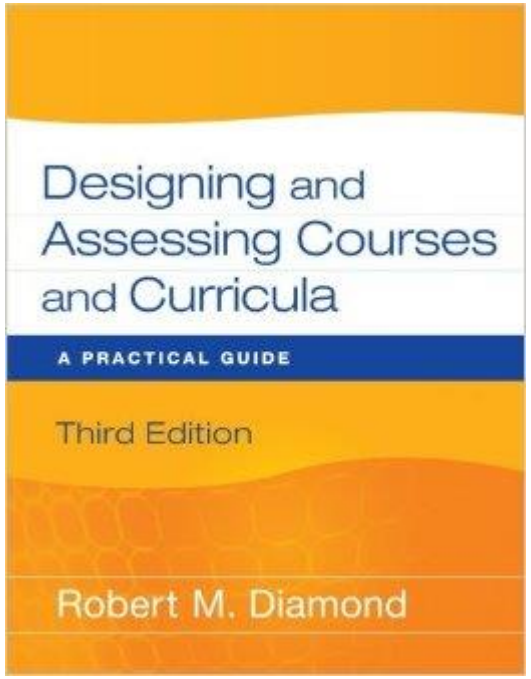
- Team work, first 2 minutes
  1. Form team of 2-3 persons
  2. Think about own experience
  3. Convince your team before proposing an answer
- Open discussion, next 1 minute
  - Tell everyone the answer

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

Voting on best answer

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

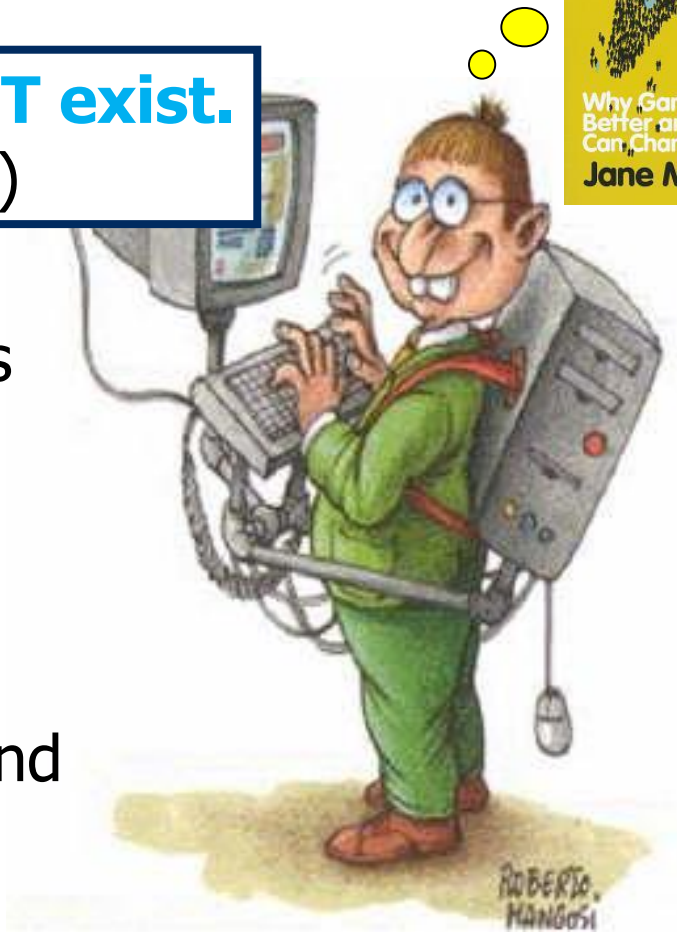
1. **Goals**
   - High-level descriptions, e.g., "EDU601 Modern Education Techniques"
2. **Outcomes**
   - Low-level descriptions
   - Measurable verb + Limitations + Performance
3. **Teaching method(s)**
   - Teaching facts, concepts, procedures, systems
   - Lectures [, flipped classroom?], Lab, etc.
   - [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.



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



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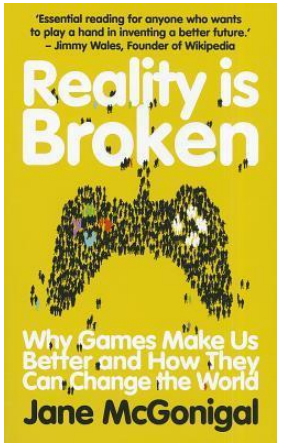
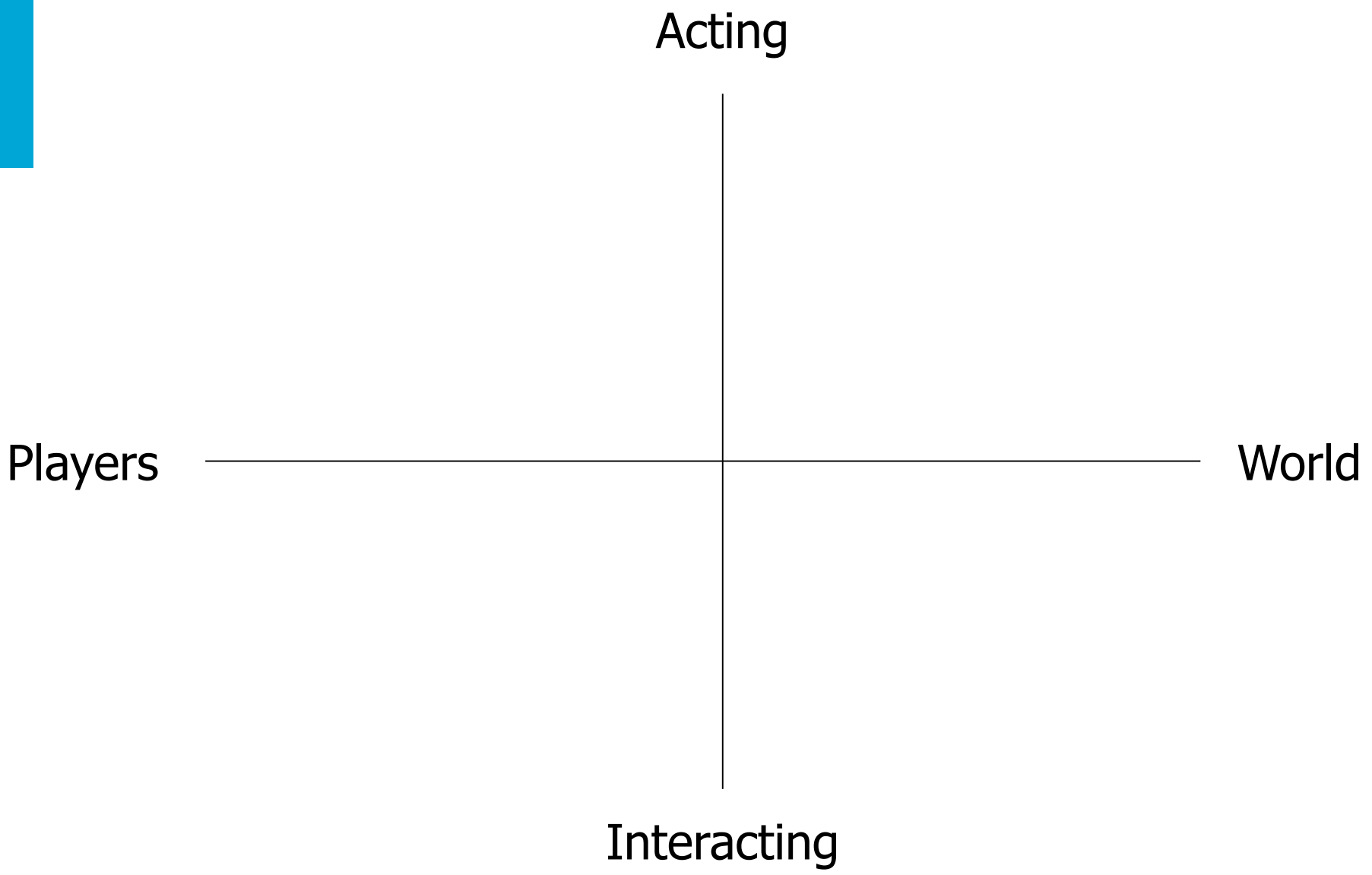
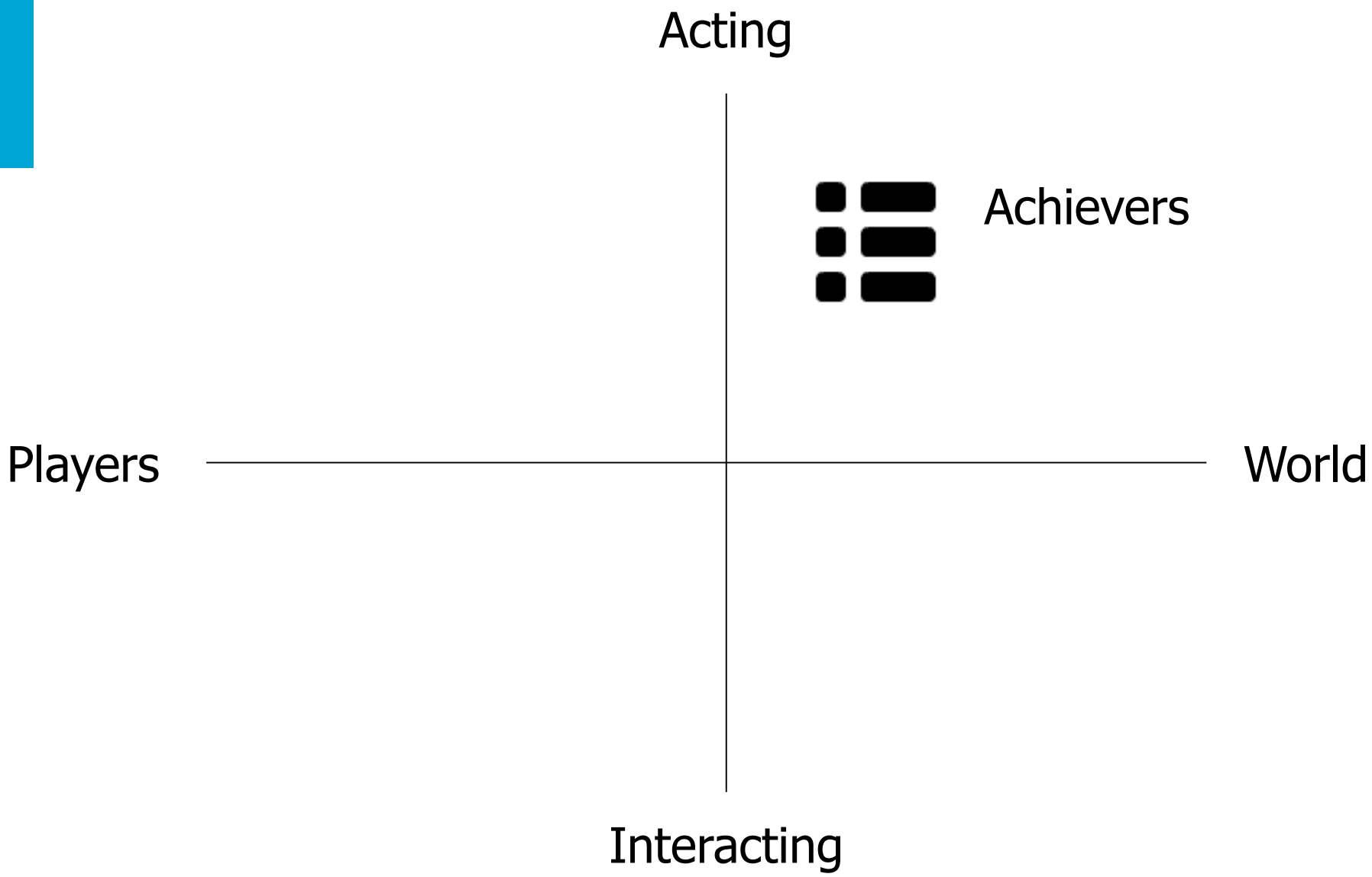



Acting
Players
World
Interacting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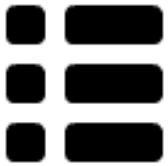
Acting



Achievers
more/more difficult challenges

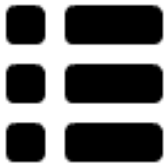
Players

World

Interacting

- Richard Bartle's "Players who suit MUDs"

Acting



Achievers
more/more difficult challenges

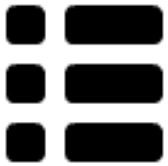
Players

World

Explorers
open/creative challenges

Interacting

Acting



Achievers
more/more difficult challenges

Players

World

Socializers
team/discussion-based challenges

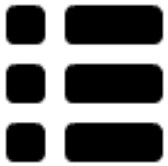
Explorers
open/creative challenges

Interacting

- Richard Bartle's "Players who suit MUDs"

Acting

Winners
competitive/single-winner challenges



Achievers
more/more difficult challenges

Players

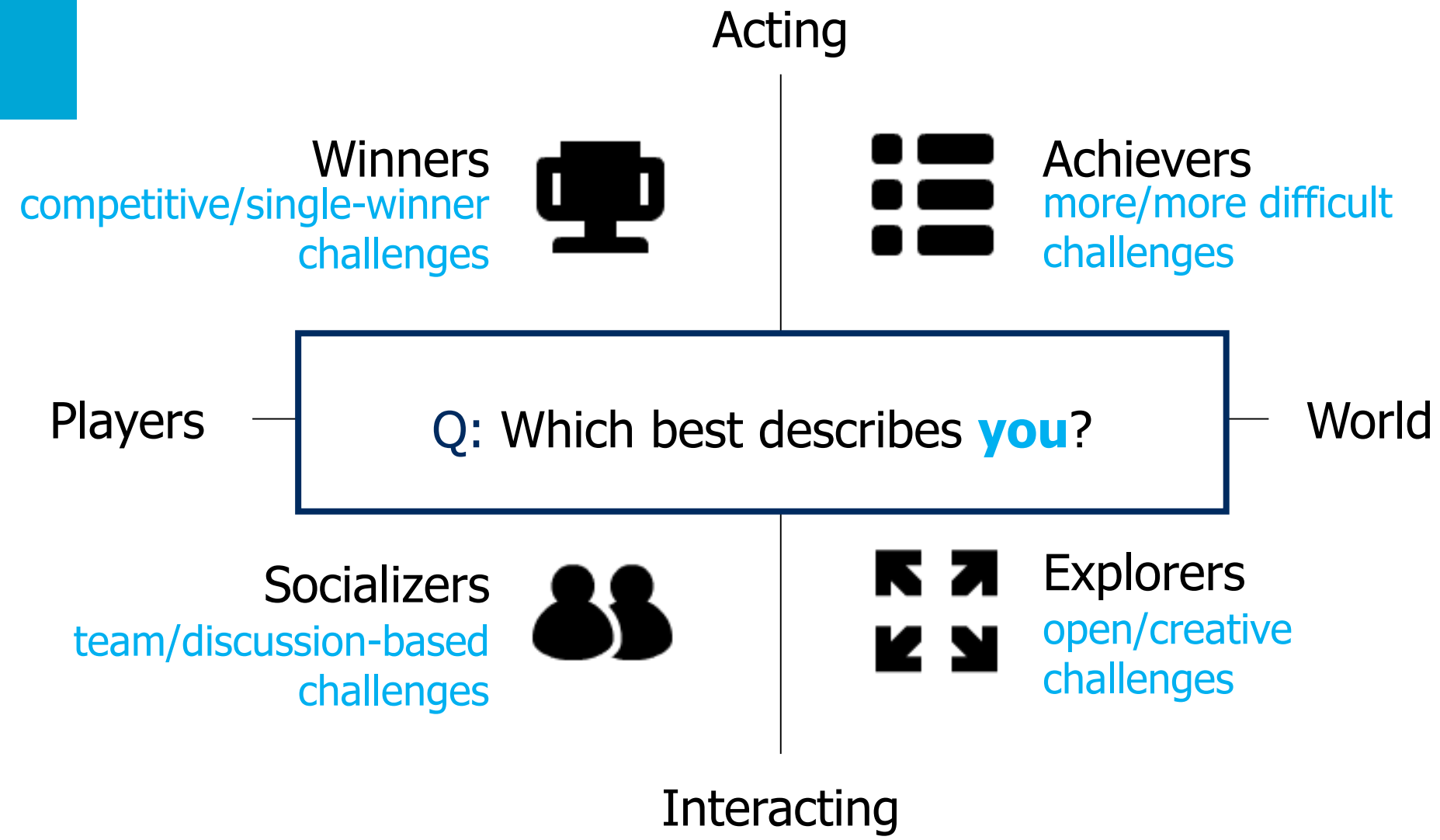
World

Socializers
team/discussion-based challenges

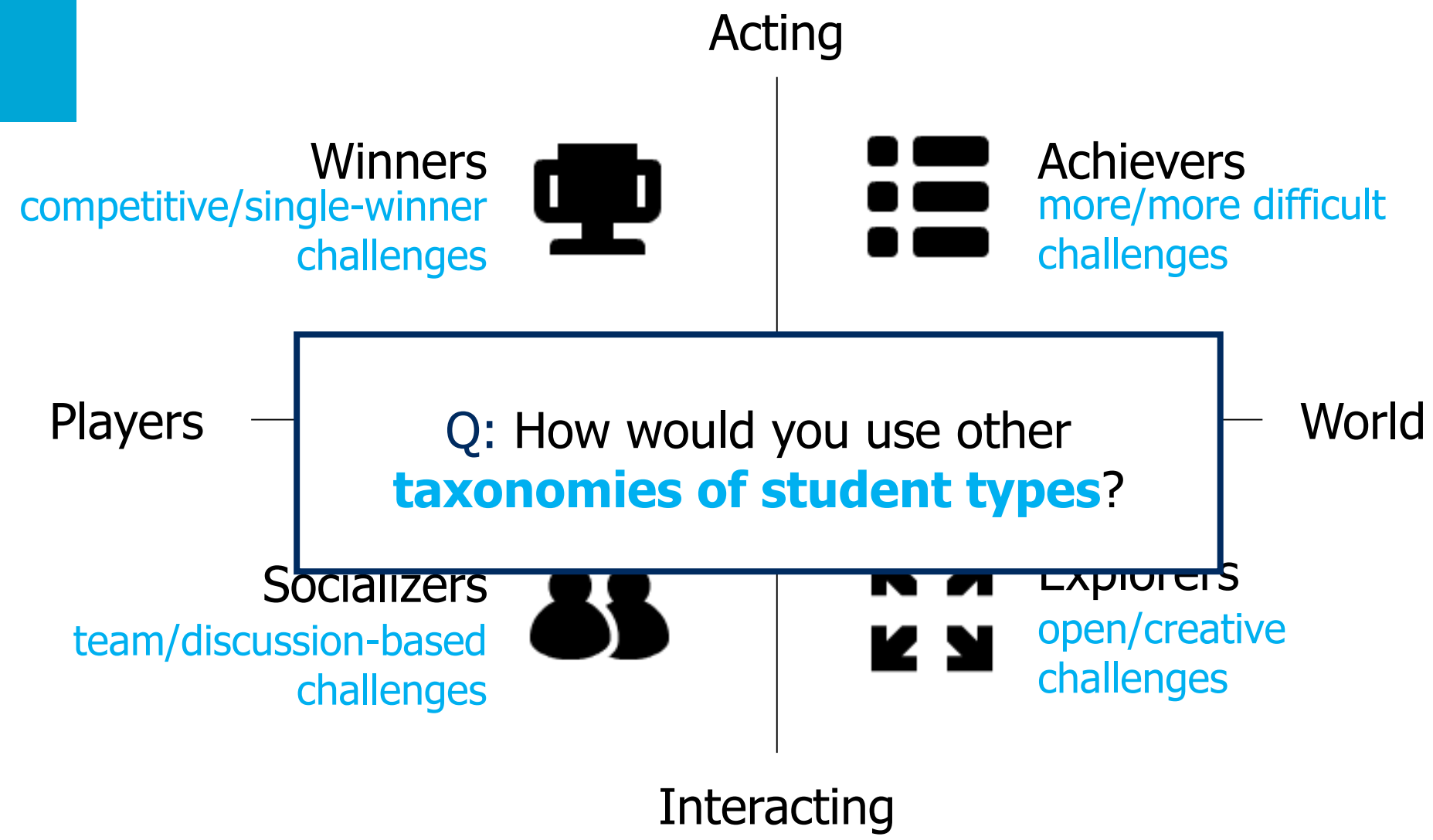
Explorers
open/creative challenges

Interacting

Exercise: The "Who Are You?" Game



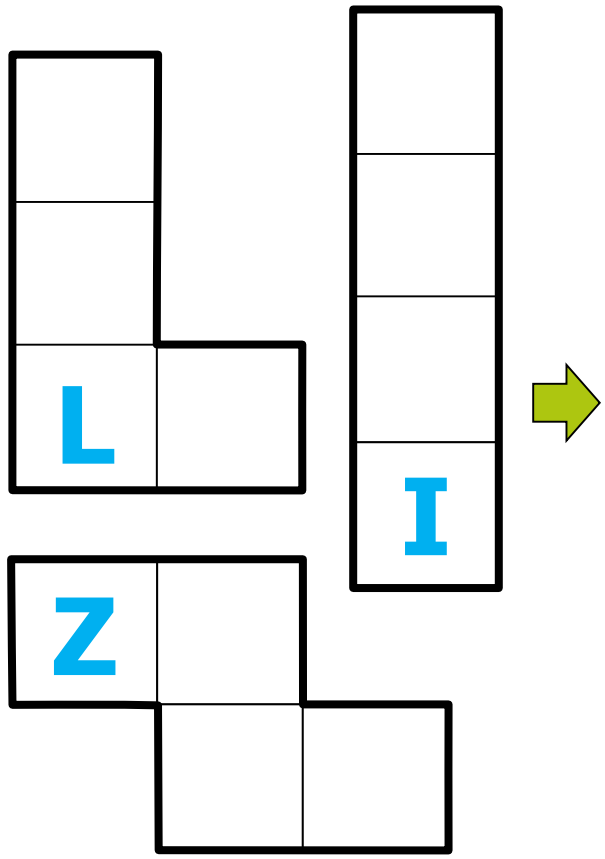
Exercise: The "Who Are You?" Game

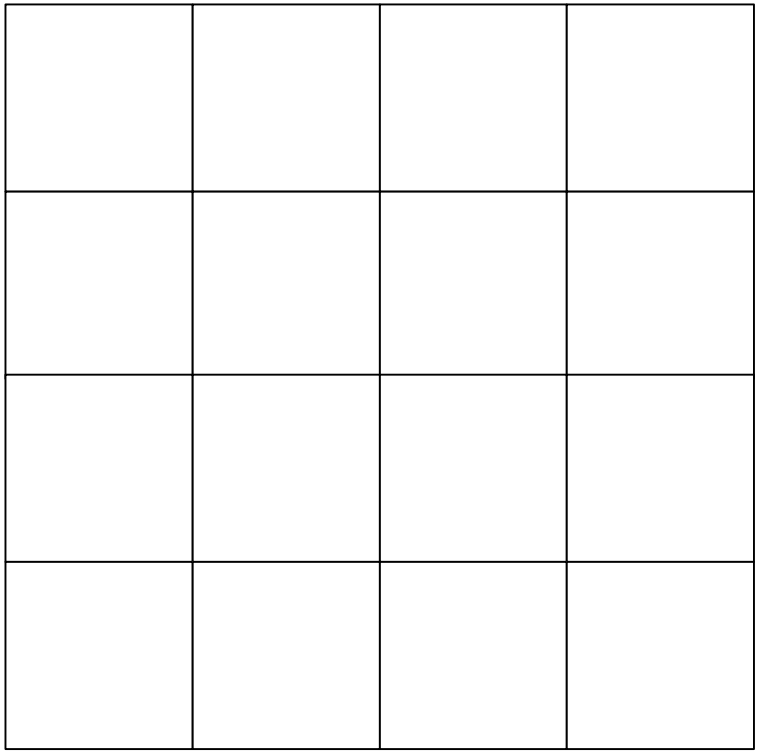


- Richard Bartle's "Players who suit MUDs", etc.

Content Unlocked!

2 x





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.

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

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

1. **Mechanics**
   Explore, do, learn, socialize, compete
   +
2. **Dynamics**
   Player progress and interaction, …
   +
3. **Game Content***
   puzzles, challenges, extra-projects, culture

* Art class pending.

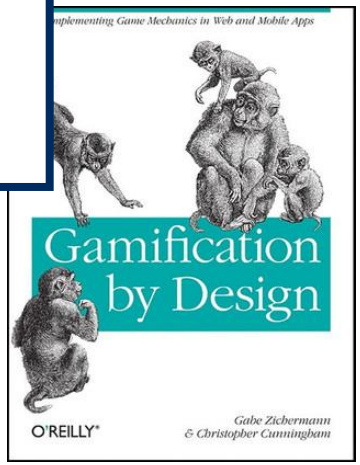
Gamification Mechanics

- Mechanics = how the system turns inputs into outputs

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

  - Points
  - Badges
  - Lea
  - Gar
  - Cha
  - Rul
  - Feedback
  - Unlocked content
  - … so many more

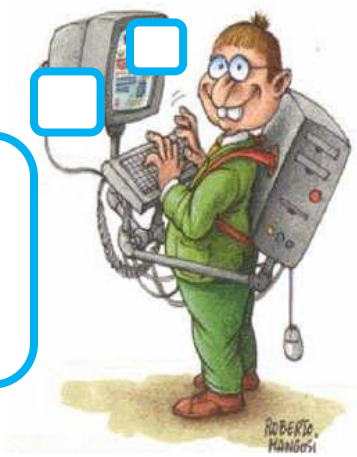
Q: Which mechanics have I already demonstrated **in this session**?



Read this article →

Iosup,Epema, …On Using Gamification in Technical Higher Education, ACM SIGCSE'14. http://goo.gl/V97zSW

(Social) Gamification Dynamics



What is my status?
How to get closer to winning?
When can I make a *choice*?

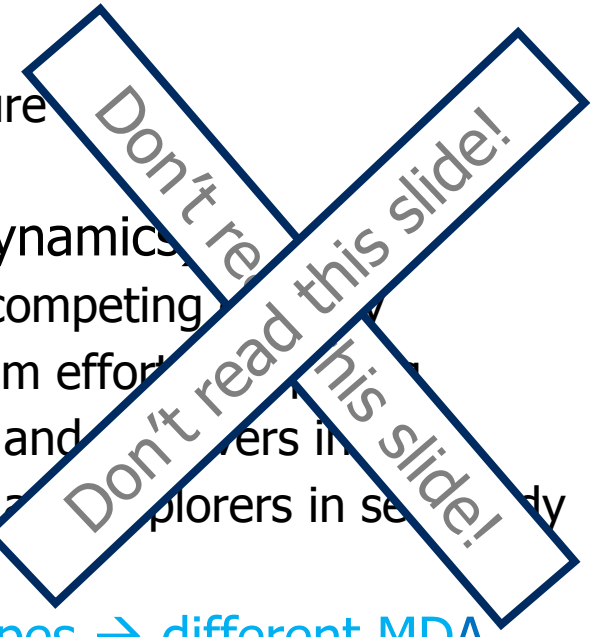
- Individual dynamics (so, regardless of what others do)
  - Students can spend their points for some reward
  - Students earn access to more advanced content
- Group dynamics (so, regardless of what students outside the group do)
  - Peer-reviews are discussed with the group (mechanic), and result in 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

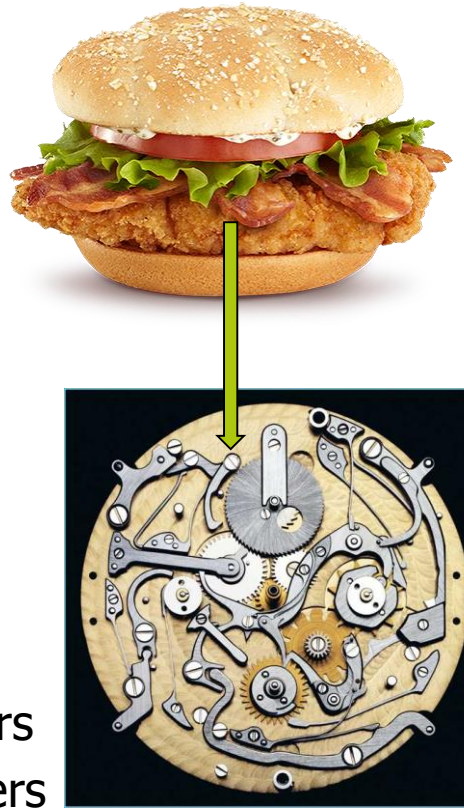
Gamification Mechanics & Dynamics in Our Courses

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

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

- Social Learning (dynamics)
  - In-class teams, competing
  - Self-study as team effor
  - Involve Winners and ers i
  - Involve Winners a plorers in se dy





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

Read this article →

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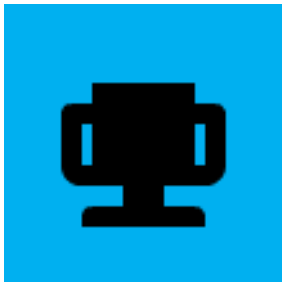
Assessment That Motivates!

10,000 points for a 10



+50 for good activity
+1,000 for most challenging activity

Badges, unlocked content

Our Diverse Scoring System

1. Course Points	2. Access Tokens	3. Brownie Points
10,000 for straight 10	Start with 1	
+1,000 **team** self-study		
+1,000 lab bonus #2	Bonus Lab assignments	I will bake brownies for *you*! (but not force you to eat them)
+500 lab bonus #1		
+300 correct exam Q	**Advanced topics** (GPUs, clouds)	
+50 activity in Lab/Lecture/Tutorial	Discuss w Lecturer	
+25 correct end-lecture quiz	Propose Exam Qs	
+500 entry quiz	**Rec. letter**	

Gamification a la Carte
(5 minutes work + 5 minutes talk)

- Groups of 3-4
- Convince your team before writing down an answer
- Discussion (talk) at end

Q: Which mechanics and dynamics would you like now to use in your own course?
"I would use … because …"

Voting on best answer

1. **Mechanics**
   Explore, do, learn, socialize, compete
   +
2. **Dynamics**
   progress/learning graph, social engagement, others
   +
3. **Game Content**
   puzzles, challenges, extra-projects, culture

A Framework for Gamification in Higher Education

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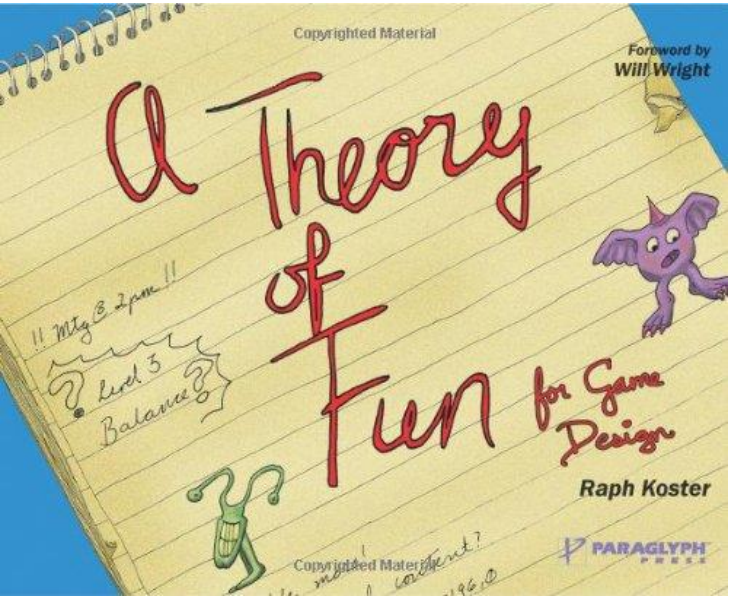
5. Operate your gamified course.

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

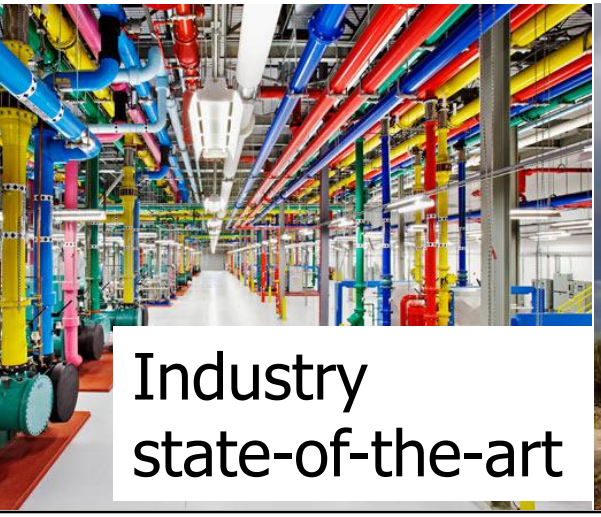
Learning Objectives

BSc-CO, 6 h)	MSc- (140h)
Digital Logic an Data Representat	Overvi clou ing
Computer Architect Organization	S and e Management
Interfacing and I/O Strategies	Centers and rgy Efficiency
Memory Architecture	tenancy concepts, ualization
Functional Organ	gramming models
Multiprocessin	Cas
Performance ments	Gues
rections in Compu	

Try something else

Try something else

Try something else



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/ (right) personal library of A. Iosup.

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?

Agenda for Today or Gamification. Because Every Student Counts!

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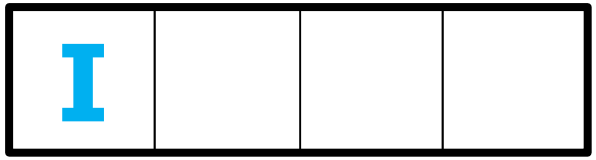
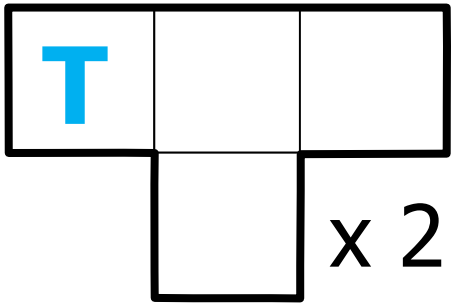
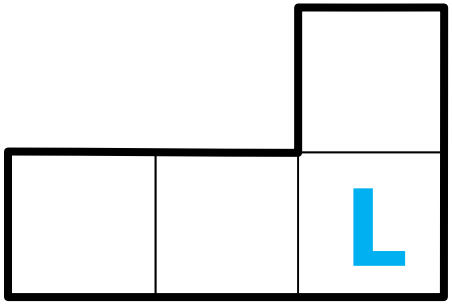
4.	focus on dynamics and mechanics	½
5.	focus on assessment	1
6.	Playtesting for fun and motivation	1
7.	Operating a gamified course	1
4.	Does gamification work?	½
5.	Wrap-up	½

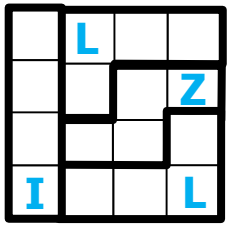
* Mechanics, Dynamics, Aesthetics







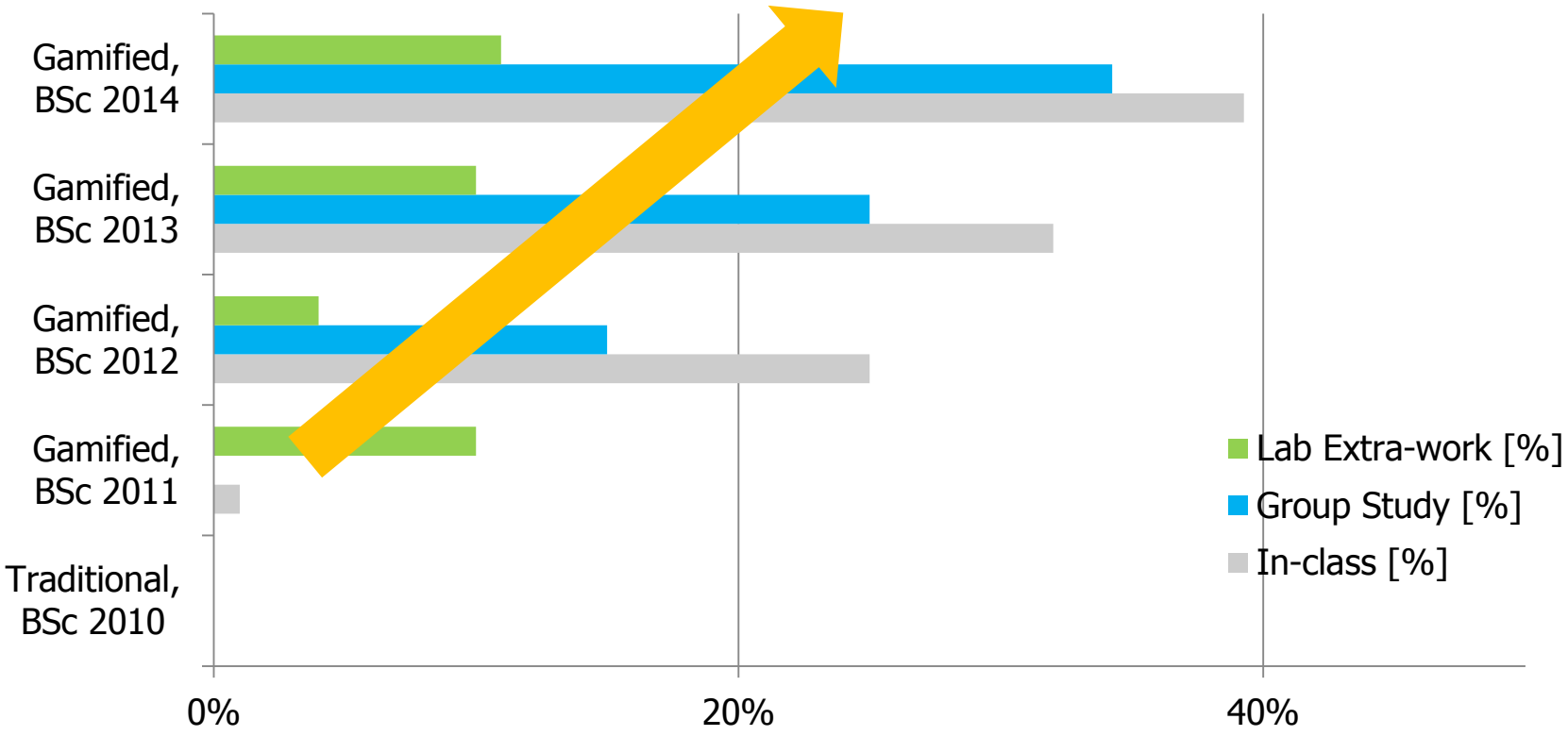
Does gamification work?



>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]

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."

There's No Free Lunch!

- Gamification takes time and energy
  - One week to consider gamification elements +
  - One day per lecture for adaptation +
  - Continuous adaptation +
  - Continuous assessment, e.g., end-lecture quiz +
  - Explaining a new system to students +
  - The nitty-gritty details

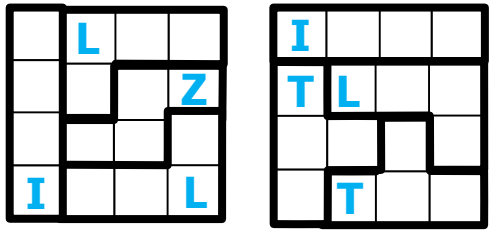
- Gamification takes personal effort
  - A new system has to conquer inertia
  - A new system has to conquer doubt

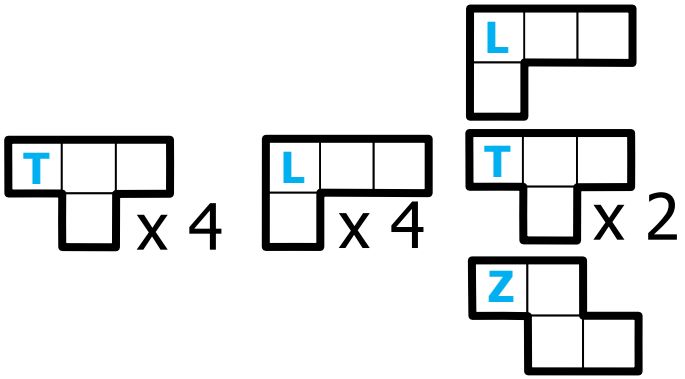
- **You are not alone, we are here to help!**

Agenda for Today or Gamification. Because Every Student Counts!

		Time Units
1.	Introduction	1
2.	An intuition behind gamification	1
3.	A practical framework for gamification in higher education (getting your courses gamified)	5½
1.	Refresher on higher-education basics	½
2.	Understanding student types	1
3.	Designing the gamified experience, focus on the MDA* framework	½
4.	focus on dynamics and mechanics	½
5.	focus on assessment	1
6.	Playtesting for fun and motivation	1
7.	Operating a gamified course	1
4.	Does gamification work?	½
5.	Wrap-up	½

Designing a course is like creating a complex puzzle





Gamification as concept & intuition, mechanics & dynamics, ...

Lumaxart Trophy Winner

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.
   - Focus on the Mechanics-Dynamics-Aesthetics Framework
   - Focus on Mechanics and Dynamics
   - Focus on Assessment

4. Playtest your design and check for fun!

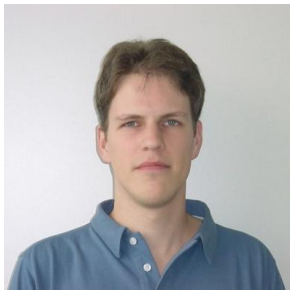
5. Operate your gamified course.

Gamification works!

Thanks from our team.

Alexandru Iosup

Gamification Researcher & Professor



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