

Yilmaz M., Saran M., Connor R.V. (2014) Towards a quest-based contextualization process for game-based learning. In: Busch C (ed) 8th European Conference on Games Based Learning, Academic Conferences and Publishing International Limited, vol 2, pp 645–651.

Towards a Quest-Based Contextualization Process for Game-Based Learning

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Abstract: This study proposes a quest-based contextualization (QBC) process, which transforms part of a traditional lecture into a well-defined questing structure. The goal is to create a learning experience by using a systematic game-based questing approach. The QBC procedure is a set of sequential tasks defined by the game designer to reflect the instructional objectives of the course. It is formed as an interaction perspective from which a game system can be materialized, and which aims to improve the quality of the game flow and the user experience in a game-based learning environment.

We claim that a game-based contextualization process can be used to restructure a traditional lecture in terms of educational quests. In particular, it was hypothesized that the design of such a quest-line should be constructed as a questing structure based on the chain of events, which are extracted from lecture notes. In the formulation of this design, the key events were discussed in an interview with an expert (i.e. content specialist) from a target field. This interview was transcribed, and further analyzed using an iterative qualitative approach as an interpretive analysis technique where an inductive proposition is considered for contextualization of data. This research used a thematic analysis methodology to explore the situations, which are suitable for questing and might be expandable into categories. Furthermore, *questable* points from the data were captured and situational elements and conversational key points were rigorously categorized. After building the initial mapping, we conducted a second interview with the same area expert to refine our preliminary findings.

To evaluate our approach from the game design perspective, we sought advice from a small group of game design experts and practitioners who are recognized knowledgeable individuals in educational game development. Based on the opinion of four game design experts, the questing structure was revised and several game elements, such as extra battles, puzzles, and achievements, were added to support the elements of fun. Three of the experts argued that the proposed questing structure was highly educational, while the fourth claimed that such an improvement was partially important. These findings, while preliminary, suggested that a well-defined questing structure should be useful to improve the quality of a game-based learning environment.

Keywords: game-based learning, quest creation process, contextualization, questing structure, thematic analysis, expert reviews.

1. Introduction:

One of the recent challenges of the modern educational system is to motivate students by capturing their interest and enhancing their learning experience (Collins and Halverson, 2009). In order to succeed in the era of e-learning, game-based approaches are some of the emerging opportunities, which transform the learning style from the traditional perspective to a new, individualized learning experience (Pivec, 2004). However, these new approaches require efficient strategies to enable newly developed game-based learning methods. Conventionally, many game-based learning systems utilize a set of game elements as a complementary theme to aid the learning process where rewards, points, and badges are distributed into the education environment with respect to the skills of the game designer. Although such an approach provides several merits to the learning experience, a reward-based conditioning mechanism may limit the learning skills of participants.

In the field of instructional technology, Haskell (2012) coined the term quest-based learning as an instructional design theory, which is built on game-based learning where the activities of students are selected from a curriculum using a questing structure. In addition, Haskell claimed that such a structure is likely to capture several opportunities in an interactive environment based upon a 3D virtual world. According to Haskell (2012), this interactive environment will improve the student's

experience of learning, and will have a high positive impact on learning. Vickers (2010) demonstrated the usage of 3D virtual worlds for language learning. In support, with the advances in 3D environments and game development technologies (e.g. see Unity 3D), more realistic and interactive environments can be built. Ultimately, these technologies facilitate the process of transferring knowledge from real life to virtual situations.

The objective of this exploratory research is to transform the elements of a traditional lecture into a video game using a contextualization process created in order to improve the game-based learning experience. The term “contextualization” refers to a process that is tailored to transform a part of the course context into the language of video games (i.e. a questing structure) while effectively communicating learning objectives.

This objective leads to the following research question: *Is it possible to design a process to build a well-defined questing structure for a game by transforming the information extracted from the literature with the guidance of a content specialist?* The remainder of the paper is identified as follows: Section 2 identifies the background for the research. The third section details the methodology of the study. Section 4 documents the outcome of the process, i.e. the questing structure. Lastly, limitations, conclusion and future work are discussed with further directions for research and exploration.

2. Background of the Research

Game and play can be considered as the indispensable artifacts of the social structure that are likely to have a significant effect on learning and innovation culture (Huizinga, 1949). The classification of games and its differentiation from the notion of play first introduced by the French Sociologist, Caillois (2001), who suggests that games (*ludens*) and play (*paidia*) should be shown on a continuum starting from spontaneous activities of play through to games characterized by controlled or organized actions. Play is an internally driven behavioral predisposition without a reward (Pellegrini, 2011). It is a value, added to an activity, which can be defined as an interactive experience that improves social welfare by promoting the element of fun. On the other hand, the definition of *game* includes elements such as a conflict, a set of rules, and a visible outcome (Salen and Zimmerman, 2003). Consequently, games are a special kind of social artifact, which transforms the behavior of participants into a special type of activity called *play*. From the educational viewpoint, the process of transforming knowledge into a game has three main steps: (i) creating rules of a game, (ii) building an artificial conflict, and (iii) defining a measurable outcome (Salen and Zimmerman, 2003).

Prensky (2005) claims that by the end of 2025 there will be no actor (i.e. student, instructor, or administrator) in the education system without experience in computer games, and ultimately games will dominate the education system as a whole. Even today, video games are everywhere. As new technologies are deployed, a new digital culture arises where games become available on mobile devices, which make games a part of daily routines. This means people are spending more than 3 billion hours per week on gaming (McGonigal, 2011). Therefore, we can confirm that the notion of games is highly suitable for use in education. Unlike conventional approaches, a game-based alternative provides more effective ways to be actively involved in subject matter (e.g. conducting a virtual experiment, gaining knowledge, etc.), which promotes the connection between knowledge and experience by using multiuser virtual environments (MUVes) such as *Second Life* (Weusijana et al., 2009).

Gee (2005) identifies many video games that are very good at teaching complex and difficult game structures with success. He argues that this should be considered to be solid evidence for the teaching capabilities of games. In support of this, Barab et al. (2009) found that game-based virtual worlds are very effective tools to teach science content. To improve students' quality of learning, they suggest that educators seek methods to integrate game technologies into their curricula.

2.1. Quest-Based Learning

The first serious discussions and analyses of the notion of quests as a common activity was possibly mentioned in Campbell's eminent publication, *The Hero with a Thousand Faces* (Campbell, 2008). In this book, Campbell analyses different cultures and patterns in their myths for commonalities. Most importantly, he defines the experience of a hero in terms of a quest. His definition of a quest is identified in three steps (i.e. the call, the journey, and the homecoming), which can also be used to construct any type of quest found in computer games.

The quests are a collection of instructions that are designed to specify the order of challenges by structuring the events for the participants, which are especially useful to integrate game objectives with the planned game play (Tosca, 2003). Howard (2008) defines the quest from a goal-oriented view where a quest is defined as a value-seeking activity. For the most part, questing structures in games are found as a *storyfied* chain of events that are customized for a player in the form of voluntary actions. The questing structures usually consist of a set of steps, which has the participant fulfill the objectives of the quest.

A quest usually includes repetitive actions and is highly incremental in its nature, and therefore possesses several objectives, which are combined with a set of (success or failure) conditions embedded in the story line including characters, events, story plots, etc. (Sullivan et al., 2009). The interaction between the player and the game world is brought out by the storytelling elements of a quest. It can be materialized in the form of (i) use/collecting of an artifact or ability, (ii) an exchange/delivery of an artifact, (iii) the exploration of an area, (iv) escorting/protecting a non-player character (NPC) to a location, and most commonly (v) killing a group of monsters for a reward (Tosca, 2003; Sullivan et al., 2009). In light of this, a video game system can be presented in the form of quests where a relationship exists between the game skills of the participants and the difficulty and complexity of a questing structure.

A questing structure can be embedded in a game environment, therefore providing more opportunities to gain knowledge and experience for participants in game-based learning environments (Ashmore and Nitsche, 2007). A recent study by Haskell (2012) suggests that user attributes such as experience, learning interests, and goals should be aligned with the objectives of an educational-quest in order to enhance the learning experience. The type of quests can be identified as follows (Haskell, 2012): (i) linear order, where the quest line is constrained by a sequence or a hierarchical order where a sequence of sub-quests constitutes a complex questing structure based on leveling of the game character, (ii) a situation-based structure in which players need to follow some special instruction to start an event or defend a selected area for a limited time, and (iv) key-lock questing structures based on the exploration game dynamics where the player first needs to deal with an obstacle (e.g. a lock), which can be resolved by seeking some artifacts (e.g. a key) or by needing to improve a game-based talent to succeed (Ashmore and Nitsche, 2007). Collectively, these studies outline a critical role for quest-based learning embedded in game-based educational environments, especially when they are designed to address players learning skills (Haskell, 2012). In view of all that has been mentioned so far, one may suppose that games can be adopted to simulate an actual situation and ultimately the information gained during a virtual game session could be transferred to solve real-life problems (McGonigal, 2011).

Although a significant number of video games are based on a well-defined questing structure, there are a limited number of studies in the literature on quest-based games that were particularly designed for educational purposes. Games require sequential decision-making skills, which are considered to be intellectually challenging, and a novel approach for students to master difficult concepts. One question that needs to be asked, however, is whether a (contextually enriched) questing structure can be useful technique to improve the process of game-based learning. In the next section, we conducted a much more systematic approach to construct a questing structure using a set of dramatic elements that are believed to be helpful to the learning process.

3. Research Design

In this part, our research design will be presented by explaining the quest-based contextualization process, research strategy, and the questing structure. In practice, the goal is to create a story line based on the selected part of the lecture content, and further create an educational video game structure using a rigorous methodology. Ultimately, the learning outcomes, such as understanding the content of the lecture, can be broken into themes and stories where knowledge is embedded in the activities that are defined in terms of quests. In the last subsection, a questing structure can be found, which is created based on the process identified below.

3.1. A quest-based contextualization process (QBCP)

Under the guidance of the conducted interviews, qualitatively collected data is processed to explore questionable situation(s) with the sequence of steps identified as follows:

- Identify the main event with start and end points of a story line that encompasses a chain of sub-events.

- Explore sub-events to decompose them with respect to atomic (indivisible) situations.
- Transform situations into a quest. In addition, the researcher is to check whether the quest can be decomposed into sub-quests.
- Identify the structure of a quest regarding the literature; (i) linear (LQ), (ii) hierarchical (HQ), (iii) situational (SQ) or (iv) lock & key (LKQ).
- Delineate the main objective of the quest(s), and specify their rewards if necessary.
- Constantly compare all attributes of created quests such as structure, reward or objective of each quest and sub-quest.
- For each sub-quest, define an interaction (mission) type; (i) kill mission (KM), (ii) delivery/cargo mission (DCM), (iii) collection mission (CM), and (iv) escort mission (EM).
- Build the overall questing structure populated with rewards, structures and mission types.

3.2. Research Strategy

This qualitative empirical study utilizes a systematic research process, with the quest building process following a rigorous and iterative structure. Given the exploratory nature of this research, we formulated a two-step qualitative research design. First, we interviewed a domain expert in two rounds to collect data in order to form a questing structure. The collected data was thematically analyzed where key patterns and relationships were extracted using the methods of analysis provided by grounded theory (GT). Secondly, after creating the questing structure, we asked a group of game design experts about the process by conducting the snowball sampling (recruitment) technique where the expert selected first helped us to identify other potential experts.

Frequently used in social science research, GT offers a number of methods for qualitative data analysis based on three distinctive levels of coding. In open coding, concepts are categorized (i.e. compared and contrasted for similarities), and labeled (Glaser and Strauss, 2007). In axial coding, categories found in open coding are investigated for associations and combined to form a core category that defines a group of categories, and selective coding, which can be used to process the (grounded) data (Corbin and Strauss, 2008).

As previously stated, our initial objective was to explore a potential questing structure from the selected content of a lecture. To this end, a famous naval battle was selected from lecture notes from a history course. In particular, we selected a part of the lecture notes to utilize the proposed questing process. The lecture was about the Venetian-Turkish War (between 1537 and 1540) that is also known as the battle of Preveza.

To assess the important points of the selected battle, the first author conducted an interview using a semi-structured format (i.e. open-ended questions) with a history professor from a well-known university in Turkey. To ensure the exploratory nature of the interview, we began the process with a selected situation, which was first reviewed from the history of the Ottoman literature.

“September 27, 1538 Barbarossa's fleet won a victory against an Imperial-Venetian fleet under Doria at the Battle of Preveza. By 1540, Venice had ceded to the Turks its Aegean islands and mainland outposts in Morea (Peloponnesus), including Nauplia and Monemvasia.” (Kohn, 2013, p. 589)

We asked questions such as: *Can you think about a good story line for building a chain of quests? How can we connect the events occurring here with a questing structure? Can you see the possible learning units that can be embedded into this part of the story?* The interview took 45 minutes, and the conversation was recorded, transcribed, and thematically analyzed (Guest et al., 2011) using the MAXQDA text analysis software tool (www.maxqda.com).

After conducting a thematic analysis of the extracted themes, we constructed a questing structure in the form of a concept map (Maxwell, 2004) based on the process identified above. We conducted a second interview after analyzing the initial themes, which we identified from the first round. After the second round, we identified three potential questing phases in order to create the preliminary form of the questing structure. To build the final form of the questing structure, we organized and combined the identified themes using axial coding (Corbin and Strauss, 2008). After building the questing structure, we conducted expert reviews using a group of games designers who are especially experienced in quest-based games. However, it is difficult to locate game designers who work on quest-based game design. Therefore, we used the snowballing technique where the researcher

collects data from a person who can direct the researcher to a person of interest working on a similar subject (Denzin and Lincoln, 2005). In fact, researcher requests found individuals who are working on quest-based game designers they previously knew. In light of the research carried through, we built and evaluated a questing process for the selected course. Figure 1 illustrates the quest-book with themes and mappings based on the results of the current analysis.

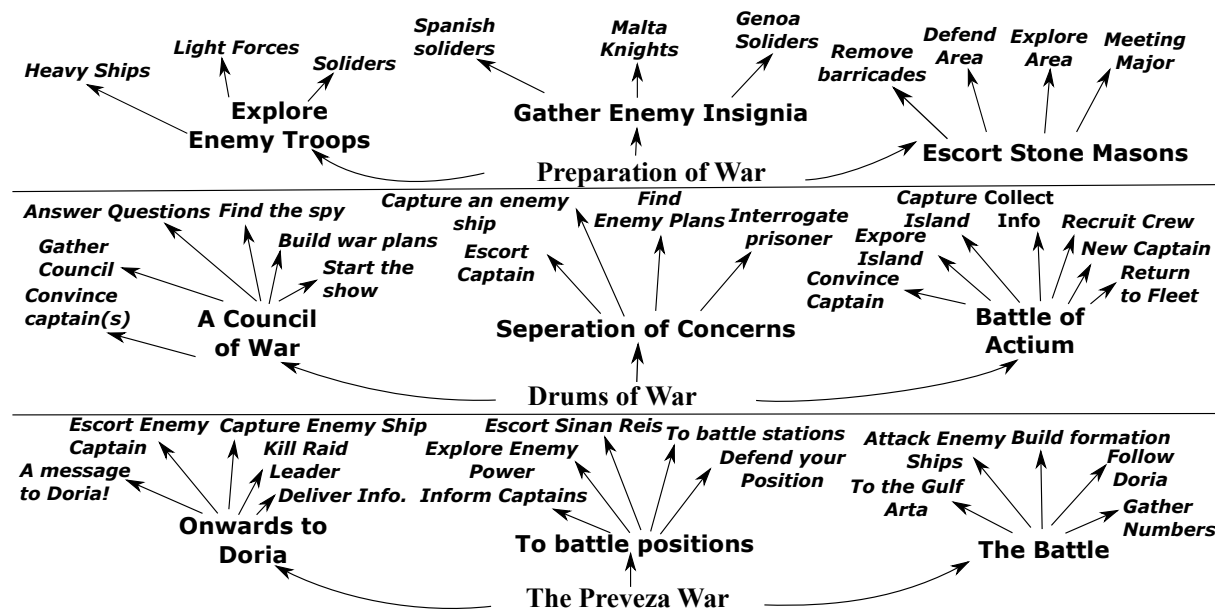


Figure 1: Illustration of the quest-book

In summary, using a set of thematic codes, we formed categories of quest elements by analyzing the selected content of the interview. Using the three-step coding mechanism, we extracted potential events and divide them into situations, which could have the potential to be transformed into a questing structure (Section 3 details Figure 1). Secondly, based on the collected data, the selected points of the curriculum are transformed into questing patterns, which were then compared using an expert reviewer and the literature. Thirdly, we asked a group of experts for their opinion regarding the constructed questing structure.

3.3. Questing Structure

According to the lecture notes, there were three phases of the Preveza battle; (i) preparation for war, (ii) drums of war, and (iii) the Preveza war itself. We divide each phase into three sub-phases (i.e. main quests), which are further divided into a set of sub-quests. The preparation of the war quest-line started with an exploration quest, which includes exploration of enemy forces. The story line is based on actual historical figures. The goal of the student was to sail into the Mediterranean Sea and explore the ships of the opposing force by approaching their ships. To this end, we formulate an *agro-radius* (Marx, 2010), which can be defined as the area that a *non-player character* (i.e. NPC) sweeps or identifies, and is likely to attack the player's avatar. When the quest is successful, the player gathers the required information to fulfill the quest objective. After finishing the first phase of the quest, the game directs the player with extra information regarding geographical information about the next part of the quest. In the second phase of the quest, the player is to identify the themes and quest objective. The goal is to kill some enemies and collect their insignia (i.e. the emblem of the opposing forces). The goal here is to keep the player engaged with routine games tasks and to embed some historical information about the non-player characters; hence the player should be fighting to collect their insignia. Thirdly, following through the real historical events, it was recorded that several castles around the battlefield had been repaired and used as supporting artillery. Therefore, we designed a quest where the player needs to escort some stonemasons to rebuild some of the castles around the area. However, the quest has sub-quests, such as removing barricades en route, defending a captured area, and saving the major from the pirates and privateers infesting the area. Table 1 illustrates the outcome of the contextualization process.

Table 1: Quest-based contextualization of the first quest chain

Identified Themes	Sub-quest categories	Categories
1. Explore 2. Gather/Collect 3. Escort 4. Kill 5. Capture 6. Find 7. Defend 8. Destroy/Kill 9. Meet 10. Convince 11. Recruit 12. Follow	i) Explore enemy troops (LQ), (DCM) <ul style="list-style-type: none"> • Find Heavy Ships (KM, DCM) • Find Light Forces (KM, DCM) • Find Number of Soldiers (KM, DCM) 	Preparation of War (SQ)
	ii) Gather enemy insignia (LKQ), (CM) <ul style="list-style-type: none"> • Find Spanish Soldiers (KM, LKQ) • Find Malta Knights (KM, LKQ) • Find Genoa Soldiers (KM, LKQ) 	
	iii) Escort stone masons (SQ), (EM) <ul style="list-style-type: none"> • Remove barricades (SQ, KM) • Defend Area (SQ, KM) • Explore Area (SQ, KM) • Meet with Major (SQ, LKQ) 	

In the second phase, we have three sub-quests: (i) a council of war, (ii) separation of concerns, and (iii) the battle of Actium. As recorded by historians, Barbarossa gathered a council of war, which was announced with a special flag. A flag-based announcement was the routine protocol of communication, especially in naval history. In this part of the learning adventure, the player is required to embark on several sub-quests. In the council of war quest, the participant is to learn several historical details and pass some of this information on to a group of NPC captains by means of virtual communications. At first, the player's mission is to inform them regarding the gathering. In order to gather the captains, he is to embark on a chain of sub-quests. One of the captains' requests is to answer a set of historical questions based on the battle, the supplied text of which the player is to study. The other captain is concerned with the spy in his ranks. Eventually the player needs to talk with his crew and extract the required information. In the next sub-quest, the player is to bring the war plans to each captain in his respective ship and ask them for their opinions. The war plans were taken totally from authentic historical manuscripts. The final part requires a puzzle to solve in order to take them to Barbarossa's flagship, which will end this episode. In order to fulfill the objectives of the quest named "separation of concerns", the player escorts an enemy captain, captures an enemy ship, finds the attack plans of the enemy and finally interviews a prisoner to gather more information about the opposing forces. These quests are designed in a sequential story form where all things are to be executed in order. The final part of this section includes a set of quests, providing the player with an active ship for the remainder of his adventures. To this end, the player starts another chain of quests. The first quest requires the player to convince the captain to move to Actium. Having some conversations with him is sufficient to achieve this. The second mission is to help the NPC captain to explore the area. Furthermore, an order from Barbarossa will help him to capture the island. After landing there, some information is needed regarding the enemy and their tactical position. After finishing the first step, the player, appointed as a captain, is assigned a new quest, where he assembles a crew and takes over a ship, which rejoins the Barbarossa fleet.

The final phase of the Preveza quest chain includes three sub-quests: (i) onwards to Doria, (ii) proceeding to the battle positions, and (iii) the battle itself. The quest chain onwards to Doria has 5 quests. It starts with the player initiating by canon fire to the commander ship of the famous historical character Andrea Doria on the game date, 28 September 1538. The message was to confiscate an enemy ship and rescue one Giovanni Andrea Doria (his nephew) and escort him back to the fleet. After capturing his barques, the player learns that there is a mutiny and helps the NPC to capture the ringleader. Lastly, the player returns this information to Barbarossa. In the second set of the quest chain, the player sails to inform all allied captains about the situation. Barbarossa assigns the player to explore enemy resources by escorting another ship by sailing both ships under an opposing fleet's flag. However, during the quest, the opposing fleet recognized the other ship, and the player's mission is to save her from enemy fire. Next, this event is announced to all allied battle ships and the player mission becomes a defense mission by standing his ground. At the final stage, the famous battle of Preveza is simulated. The player moves to the Gulf of Arta where the Battle originally took place. The next quest requires an attack against the enemy ships. Later, based on Barbarossa's commands, the

player helps the captains to provide the required formations, which were the historical events from the original battle. Following these events, the player forces Doria to leave the battlefield to Corfu, and the player's next mission is to pursue him. In the final phase, the player visits the alliance captains to learn about the damage and casualties they sustained.

4. Conclusion and Future Work

In this paper, we proposed a novel quest-based contextualization approach to improve game-based learning experiences. The contextualization (i.e. quest creation) process offers a method to extract a chain of complex questing structures from a selected event from the lecture notes under the guidance of a content specialist. The contents from the extracted events (i.e. potential quests) were discussed, and the two consequent interviews were recorded and later analyzed using thematic analysis. Based on the sequential steps of the contextualization process, an initial questing structure was formed. Furthermore, we documented the outcome of the process using an historical lecture and interviewed four game designers regarding the validity of the process outputs.

The majority of expert reviewers (n=3 out of 4) suggest that a contextualization process is very promising for designing a well-defined questing structure, in particular from the textual contents. There is a consensus among the experts that a previous quest-based game design process has not yet been introduced. However, with a limited number of experts, caution must be applied and these results should be interpreted with care. Furthermore, while one evaluator/expert criticized that such a highly structural process might increase the complexity of the generated content, it is encouraging to note that all four evaluators agreed that the process was highly rigorous. There was, however, only limited evidence found for an increased risk of quest complexity. The study has gone some way towards enhancing our understanding of well-defined questing structure. To evaluate our approach more deeply, future studies on the current topic are therefore recommended. For example, it would be interesting to compare the opinions of more experts about the contextualization process.

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