Chapter Ten

Lessons Learnt from a Decade of Game Development for Higher Education in Delft

Harald Warmelink, Geertje Bekebrede, Casper Harteveld, Igor Mayer and Sebastiaan Meijer

Introduction

The city of Delft, on the West coast of The Netherlands, is known for its blue pottery, the murder of William of Orange, the painter Johannes Vermeer and many other famous historical figures and events. Delft is less well known for transforming its university education into learning through games. Yet, during the past decade, Delft University of
Technology (DUT) has developed many games “in house” and used them within several of its engineering curricula.

Between 2001 and 2011, a growing number of researchers, teachers, students (Masters and PhD), and designers at DUT gradually became involved in gaming. This emerging “gaming group” produced many digital and analogue games with a focus on university education. The games were often developed from simulations, following the well-established simulation gaming or gaming/simulation tradition (Duke, 1980; Duke & Geurts, 2004).

Such games are often based on models of real-world socio-technical systems; that is, systems in which technology as well as organisation and management play pivotal roles. We subsequently add principles of gaming, most notably player goals, rules and interdependencies, to incentivise players into action. The result is an artefact that is arguably as much a simulation as it is a game, as becomes evident when positioning it on the Simulation Triad (Wills, this volume). Our games typically have a handful of roles and quite a high number of problems and rules.

Well over a thousand DUT students have played the games in a variety of engineering-related courses including project management, spatial planning or port management. The students come from different faculties, including Architecture and Civil Engineering, and mostly from the Faculty of Technology, Policy & Management (TPM).

The core gaming group also originated and resides in the TPM faculty. It now consists of twelve junior and six senior researchers working in various departments of the faculty, as well as a flexible production team of twelve young and dedicated game developers. This is of course not how we started or even what we envisioned a decade ago. We went through enough success stories to stay motivated but we also experienced quite a few painful failures.

In current game design literature (e.g. Duke & Geurts, 2004; Harteveld, 2011) little attention is devoted to the practical issues of developing and applying games in higher education. Cermak-Sassenrath and Walker (this volume) are among the few who shed light on how an educational institute changes organisationally when applying games or principles of play in a curriculum. We therefore suggest that our specific lessons learnt will be of value to anyone who is interested in developing and using games in their own curricula.
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This chapter is practical in nature with a strong emphasis on how university teaching is transformed through games (that is, game development and application) and what we can learn from this, rather than how students learn from playing games (that is, game use and effectiveness). We look back on our experiences to reveal and self-evaluate our approach, distilling some best practices in game development for higher education. We specifically pay attention to three issues: what role technology has (or should have) when developing games, how games are to be embedded in curricula, and what it means to manage a game development project. Before we discuss our games, we will explain our vision of using this educational method at DUT.

Game-based Education at DUT

DUT in general and the TPM faculty in particular, focuses primarily on the management of technology-based societal issues in both public and private environments. Much of the research and teaching is concerned with the design and management of "complex infrastructure systems" (Mayer, 2008; Russell, this volume). This topic is relevant to areas such as transport and logistics, energy markets, urban planning and sustainable development.

In our education, we try to bring real world cases to life. This is where gaming plays an important part. Through gaming, students can experience the usefulness or meaning of theories, methods or skills within the real world without the risk of negative consequences for the student, teacher or external world. In terms of Kolb's (1984) experiential learning cycle, we use games to give students a "concrete experience" from which they can learn. In our view, to foster this learning a game is not, and never should be, an isolated educational method. Lectures and other course methods and material are needed to assist students move through Kolb's other stages; most notably reflection on the experience and formulation of a subsequent theory. We propose four specific rationales for embedding games into a curriculum:

1. Sensitising: a game is used at the beginning of the course to sensitise students to the problem situation: for example, managing a large infrastructure project. Based on this concrete experience, students will get a better understanding of the theories discussed later in the course.
2. Exploring: once students know about a problem a game can be used to explore its different dimensions; for example, how the complexity of a large infrastructure project can influence management. Now theory comes first and students will experiment with how it takes place in a simulated real-world case.

3. Practising: often theories or skills need some practice for learning to take place. How does one practise "project management skills" as a university student or, more specifically, the "planning and management of an off-shore wind farm"? A game provides an ideal setting to apply and practice such knowledge or skills safely.

4. Proofing: less common but intriguing is the use of a game to assess students. Performance in the game is an indication of how well a student has acquired relevant knowledge and/or skills.

In terms of game technology, the variety of games that we have developed and used is significant. We apply four main forms of games:

1. Analogue games: games that do not make use of computers or computerised simulations. Players may use all kinds of game paraphernalia, such as blocks, maps, boards, cards, dice, pawns and chips, and may communicate face-to-face.

2. Computer-supported games: a computer system (that is, a set of stand-alone computers or a local network of computers) may handle difficult and time-consuming calculations or feedback about the consequences of the players' individual and collective decisions. Players do not necessarily interact with the computer software. Some kind of support desk might take care of it and provide the results.

3. Computer-based games: players interact directly with computers. Players make their choices, take actions, make decisions and get feedback through the game's digital user-interface. Multiple computers are connected in a network to allow multiplayer game play or to keep track of scores and performances. Computer-based games are usually played in one half-day session at one location.

4. Distributed/online games: players use their own personal or work computers to play the game. A single player game can be...
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A game can be downloaded or otherwise distributed to the players at home, work or a training location. When it is a multiplayer game, the players usually log in, communicate and collaborate through the internet.

One excellent example is called "SimPort-MV2" (Bekebrede, 2010). In this computer-based game, used for sensitising as well as exploring, students have to learn about the planning and exploitation of a major port extension project. The complexity, extensiveness and duration of this infrastructure project can hardly be taught in any other way.

This game is one of many we have used. In fact between 2001 and 2011 we have used seventeen games: four analogue, four computer-supported, five computer-based and four online. Here is a closer look at the complete portfolio.

DUT's Portfolio of Games

We base our lessons on a database in which we systematically reconstructed and analysed our historic portfolio. This database consists of thirteen games that were developed (mostly) "in house" and four that were acquired ready-made from other developers. This set of examples is far from exhaustive. Other games with a non-educational objective and/or used for advanced, professional learning and training outside formal education were excluded from our analysis. To analyse the relevant games we gathered metadata on six factors, namely:

1. The types of curriculum embedding and technology use noted above
2. The games' start and end year of development and use
3. Budgets and costs
4. Total development time
5. Involved developers and sponsors
6. In-game and learning objectives

Our purpose is to identify and reveal salient insights, which are important to keep in mind for the discussion on the development issues of game technology, curriculum embedding and project management. Table 1 gives an overview of the seventeen games in our portfolio.
<table>
<thead>
<tr>
<th>Game name</th>
<th>In-game objective</th>
<th>Explicated learning objective</th>
<th>Application of the game in course</th>
<th>Game name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sim-MV2 &amp; SimPort-MV2</td>
<td>Plan, build and manage a port extension project</td>
<td>Insight into the complexity of port planning</td>
<td>Sensitising, exploring</td>
<td>Electricity Market Simulation Game (EMSG)</td>
</tr>
<tr>
<td>Ventum &amp; Ventum Online</td>
<td>Form a consortium to tender, plan and build an offshore wind farm</td>
<td>Insight into and training of project management skills</td>
<td>Sensitising, practising</td>
<td>Tramtunnel (Designed by Erasmus University Rotterdam)</td>
</tr>
<tr>
<td>Construct.it</td>
<td>Redevelop an existing urban port district.</td>
<td>Insight into and training of skills for construction management</td>
<td>Sensitising</td>
<td>Shark world (Designed by Ranj Serious Gaming)</td>
</tr>
<tr>
<td>DUBES</td>
<td>Redevelop an existing urban neighbourhood</td>
<td>Insight into implementation of sustainable urban development</td>
<td>Sensitising</td>
<td>Cartonia (Designed by Erasmus University Rotterdam)</td>
</tr>
<tr>
<td>Sieberdam</td>
<td>Come to an agreement about renovating a railway area district</td>
<td>Insight into and training of skills for policy making</td>
<td>Sensitising, practising</td>
<td>TopSim (Designed by TopSim BV)</td>
</tr>
<tr>
<td>Global Supply Chain Game (GSCG)</td>
<td>As a distributor, stay ahead of competition by managing a global network of suppliers and customers</td>
<td>Insight into and training of skills for supply chain management</td>
<td>Sensitising</td>
<td></td>
</tr>
<tr>
<td>Patentopolis</td>
<td>Get the highest revenues by managing your patent portfolio</td>
<td>Insight into and training of skills for patent management</td>
<td>Sensitising</td>
<td></td>
</tr>
<tr>
<td>Team-Up</td>
<td>Clear the puzzles as a team as fast as possible</td>
<td>Training of team role competences and assessment of team role performance</td>
<td>Practising, proofing</td>
<td></td>
</tr>
<tr>
<td>Containers Adrift</td>
<td>Come to stakeholder agreement about a plan for building an inland container terminal</td>
<td>Insight into and training of skills for process management and interactive policy making</td>
<td>Sensitising</td>
<td></td>
</tr>
<tr>
<td>Road Roles</td>
<td>Try to get the best tender for road maintenance</td>
<td>Examining the consequences of different tendering procedures</td>
<td>Sensitising, exploring</td>
<td></td>
</tr>
</tbody>
</table>

Table 1: The Games

A Predominam

From Table 1 it for "sensitising" a learning objective type of learning. So a gap seems the designers and volume) also later the model for [g: exploring (SimPo Ventum Online, only one for proof]
A Predominant Application

From Table 1 it becomes clear that the predominant use of games is for “sensitising” students about a topic relevant to the course. Explicit learning objectives behind the games promise a different, more complex, type of learning – such as better understanding of a particular theory. So a gap seems to exist between the explicated learning objectives of the designers and the way teachers use it. Henriksen and Lainema (this volume) also identify this gap in their discussion of the 1-2-1 application model for games and experiential learning. We do use games for exploring (SimPort-MV2 and Road Roles), six for practising (Ventum, Ventum Online, Sieberdam, Shark World, Team-Up and TopSim), but only one for proofing (Team-Up).
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**A Potpourri of Ambitions**

To illustrate the differences in development of the games, Table 2 lists the type, the order of magnitude of the development cost, and the general composition of the project team, for each game in our portfolio.

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Development costs (in €k)</th>
<th>Project team</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sim-MV2 &amp; SimPort-MV2</td>
<td>Computer-based (2D)</td>
<td>&gt; 100 &amp; &gt; 100</td>
<td>1 PhD student; 2 BSc graduate projects; 1 research assistant; 1 faculty member and input from client</td>
</tr>
<tr>
<td>Ventum &amp; Ventum Online</td>
<td>Analogue &amp; distributed/online (2D)</td>
<td>&lt; 20 &amp; 50–100</td>
<td>2 researchers initially; 1 BSc graduate project; external game company</td>
</tr>
<tr>
<td>Construct.it</td>
<td>Computer-based (3D)</td>
<td>50–100</td>
<td>1 researcher; 1 PhD student; external game company</td>
</tr>
<tr>
<td>DUBES</td>
<td>Computer-supported (2D)</td>
<td>20–50</td>
<td>Several faculty members in collaboration with a consultancy company</td>
</tr>
<tr>
<td>Sieberdam</td>
<td>Distributed/online</td>
<td>50–100</td>
<td>Existing case was implemented in an existing learning environment</td>
</tr>
<tr>
<td>Global Supply Chain Game (GSCG)</td>
<td>Distributed/online (2D Online)</td>
<td>&gt; 100</td>
<td>1 faculty member; 1 PhD student with input from other PhD students; several MSc graduate projects</td>
</tr>
<tr>
<td>Patentopolis Team-Up</td>
<td>Analogue (3D)</td>
<td>&lt; 20</td>
<td>5 students during game development project course; DUT game team later improved it</td>
</tr>
<tr>
<td>Containers Adrift</td>
<td>Computer-supported (Excel, Visio and Arena)</td>
<td>20–50</td>
<td>Several faculty members</td>
</tr>
<tr>
<td>Road Roles</td>
<td>Computer-supported (Excel)</td>
<td>&lt; 20</td>
<td>1 PhD student; 2 MSc students during game development project course; input from experts</td>
</tr>
</tbody>
</table>

Table 2 is quite low, at least "serious game" development cost of entering our analogue is €50k. Budgets are making or buying supported games, buying a licence (re-purposed) ent for repeated use, sma. With a standard expected and have

**Finance Strateg.**

In many cases, we including DUBES, city funds to project supported develop Ventum Online. S.
games, Table 2 lists cost, and the general portfolio.

Table 2 shows that the development budgets of many of the games are quite low, at least if compared to the budgets available for commercial “serious game” development, and even more so if compared to the production cost of entertainment games. The development budgets for most of our analogue or computer-supported games were around or below €50k. Budgets are mainly set to cover hours spent on design and testing, making or buying artwork and software programming for the computer-supported games. This might be considered rather high compared to buying a licence on the market for a commercial-off-the-shelf game or (re-purposed) entertainment game. However, with many students and repeated use, small licence fees for an education game quickly add up. With a standardised learning product you might not get the quality expected and have few possibilities for modification.

Finance Strategies

In many cases, we developed games with the support of research grants including DUBES, SimPort-MV2 and Road Roles. National or university funds to promote the use of ICT and games in education also supported development of several games (Sieberdam, Construct.it and Ventum Online). Some external clients supported development, such as

<table>
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</tr>
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<tbody>
<tr>
<td>Electricity</td>
<td>Computer-based (2D)</td>
<td>20–50</td>
<td>1 faculty member; 1 PhD student; improved by external game company</td>
</tr>
<tr>
<td>Tramtunnel</td>
<td>Analogue</td>
<td>&lt; 20</td>
<td>Erasmus University Rotterdam</td>
</tr>
<tr>
<td>Shark World</td>
<td>Distributed/online</td>
<td>&gt; 100</td>
<td>Ranj Serious Gaming</td>
</tr>
<tr>
<td>Cartonia</td>
<td>Analogue</td>
<td>&lt; 20</td>
<td>Erasmus University Rotterdam</td>
</tr>
<tr>
<td>TopSim</td>
<td>Computer-supported</td>
<td>License</td>
<td>TopSim BV (Tata Interactive Systems)</td>
</tr>
</tbody>
</table>

Table 2: Type, Costs and Project Team of Games Used in DUT Curricula
the Port of Rotterdam (SimPort-MV2) or consortia of universities or other educational institutions (Cartonia). Some games had no real need or client at the start and hence no budget, but just seemed like a game worth bringing to life. A good example is the game Ventum Online. The development of Ventum Online started in 2001 and lasted until 2005. It was the first project where we tried to involve game technology, specifically in the form of a Flash-based graphical user interface and web-based, multi-user gameplay, to create a new generation of games. We had virtually no budget and nobody waiting for it and most of the software was developed by a student during his internship period.

Hidden Costs

The development of Ventum Online suggests that if you include hidden costs the total cost for a game can be much higher, possibly by a factor of two or three. The “hidden costs” are due to some of our games emerging from a mixture of personal and organisational ambitions — PhD research, education, training, public relations, show cases, hobbyhorses and pet projects, where personal time is not costed. Moreover, the games need to meet the demands of a university environment — quality, originality and innovativeness — rather than cost-efficiency. In addition hours spent on the development of games by researchers, lecturers and interns are considered part of their regular work activities — teaching or research. A lot of work also was done by relatively low-waged students and interns.

The cost of two games went through the roof: the Global Supply Chain Game and SimMV2/SimPort-MV2. Both of them were core parts of PhD research into gaming for learning and policy making. The PhD students involved spent much of their four-year research period conceptualising, developing and subsequently validating and studying their games (Van Houten, 2008; Bekebrede, 2010). In both research projects the eventual games kick-started the development of modular and flexible game engines — basic software systems with which more games of a similar genre could be developed easily. These game engines did indeed lead to the development of a suite of similar games for higher education as well as other learning contexts. Therefore, looking back, the costs and efforts seem worthwhile. The games are still being updated and played, and the projects had several spin-offs.
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The Life Span

Figure 1 shows the life cycle of our games. It shows that our games' "time-to-live" (the total time up until application) varies markedly. Some of the early games, like Cartonia, Ventum Online, Tramtunnel and Patentopolis are still in use, although most of them are played sporadically. Others were discarded after some productive years. Most were in service for at least three or four years. We attribute the short life spans to two issues.
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Some games were gambles, turning out to be something of a failure in the eyes of the teachers or designers because they were not engaging and/or not leading to the desired learning outcomes. Other games were abandoned because the users or owners left DUT and no one else wanted to champion them.

Game Development Issues

Following our reflections on the game portfolio we now discuss three important game development issues: the role of technology, curriculum embedding, and project management. From this discussion we can derive several lessons relevant to game development in higher education.

The Role of Technology

Over the past years we have seen a shift from analogue to computer games. This was occurring in line with the increased capabilities and reduced costs of computer game technology – game engines and game development software. However, the shift towards computer games is not final. In fact, the real long-runners in terms of use are the analogue games (see Figure 1). It was and is relatively easy to take them off the shelf and run them in class, as long as teachers know how to run them. Often the learning objectives of a course do not necessitate computer games, especially if they revolve around social interaction.

Computer games such as Containers Adrift and DUBES have been played with many generations of DUT students. But the computer models and interfaces became out-dated, unstable and impractical and the early generation of computer-supported and computer-based games required a face-lift after some years of use. These sophisticated games can take a day or so to run and the knowledge and experience on how to do so also disappeared after some time, as explained earlier. The most successful ones – Ventum and later SimMV2 – were replaced by new versions that incorporated new state-of-the-art technology and had improved game play following several years of experience. The analogue game Ventum became the computer-based Ventum Online, and the limited version of SimMV2 became the success story that is now the commercial service SimPort-MV2.

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Apart from Shai games were play Conversely, Shai Online, Sieberd: from other locati even if they were As indicated might be due tc applications thes objectives of the a focus on gaini certain course oi games are appli course’s content Port Developm because the cou the game but n although Ventu about project an
In terms of graphics we see limited diversity amongst computer games. Most games include a two-dimensionally rendered virtual environment or a simple combination of texts, graphics and static imagery. Only four games included a three-dimensionally rendered virtual environment at one point in their development (Team-Up, Sieberdam, SimPort-MV2 and Construct.it). The reason lies in our multi-actor systems perspective that calls for a graphical user interface that does not necessarily include a three-dimensional environment. When we did include a three-dimensional environment, it did not have a clear role in the game play. As a result, it also did not contribute to learning, as was quickly evident from student and teacher evaluations. Team-Up is the notable exception because the three-dimensionally rendered abstract puzzle world contributes to the main goal of the game: learning how to collaborate and communicate as a team within an unknown and uncertain working environment.

**Curriculum Embedding**

Apart from Shark World, all games were multi-player by design. Most games were played at a single location at a specific moment in time. Conversely, Shark World and three other computer games (Ventum Online, Sieberdam and Global Supply Chain Game) could be played from other locations (including home) and at the players’ own discretion, even if they were multi-player in nature.

As indicated earlier, most games were used for “sensitising”. This might be due to inexperience with or unawareness of other possible applications these games have. More likely it is related to the curriculum objectives of the courses at the Faculty of TPM which happen to have a focus on gaining insight into a topic. Whatever it may be, within a certain course or curriculum, two particular uses emerge. Firstly, some games are applied within a course because the game’s domain fitted the course’s content very well – for example, SimPort-MV2 used within a Port Development course. Secondly, games are applied within a course, because the course content fits with the topic of, or the theory behind, the game but not necessarily the domain of the game. For example, although Ventum Online and SimPort-MV2 were applied in courses about project and process management in large infrastructure projects,
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the games’ domains are actually concerned with wind farm and port development, respectively.

As discussed earlier, and in agreement with O’Neil et al. (2005), we support the proposition that games themselves are not sufficient to guarantee learning. However, elements exist in games that can be activated within an instructional context to enhance the learning process (Garris et al., 2002). This key element is concrete experience. As Wolfe (1997) notes, learning outcomes are affected by the instructional strategies employed, and teacher must support the process of reflection and theory building based on the experience, as discussed by Henriksen and Lainema (this volume).

The games are often played by relatively small groups of students. In some learning contexts students take on interactive and practical assignments (for example, presentations and discussions) in groups of up to 50, usually after one or more plenary lectures. Our games are designed to support unique workgroup forms, because they are played at DUT as a single physical location. In hindsight this may have influenced their design, since it was an implicit requisite.

Given the dominance of workgroup-playable games, it is not surprising to find that most of our games take slightly less than a full day to complete. Getting students to a specific location to set up and play a game over several days or weeks is hard to organise. In those cases where game play did indeed last several days or weeks, the specific game could be played from home or any other location.

In addition to these practical reasons for finishing the game in one workday, there were reasons from the perspective of game design. The older games were mostly round-based (Thiagarajan, 2003; De Caluwé & Geurts, 1999) and immersion in the game arguably increases if it is played for several consecutive hours instead of roughly one hour each day over several days or weeks. The few times we set up a longer-running role-playing game that was “asynchronous” and “distributed”, like Sieberdam, our experiences in terms of student-player involvement and performance were not as positive. Designing a game to be engaging enough for students to play it for weeks on end is a great challenge.

In post-game questionnaires, students have generally agreed that gaming is an interesting and valuable educational method and that the specific learning objectives were reached (Bekebrede, 2010; Gasnier, 2008; Van Houten, 2007).

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Conclusions

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Project Management

All games were developed in teams of several teachers and specialists. The specialists were not always game design/development professionals. Often they were still students of game design and development or even of engineering and management. Involving your own students in game design projects has great advantages for teachers (in terms of creativity), for students (in terms of learning) and, of course, for the budget. Most games were developed in a network context with (external or internal) partners who either had domain-specific or topic-/theory-specific knowledge. Road Roles, for example, was developed with the help of a company specialising in road maintenance. This shows the advantage of developing games for engineering. In this discipline, we are often able to develop games for organisations that are also useful in our own curricula.

Designing games in higher education can be expensive. Scaling a game prototype to a fully fledged, playable version that is stable and reliable enough to run in education requires a considerable budget. This is where most of the money listed in Table 2 went. As to the issue of time, development of the games generally took up a year or more. After we played the games a few times, many adaptations and extensions were needed or requested, especially for games that also involved PhD research (for example, SimPort-MV2 and Patentopolis).

Various ways exist to make games development affordable. When it comes to innovation in design, research and teaching the “student workforce” is an important resource of institutions in higher education. For us, as teachers and researchers, the involvement of and working with students as “junior colleagues” has been one of the most rewarding aspects of gaming in higher education. In the past decade many of them have become PhD students or started their own business using the ideas, knowledge and skills they gained as members of the gaming group.

Conclusions

Based on our experiences we derive six lessons that others can take as recommendations for developing and applying games in their own educational institutions:
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1. Games can change the organisation of education: The fact that we have been able to reflect on the development and use of no less than seventeen games – primarily within our faculty over a ten-year period – shows that we consider games to be valuable assets to the students’ learning process. It also shows that our faculty has changed; using gaming for university learning is now taken seriously by the majority of teachers and students. A “gaming group” is constantly involved in designing and running games and many teachers have subsequently applied games in their courses.

2. Planned versus emergent learning: Although games have a general value in our faculty, it is often difficult to plan what games offer specifically. In many cases, we observed that what the students learn differs from the explicit learning objectives. For example, in games where project management skills were the main focus, students also unintentionally practised social skills such as negotiation or communication. On the one hand, we want to reach well-defined and, preferably, measurable results with games. On the other hand we do not want to deter emergent learning because that is why we use games in the first place. Therefore, when it comes to defining learning objectives or evaluating learning outcomes, try to think of and value both formal and informal, or simply (un)intended, (un)desirable, (un)expected learning outcomes.

3. Start small: The number of games at DUT was only possible because of the low costs. If a game is successful it will, or at least should, attract potential investors. The higher education environment is unique in its possibilities to use students for building prototypes. Starting that way, some games will disappear after a few years, while others will develop into fully fledged versions.

4. Find a champion: A game for advanced learning is hardly ever finished. It can live on as long as the game’s “sponsors” are motivated to keep it alive, revive or upgrade it, and use and facilitate it. A potentially great game can die before it reaches maturity when the sponsors lose interest or leave. Once the game project is well under way it is almost impossible to find another sponsor unless someone tak and keeping willing to in Finding such game’s origin tually bring

5. Make technology three-dimensional: Essential to an attractive, b three-dimensional Recently, D three-dimension value if in our game

6. Never develop the increase versions and feel out-date developed c versions th: for success.

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The fact that and use of no less difficulty over a ten-year period to build valuable assets that our faculty has now taken seriously.

A "gaming group" for games and many of our courses.

Games have a general what games offer to the students. For example, the focus on the main focus, skills such as negotiation.

We want to reach such goals, which is only possible if it will, or at least education environments for building knowledge maturity when a game project is well her sponsor unless someone takes up this role spontaneously. We recommend finding and keeping a "champion", someone - internal and/or external - willing to invest time and energy into completing a game project. Finding such a person might be hard. Ideally, the person is the game's original conceptualiser, who will feel responsible and eventually bring the project to a good end.

5. Make technology serve the specified learning goals: We learnt that three-dimensionally rendered virtual worlds are often neither essential nor beneficial. It is indeed necessary that a game looks attractive, but our portfolio indicates that one should only use three-dimensional worlds when the learning goals require this. Recently, Dalgarno and Lee (2010) researched the added value of three-dimensionality in virtual environments, showing that it has value if immersion and a sense of presence are required. In the case of our games such experiences have not been required.

6. Never develop for eternity: Gaming technology ages rapidly. With the increase of computer games in the portfolio, the need for new versions and new features increases. Old versions can quickly feel out-dated, with innovations in graphics and simulation being developed constantly. Incremental development, and employing versions that work - even if not the best ever - has proven a key for success.

So what is next? Are we "fed up" with turn-based games that are at most only computer-supported and played on a single day? The answer is "no", but we are more and more interested in using games for "proofing" student's skills, knowledge and attitudes. Therefore, our next challenge is to develop systematic evaluation systems that can be applied in current and future games continuously and consistently to assess learning outcomes (see also Kriz and Hense, 2006; De Freitas and Martin, 2006). A second, related challenge is more teacher-centric. As discussed in this chapter, our games have mostly been applied to sensitise students, partly because the curriculum objectives often do not ensure that students gain insight into a certain topic. To apply games for practising and proofing purposes, teachers would also need to be open towards redefining their curriculum objectives as well as their teaching theories and methods, in the spirit of Cherry and Khan (in this volume).
Chapter Ten

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Chapter Eleven

From D to Democracy

Politics (Theory)

Introduction

East Politics

Teaching politics must be shaped by the shared values and political invalid and subjective people and states (Stover, 2005).