Instructional Design of active online learning through Serious Games

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EPIC conferentie Versnellingsplan
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Dutch students are amongst the least motivated in the world (PISA 2015-2020 reports)
Education 2030 Curriculum: 
An Analysis of the Netherlands Curriculum Proposal (OECD, 2020)

More meaningful learning in authentic contexts: experiential learning

More attention for multi-disciplinary themes
   (like Citizenship; Sustainability; Healthcare in the aging society)

More attention for transversal skills
   (like Critical thinking; Media-literacy; Creativity and Problem solving; Self regulation and reflection, Entrepreneurship; Inter-cultural communication Skills)

(Also see: curriculum.nu)
See also: Radović, Hummel, & Vermeulen (2021). The mARC instructional design model for more experiential learning in higher education: theoretical foundations and practical guidelines. Teaching in Higher Education. doi:10.1080/13562517.2021.1872527
Serious gaming: what ‘science’ tells us (1)

Much potential, little use

Game-based learning holds much potential, has been investigated in a great variety of scientific disciplines and domains over the last two decades. A recent literature review (Zhonggen, 2019) on serious games over the last decade shows that, especially since 2015, numbers of empirical studies have been increasing. However, its uptake as a mainstream educational medium still lags far behind that academic hype (Wouters et al., 2013; Boyle et al., 2016).

Inflation of terms: gamification or ‘chocolate covered broccoli’

To design integrated serious games is rather different from ‘gamification’ of education, whereby just one or some gaming elements (like badges, a Kahoot quiz, or videoclip) are added to existing education for a more playful appearance (Shaffer [2007] referred to this as ‘chocolate-covered broccoli’).

Gamification has indeed been found to initially motivate learners (it is more fun for a while), but not to contribute to sustained learning of complex skills. Enjoyment and motivation were not found to be influencing factors for learning effects, although this often is thought to be the case. But the other way around, increased enjoyment and motivation are reported as resulting factors improved learning and efficiency through gameplay (All, Nunez Castellar, & Van Looy, 2015).
Serious game design is a serious profession

Conceived *paradox* between wanting more active and meaningful learning on one side, and practical limitations for high quality online learning on the other. Courses offered in response to crisis or disaster are meaningfully different from well-designed online courses (Hodges, Moore, Lockee, Trust, & Bond, 2020). Need to professionalize teaching staff on ‘digital didactics’.

Need for dedicated ID models and support: ‘garbage in, garbage out’

Overall, researchers report the need for a general evaluation framework for quality assessment of serious games, and some dedicated design methods have been suggested (eg, Hainey & Connolly, 2010; Mayer, 2012; Nadolski et al., 2008). Adequate relationships between learning attributes and gaming mechanics were found to be critical for the quality of instructional (game) design and desired learning outcomes, and some models for their mapping have been elaborated (eg, Arnab et al., 2015; Carvalho et al., 2015).

Potential for transversal skills

Positive effects of acquiring more transversal (or generic) skills (that are not specifically related to certain jobs or domains, like media literacy, negotiation, entrepreneurship, critical analysis, problem-solving or research skills) on both awareness and commitment during academic and professional careers, have been reported. When students have more concrete ideas of their own interests and preferences, they can better engage with future careers.
Importance of meaningful, authentic (‘whole’) learning tasks and scenarios

Active learning through meaningful and playful practice has shown to positively influence students’ professional awareness and skills (e.g., Boersma, ten Dam, Volman, & Wardekker, 2010; Meijers, Kuijpers, & Gundy, 2013; Sherman, Sebora, & Digman, 2008; Hummel et al, 2011; 2015; 2017; 2019; 2021).

Importance of ‘rich’ learning environments

“Professional games” provide learning context that simulates the context in which students will apply their learning. Learning activities become more relevant and motivating, and increase the likelihood that acquired skills will actually transfer to real-world situations (Herrington, Oliver, & Reeves, 2003; Hoekstra, 2011). Such gaming or playful learning in context is recognized as an activity that can enhance students’ motivation to learn and lead to better learning results when compared with more traditional learning (e.g., Boyle et al., 2016; Garris, Ahlers, & Driskell, 2002; Wouters & van Oostendorp, 2013).
Does player experience clear purpose?

Does player decide on strategy for solution?

Does player make meaningful choices?

Can player try out new strategies or choices without instant karma?

Direct feedback loop
4C/ID model

2 develop assessment instruments

- analyse non-routine aspects
  - 5 analyze cognitive strategies
  - 6 analyze mental models
- 3 sequence learning tasks
- analyse routine aspects
  - 8 analyze cognitive rules
  - 9 analyze prerequisite knowledge
- 10 design part-task practice
- 1 design learning tasks
- 4 design supportive information
- 7 design procedural information
**LM/GM model**

1. Introduction
2. Selecting scene
3. Observe discussion
4. Evaluate arguments
5. Compare own perception
6. Scenario complete
7. Debriefing & communal discourse

Learning mechanics:
- a) Instructional
- b) Action/task
- c) Participation
- d) Observe
- e) Explore
- f) Discover
- g) Q&A
- h) analysis
- i) Hypothesis
- j) Reflecting
- k) Assessment
- l) Feedback
- m) ownership

Game mechanics:
1. Role play
2. Goods/information
3. Selection/collection
4. Cut scene/story
5. Cascading information
6. Stimulate
7. Assessment
8. Action points
9. Feedback
10. Communal discovery
11. Behavioural momentum
12. Status
Playful design canvas (HKU)
EMERGO games

(Also see: https://www.ou.nl/-/emergo)
Voorbeelden EMERGO games

Tycoonstructor (2021)
https://emergo.ou.nl/emergo/skins/ounl2/run.zul?cacId=8656&tagId=1&runstatus=previewreadonly&rgaId=8749
&rutId=&lang_lang=en&lang_count=EN&lang_var=&unique_par=567C3750A2F84907DCA92A862F0168018A2DA1BF14873 (UK)

Snuffelstage psychologie (2019)
https://emergo.ou.nl/emergo/skins/ounl2/run.zul?cacId=8773&tagId=1&runstatus=previewreadonly&rgaId=8966
&rutId=&lang_lang (NL)

De aanslag (2020)
https://emergo.ou.nl/emergo/skins/ounl2/run.zul?cacId=8930&tagId=1&runstatus=previewreadonly&rgaId=9258
&rutId=&lang_lang=
### Entrepreneurial (sub)competences as identified (by EntreComp and SOCCES projects)

<table>
<thead>
<tr>
<th>1. Ideas &amp; opportunities</th>
<th>2. Resources</th>
<th>3. Into action</th>
</tr>
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<tbody>
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<td>1. Creativity and innovation</td>
<td>2. Teamwork and collaboration</td>
<td>3. Communication</td>
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<td>4. Critical and analytical thinking</td>
<td>5. Positive attitude and initiative</td>
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**Spotting opportunity; Creativity; Valuing ideas; Vision; Ethical and sustainable thinking**

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### Entrepreneurial competences for construction as identified and selected (by our survey)

<table>
<thead>
<tr>
<th>1. Be accountable; Assess consequences and impact of ideas, opportunities and actions; Ethical and sustainable thinking</th>
<th>2. Inspire, engage and get others on board; Communicate effectively; Motivation and perseverance; Stay focused and don’t give up; Be determined; Mobilizing resources; Believe in yourself and keep developing; Self-awareness and self-efficacy</th>
<th>3. Learning through experience; Learn by doing; Planning and management; Taking the initiative; Working with others Take responsibility; Prioritize, organize and follow up.</th>
</tr>
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<tbody>
<tr>
<td>4. Ethical and sustainable thinking</td>
<td>5. Motivation and perseverance</td>
<td>1. Taking the initiative; 2. Learning through experience; 3. Working with and mobilizing others</td>
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![Open Universiteit](https://www.ou.nl)
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<tr>
<th>Competences / case leads</th>
<th>Learning goals</th>
<th>Criteria</th>
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<tr>
<td><strong>Ideas and opportunities</strong></td>
<td></td>
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</tr>
<tr>
<td><strong>1.5. Ethical and sustainable thinking</strong></td>
<td>Be able to assess the consequences and impact of ideas, opportunities and actions in an ethical and sustainable way</td>
<td>Assess the consequences of ideas that bring value and the effect of entrepreneurial action on the target community, the market, society and the environment; Reflect on how sustainable long-term social, cultural and economic goals are, and the course of action chosen; Act responsibly</td>
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<tr>
<td>(Case lead 4: Spain)</td>
<td></td>
<td></td>
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<tr>
<td><strong>Resources</strong></td>
<td></td>
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<tr>
<td><strong>2.2. Motivation and perseverance</strong></td>
<td>Stay focused and don’t give up</td>
<td>Be determined to turn ideas into action and satisfy your need to achieve; Be prepared to be patient and keep trying to achieve your long-term individual or group aims; Be resilient under pressure, adversity, and temporary failure</td>
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<td>(Case lead 5: Germany)</td>
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<tr>
<td><strong>Into action</strong></td>
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<tr>
<td><strong>3.1. Taking the initiative</strong></td>
<td>Go for it when you see the chance</td>
<td>Initiate processes that create value; Take up challenges; Act and work independently to achieve goals, stick to intentions and carry out planned tasks</td>
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<tr>
<td>(Case lead 1: Italy)</td>
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<tr>
<td><strong>3.4. (and 2.3.) Working with and mobilizing others / resources</strong></td>
<td>Team up, collaborate and network; Inspire, enthuse and get others on board</td>
<td>Work together and co-operate with others to develop ideas and turn them into action; Network; Solve conflicts and face up to competition positively when necessary; Inspire and enthuse relevant stakeholders; Get the support needed to achieve valuable outcomes; Demonstrate effective communication, persuasion, negotiation and leadership</td>
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<td>(Case lead 3: UK)</td>
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<tr>
<td><strong>3.5. Learning through experience</strong></td>
<td>Learn by doing</td>
<td>Use any initiative for value creation as a learning opportunity; Learn with others, including peers and mentors; Reflect and learn from success and failure (your own and other people’s)</td>
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<tr>
<td>(Case lead 2: Slovenia)</td>
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<tr>
<td>Case leads</td>
<td>Name mini-game</td>
<td>Game Mechanisms</td>
</tr>
<tr>
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<tr>
<td>1 Italy</td>
<td>1.1 Business opportunities</td>
<td>Simple selection game</td>
</tr>
<tr>
<td></td>
<td>1.2 Ayusha</td>
<td>Interactive dialogue</td>
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<td></td>
<td>1.3 Padua Housing Project</td>
<td>Interactive dialogue + selection game</td>
</tr>
<tr>
<td>2 Slovenia</td>
<td>2 Smart House</td>
<td>Interactive dialogue + assignments</td>
</tr>
<tr>
<td>3 UK</td>
<td>3.1 Project planning</td>
<td>Drag-and-drop game</td>
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<tr>
<td></td>
<td>3.2 Team</td>
<td>Ranking game</td>
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<td></td>
<td>3.3 Suppliers</td>
<td>Complex calculation</td>
</tr>
<tr>
<td>4 Spain</td>
<td>4.1a Target Groups</td>
<td>Selection game (simple)</td>
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<tr>
<td></td>
<td>4.1b Impacts</td>
<td>Selection game (medium)</td>
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<tr>
<td></td>
<td>4.2 The Logic Model</td>
<td>Selection game (complex)</td>
</tr>
<tr>
<td>5 Germany</td>
<td>5.1 Project Planning</td>
<td>Medium selection game</td>
</tr>
<tr>
<td></td>
<td>5.2 Heritage Authority</td>
<td>Interactive dialogue</td>
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<td>5.3 Incidents at the worksite</td>
<td>Interactive dialogue with assignments</td>
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PhD position Serious Game Design

PhD position AI in Education