Game Design Document for Utopolis

Educational Gamification – IN4302TU Building Serious Games

Version: 2.0 (17.01.2014)

Commissioner: Dr. Martijn Koops

Contact: anika.carolina.rose@gmail.com

1 Basic Information

1.1 The game

The game Utopolis is about motivating students to perform better in school by receiving in-game rewards for desired real-world behaviors. It is a multi-player city building game with both individual and collective incentives. Students need to decide how to build their cities, which together comprise a province, in order to reach a higher achievement score (of the province) than the province of a competing class.

The setting of the game takes place in a fictional iron age style world. One region corresponds to one class and is composed of cities. The students in the class are divided among these cities based on grouping by the teacher (either random or with an express purpose). The game play revolves around building the city and province guided by completing given quests. Each city is built of structures, which can be built with [an initial stock] of resources and citizens; citizens are only received by being awarded by the teacher for desired behavior.

A student can then assign citizens to build a structure (using the resources the student has). Structures then produce further resources (except houses, which when built produce one citizen – making houses the only way to increase the number of citizens a student has, other than being rewarded citizens by the teacher). Resources are both tangible (such as brick and wood) and intangible (such as knowledge).

The game will be open source in order to allow schools, who usually have low budgets, to easily implement the game. This will also facilitate that ability for the developer community to further develop the project to a higher level. We also believe this is ethically correct. The project will be hosted on Github, which will contain the information on installing and setting up the game, the state of game development, the code of the game itself and log of issues that are still open as well as completed. Security of the game is simple at this stage with a server with database behind it (using basic authentication).

1.2 The team

The project team consists of the commissioner and the team members. The commissioner in this case is Dr. Martijn Koops, a physics lecturer and serious game developer from the Faculty of Education in the University of Applied Sciences of Utrecht. The team consists of six MSc students from the Delft University of Technology. Team roles are mentioned after each team member.

- Georgi Khomeriki (Computer Science) – Programmer
- Tiago Mota (Computer Science) – Testing
- Anika Rose (Technology, Policy and Management) – Communication and Producer
- Wouter van den Heuvel (Media Technology) – Designer
- Mircea Voda (Computer Science) – Architect

1.3 The problem and purpose

Th organizational problem stems from students under-performing in class, not only regarding academics, but also in the terms of social behavior or sports. This behavior comes from the lack of motivation students feel to perform well. Thus the problem of this project is: *How to motivate students to exhibit desired social and academic behaviors both in and outside of the classroom*? Thus the scope of the problem allows for multiple areas of achievement (the different areas in which students might excel) as well as for different situations where desired behavior might be exhibited (for example not only during class hours, but also in the breaks).

Thus the purpose of the game is to allow teachers to reward students who exhibit desired behavior. The teacher should be able to determine the level of the reward and what behaviors (or results) will be rewarded.

The original proposal to achieve this goal was an avatar like status symbol. Teachers would award students with points to update this symbol. In order to add complexity to this symbol, and thus hopefully increase student engagement with the game, the team conceptualized a city building game. The city of each student thus becomes the status symbol.

The city building mechanic was chosen because it is flexible to appeal to many different player types and ages. Additionally, many different game mechanics can be incorporated into the game, allowing for both individual and collective incentives; lastly, the limitations on resources – especially time – make this option attractive.

1.4 General considerations

A number of considerations are important for this game. First, the complexity of the game should be limited in order to be able to meet the deadline. Another consideration is the age (15-18) and level (high school) of the students who will be the target for this game. The game must be designed to be attractive to this target group. Further, the game itself will be implemented in schools. The game must be playable in a browser in order to reduce complexity for school in the implementation of the game.

2 Game Elements

2.1 The meta structure

Basically, game-play revolves around city building in a SimCity fashion. A group of about four students, grouped by the teacher, works together to build one province. These students individually earn "citizens", as their work force, from the teacher when the teacher deems they should (based on exhibiting desired school behaviors).

The teacher assigns citizens subjectively in order to be able to reward a wide variety of behaviors. The teacher sends the student a short message to indicate which behavior earned the student the citizen. With citizens and resources (an initial amount is given), students can build structures in their city. Once a structure is built, it produces resources continuously. Continuous resource generation is used to entice students to constantly play.

Students can gift resources and structures to each other within the game. Gifts can only be traded by agreements in the real-world to give reciprocated gifts. This mechanic will attract players who are more socially oriented as it feels good to help others even if it is virtually.

Each student will start the game with a customizable flag that is differentiated from other players, adding to the status symbol concept. As students reach achievements in the game, more alterations can be made to the flag, such as uploading their own pictures or putting the flag on a monument.

Game play is driven by quests, which initially serve as a guide to the game, almost like a tutorial. The quests then incorporate both individual and collective tasks to promote the advancement of the game as well as class cohesion. Upon quest completion, rewards in the form of resources are given to the player. These are not yet specified precisely. These quests include:

1. Quest: *Village* (individual)
   (a) Welcome to Utopolis! As you are now in charge of new city within Utopolis, your citizens need a place to live. Thus, your first quest: Build the first village in your city. A village contains at least 3 houses, a civic center and a farm. Once you have completed the first quest, you will be able to move onto the next quest.
   (b) Remember that your actions are not limited by quests. You are free to build your city outside of the requirements of the quest. (A similar message is shown for each quest)
2. Quest: *Boundaries* (group)
   (a) Congratulations on completing your first quest! Your second quest is a group quest. This means each city in your province must complete this quest before you can go onto the next quest. (All group quests will have a similar message)
   (b) Your citizens have started to notice other cities. They feel they need to define their home clearly. Your second quest is to set the boundaries of your "downtown". This means you will need to build at least 4 wall towers.
3. Quest: *Nourishment and Wealth* (individual)
   (a) Your citizens are not getting enough food. They are hungry! In order to give your citizens nourishment, you need to be wealthier! Reach at least a level of wealth of 1000. (all individual quests have a similar message)
   (b) Your citizens are not getting enough food. They are hungry! Give your citizens nourishment. Build at least 3 farms and 2 corrals.

4. Quest: *Rainy Day* (individual)

    (a) As your citizens are becoming richer, they are thinking further in the future. They are worried they will not have enough food in the future. Provide your citizens with at least 2 food stores in case of a rainy day (build 2 storehouses). In order to complete this quest, you must also have healthy citizens. This means you must have at least 1000 units of health.

5. Quest: *Trading* (group)

    (a) Your citizens are happy in the city, but are starting to hope to see the world. Open the trade routes between your city and the rest of the province. Build at least 2 markets. Give at least three gifts to someone else.

6. Quest: *Order* (individual)

    (a) Your citizens are starting to wonder where the birds come from and what they mean. Build a temple to honor the flying gods. In order to complete this quest, you must also have spiritual citizens. This means you must have at least 1000 units of peace and 1000 units of spirituality.

7. Quest: *Beautification* (individual)

    (a) Your citizens are content, but jealous of the other cities. They want a beautiful city too! Build at least 10 trees, update your flag and receive at least 1 gift from 2 different players as a sign of the beauty of your city.

8. Quest: *Another Province?* (group)

    (a) Your scouts have detected another province. Your province needs to prepare itself. Build 2 barracks and a Fortress. To defend your province, you need enough citizens and strong foreign relations. In order to complete this quest, you need have at least 1000 units of population and 100 of foreign relations.

In addition to the quests, collectively students work towards having a the "best" province, as given by certain indicators shown on leaderboards. Individual students may have different in-game goals, such as a nice city layout, a nice flag, reaching achievement levels or others. This depends on the type of player the student is.

2.2 Game Start

Before students interact with the game, the teacher initializes accounts for all of the students. Then students use the created account to first customize their city by choosing a name of it in order to differentiate it from other students. They also set up the game by choosing pre-set flag (a sort of logo for the city) and a player color. Students then enter the game world. This consists of a view of the three-dimensional world they are building in.

The choice of a three-dimensional world is based on appeal to the student age group as well as simplicity of game implementation (due to the team's limitations on art). The game world, set in the iron age, also helps to bring an "epic" element for the players (TED talk by McGonigal, 2010). Students have been exposed to ancient civilizations in history class, now they can see and even recreate these impressive cities themselves.

2.3 In-game actions

Collectively students work towards having a the "best" province, as given by key performance indicators, which are displayed on leaderboards. Individual students may have different in-game goals, such as a nice city layout, a nice flag or moving up on the leaderboards. This depends on the type of player the student is.

Students can build different types of structures when they have sufficient resources and citizens available, meaning structures have a cost expressed by the resources needed to build them and a certain number of citizens need to be assigned to each building process in order for it to be completed. The more citizens assigned to build a structure, the faster the structure will be built. More complex structures will not be achievable at the start of the game as they will require further resources than what students have available. As students gain further resources, they will be able to build more complex structures. This allows the game to grow with the students and allows students to progress in the game along multiple individual paths.

In addition to citizens, two types of resources are needed to build a structure: basic resources and intangible resources. First, basic resources (stone, metal, wood and food), are resources which will be consumed when the structure is built. Some additional intangible resources (culture and knowledge) are needed for certain structures to be built. The resource production rate by each structure will be instantaneous, but at a slow rate. Therefore, while students will have an instant reward from building a structure, they may also will gain further resources while logged out of the game.

This mechanic was chosen in order to give instant feedback to students active in the game, and also promote students to log into the game throughout the day (as new resources will have been generated). We specifically opted for non-variable reward schedules because they are liable to confuse the player. Additionally, the level of resource production depends on the number of citizens allocated to the structure. Because having more citizens result in more resources, students are always in need of more citizens. Thus the role of the teacher awarding students citizens based on positive school behavior is paramount.

Teachers can award a number of citizens to students with an individual message that indicates what behavior resulted in the reward. This makes it clear what behavior is desired, while not making it clear to the entire class.

2.4 Information (in-game) and indicators

Information about structures and the student's resources is displayed on a panel on the top of the game. Messages about quests will pop-up in the game. Messages about gifts and citizens awarded by the teacher are shown in a *mailbox* way.

The indicators of level of achievements are present in the form of leaderboards. These will show the name (initially chosen by the student) of the city with the highest level of achievement. The levels of achievement can be shown in multiple categories, called KPIs, including happiness, population, technology and wealth. Multiple achievement categories are used to appeal to different player types. There will be leaderboards not only for each city, but also for the entire province. Leaderboards will also be accessible at all times through a menu.

3 Up scaling

This game is a prototype which will be tested by Martijn Koops and his colleagues at the Hogeschool Utrecht with their students. This testing will provide valuable feedback to determine exactly how

the future of the game should develop. Based on preliminary testing, some elements have already been identified (further information on testing can be found in Appendix). These include crafting, population dynamics and trading (further more detailed information can be found in Appendix B).

Basically crafting entails creating good from basic materials. These goods are then added to the players resources. This adds a lot of complexity, and thus cannot be implemented in the remaining time. Next, population dynamics refers to player responding to specific changes in the game. Basically, the player has to keep tabs on his citizens to determine and satisfy their needs. Without, the city will not prosper. Finally, trading expands on the function of gifting. Additionally, structures in the game will have a slightly different role, as citizens will be allocated based on proximity. Again, none of these elements have or will be implemented for the final project of the course due to the complexity they entail and the limited time remaining.

Appendix

A Testing Plan

A.1 Target Group

The target group for the game is composed of Dutch students in the last years of their high school education. The target group for this test is then the same as the game. The size of the test group is planned to be approximately 15 students. This size will allow for adequate diversity in game player types as well as demographics. Larger tests will be carried out by the commissioner of this project after the project has been completed for the course.

A.2 Goal of test

Testing whether the game in fact does increase motivation in students is not possible on the time scale of this course. In order to test this level of the game, the commissioner of the project will test the game for a full ten weeks.

At the stage of the first beta. The testing will focus on the goal of determining player engagement. Basically: *will students like the game enough to want to play*?

A.3 Process

In order to test the game, first students in the target group will be found. This will be done through contacting relatives and friends who fit the profile. While the selection will be bias, the time constraints dictate this method.

Once test students are identified. They will be given a link to the game and a questionnaire. The email sent to the test students is below.

Dear Student,

We are a team of TU Delft students working on a project which involves gamifying the classroom. This means making your experiences at school include games. Our particular game is aimed at motivating you to do well in school, whether this be academically, socially or sport related.

The game is a multi-player city building game with both individual and collective incentives. You need to decide how to build your city, which together with other cities composes a province. The choices you make lead to higher achievement scores (of the city and the province).

In this test, we are hoping to determine the effectiveness of the game, not in motivation, but in player engagement.

To test the game, please go to [insert link when ready]. Then spend 10 minutes playing the game, and build at least three buildings.

For gameplay, the basic instructions are:

- movement: [to be filled in]
- building: to build a building click on the building you want to build on the left hand side and then place it on the terrain. The building will be green when it can be placed somewhere and red when it cannot.

After playing, please fill in the questionnaire attached.

Thank you for your help.

Kind regards,

Anika Rose

on behalf of the Utopolis game design team

A.4 Questionnaire with Responses

Questionnaire with Responses

Question	Respondent 1	Respondent 2	Respondent 3	Respondent 4
Demographic Information				
Date of Birth	26/1/1991	23/4/1990	12/05/1994	25/08/1993
Gender	M	F	M	F
Current level of schooling	VMBO Theorie	HAVO	HAVO	HAVO
Nationality	Dutch	Taiwanese	Dutch	Sri Lankan
Previous gaming experience				
Do you have previous experience gaming?	Many	Mostly on my smartphone, sometimes Playstation	Yeah I play on Playstation and PC	I don't play so many games
About how many hours do you play computer games per week?	Around 6, used to be more	Around 4	Around 8	Sometimes I play on my ipad
How much do you know about computer games?	Quite a lot. Read gaming blogs, magazines and such	Not so much, when I play on Playstation I rarely finish one	I know a bit, I'm also designing games for a hobby.	Almost nothing
What types of games do you like to play?	Real Time Strategy, 1st Person Shooters	Role playing games, adventure games	Racing games, First person shooters	Fruit ninja, Zelda
Game Related Questions				
How many buildings did you build?	Around eight different ones	Three or four	Around a dozen	Around twenty
Which types did you build most?	All different to see them all	I have no idea, I think houses	I wanted to compare styles.	I liked the markets most
How did you find the game overall?	It looked nice but I wasn't sure how it worked	It's nice but I'm not sure it's the type of game I would play	I liked it	Nice game
How easy did you think it was to get started playing the game?	It felt pretty intuitive	Not so difficult	It all seemed pretty straight forward	Yeah not hard at all
Did you understand how to play the game?	I don't think I fully understood how to play it	Yeah I think so	I was unsure if I was doing the right thing, didn't get much feedback	Yes
Do you think the game is suitable for students like you?	Yes I don't see why not	Yes	Yes	It wasn't too hard, so yes.
How well did you feel the game responded to your actions?	It was responsive but I was not sure what everything was for	Pretty good. I couldn't place any more buildings and didn't know why	It responded well	There was nothing happening I didn't expect.
Game Appeal				
Did you find the visuals appealing?	Yes it looked cool	Yes very pretty, especially the birds	It looks a little outdated. OK for a browser game	It was nice but I would like to see some more colors
Did you like the music in the game?	I don't really like music in games.	Was there music? I can't remember.	Yup	Yes
Did you like the flamingos?	I'm not sure if its historically correct. Added flavor.	Cool.	Maybe other animals. It's nice to have movement.	Yes they're great
Did you like the "iron age" theme of the game?	Yeah, but I prefer science fiction.	It's very interesting	Yeah I really like it	Yes I like history a lot.
Final Questions				
Would you play the game again?	Yeah, but it needs more action	Maybe, I dunno	I think so	Yes
What did you like best in the game?	Playing with classmates.	The difference in the art styles	Can't really say	Flamingos
In what ways do you think the game could be improved?	More actions that can happen to the player	Personalization, and an element of exploration.	Roads, actual people. Perhaps start a war.	Diversity in the different buildings

B Future Work

This section describes proposed future work for the game Utopolis.

The biggest change that this revision proposes revolves around three new concepts, presented in a triangle:

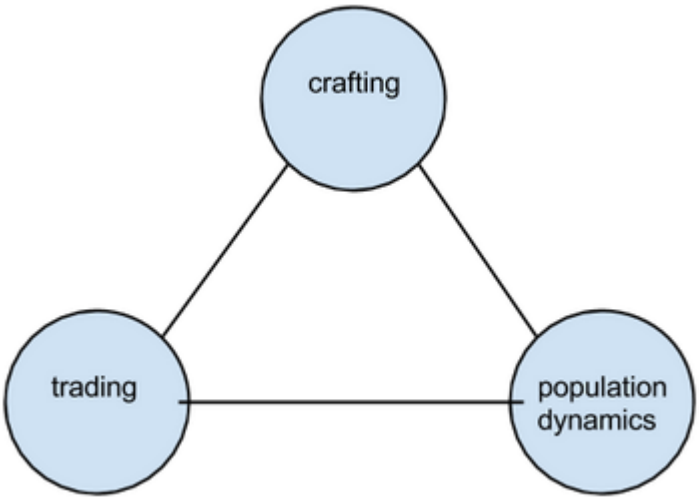

Figure 1: Feature Triangle

These three concepts all interconnect and support each other.

B.1 Crafting

Crafting is the creation of goods through processing basic materials. These goods could be sub-assembly requirements for the creation of other crafted goods. For example one crafted good can be creating spear points from iron, another wooden shafts from felled trees. Spear points and shafts together can be combined to create spears.

Other than the required materials the player also needs to have free workers working in the appropriate buildings. Crafting an item can take a certain amount of time (think hours). During that time the worker (who is automatically assigned) cannot take up any other tasks. Therefore an incentive exists to have more Citizens (thus workers). The player crafts items from the GUI. Once crafted, they are added to the players' Inventory. An extensive list of crafted goods exist, some examples:

- *Food*: Bread, soup, stew, wine, various meat and fish dishes
- *Household*: Pots and pans, storage jars, baskets,brooms, whetstones, knives, spoons, chests, sofas
- *Clothing*: togas, sandals, tunics, cloaks
- *Military*: swords, spears, Armour, helmets
- *Luxury/ vanity items*: Various jewelry, charms, shrines, religious tokens, mirrors

All basic goods can be crafted by all races, however some specific advanced technology is available only to certain races (e.g: Persian carpets are only available to players with Persian race). This is to encourage trade between players.

B.2 Population dynamics

Population dynamics provide a dynamic, changing element to the game where the player has to respond to acute changes. Population dynamics is manifested through the needs and wishes of the players' city population (i.e Citizens). The player has to keep tabs on his Citizens frequently in order to have a prosperous city. Primarily, the player polls the houses of families (by clicking on them, and there should be a 'cycle' button that focuses on the lowest scoring house first and then moves onward) to get some idea of their needs. These change over time and influence their mood or happiness (authors note: Perhaps a better word can be found). Indeed, these mechanics can be regarded as a form of rudimentary A.I. At first, families will have need of basic things, pots and pans, flint and timber, knives, bread, soup etc. Over time, they will have fulfilled their basic needs and move on to more advanced requirements, like furniture, oil lamps and once all that is taken care of will start to yearn for luxury items such religious idols, jewelry, tapestries etc. If the player wants to satisfy her Citizens she has to Gift the house with what they most need at that point, but beware that if left without any gifts for a period of time, their happiness will decay.

This happiness is used in two ways, 1) an aggregated average of all happiness can be used in the leaderboard and 2) when a family's' happiness is below some threshold they will stop working and thus lower income and taxes. Note that happiness could be a pretty complex function and its internal workings should be hidden from the player. he also does not see the internal number value(s) but rather something more abstract e.g a smiley face or a short story explaining the situation. So the happiness function does not yield a single value but is rather a pretty complex calculation taking into account many factors to define what a Houses' greatest needs at this point in time are.

B.3 Trade

All cities in a province have access to an Auction House. This works similar to eBay, where you can sell and buy resources for gold. The idea is that an economy will start to emerge where players will actively try to sell their excesses and buy the things they can't produce themselves. Because of the complexity created by randomness in the population dynamics as well as players' choices of resource generation and crafting workshop buildings the goods that players will have will be very asymmetrical and trade will be necessary to progress. Add to that the fact that some goods are race specific thus they only way to obtain them is to purchase them from other players.

B.4 New buildings functions

Buildings work pretty different.

B.4.1 Houses

Houses require a small amount of resources and 6 citizens in order to be built. These citizens are now 'living' there (as a family) and cannot be reallocated or anything. The houses themselves are a central focus point in the game because they provide feedback for population dynamics. In a way the house is the most important structure in the game.

Other types of buildings in the neighborhood provide work opportunities for the citizens. Note that proximity plays an important role here. Citizens will prefer to take up a job at an available 'work spot' closer to home (although a small amount of randomness here I think would be in order). If no work buildings with free work spots are located within some fixed threshold those citizens will stay home unemployed (which means sub optimal production as well as less happiness - in our world work makes one happy).

Cost: 6 Citizens + tdb (very, very cheap)

B.4.2 Storehouse

This is the structure that does not craft but rather generates (per worker) four basic resources: wood, stone, metal, clay. It would be best if the ratio of the resources generated would differ, maybe based on if the player placed the storehouse near a vein of ore, some rocks or woods. Storehouses have 8 workspaces available. Each occupied workspace in the storehouse generates some of these resources.

Cost: tbd (cheap)

B.4.3 Farmstead

Farms generate some amount of wheat and vegetables for each assigned worker. They also enable crafting of bread and soup.

cost: tdb (cheap)

B.4.4 Corral

Corrals are used to herd animals. They generate different types of meat, wool, skins (possibly some other animal byproducts, no bone though, because that is yucky). Workers in corrals can craft stews, various meat dishes and leather items.

cost: tdb (moderate)

B.4.5 Blacksmith

This structure enables crafting of metalworks such as cutlery, weapons and Armour, barrel hoops, basic jewelry. Blacksmiths have 6 workspaces available.

Cost: tbd (moderate)

B.4.6 Market

Markets are the center of artisan craft such as basket weaving, cloth making, carpets and such. Markets have 10 workspaces available.

cost: tdb (moderate)

B.4.7 Civic center

In a civic center advanced technologies such as glass blowing is practiced. Also finer cloth is produced then on the market. Civic centers also enable things like paper. Civic centers have 10 workspaces available.

cost: tdb (expensive)

B.4.8 Temple

Temples enable crafting of religious tokens and shrines that Citizens will want for. They can also provide various life improving balms and potions. cost: tdb (expensive)

Note: as you will rightly notice, barracks, towers and fortresses are not included, this is due to time constraints.

B.5 Empire

You really can play one 'empire'. This is important because of race specific traits and recipes. This means: for a fun, balanced game where players get the full game experience there needs to be as much race diversity in a province as possible. For that reason it is recommended the teacher/mentor/game admin inputs each players' empire. It would be nice if she did cooperate to take into account players' preference but this is up to the teacher.

B.5.1 Gold and tax

Gold is a new resource. It is required for building more advanced houses and crafting some products. It is also the currency in the auction house. Gold is acquired through tax. The player - as the city governor - can raise tax money from its citizens. This tax is closely linked to happiness. DISCUSS I suggest the player can set a tax rate that is taken into account in the happiness function. So the player has to balance gold income with the happiness of the citizens.

B.5.2 Inventory

The inventory is just a players' current stash of raw materials (resources) and crafted goods. They can be gifted to Houses or traded in the Auction House.