Questlab: A Web-Framework for Gamification of Seminars

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Abstract

This paper presents the concept and implementation of Questlab, a web-based platform for Gamification of seminars and classes. It will show how game elements and game mechanics can be used in learning environments and will present all aspects of the implemented platform. These aspects contain several game mechanics like avatars, experience points, achievements and some others. Combined with a usable user interface the system's focus is to offer a flexible, versatile learning environment which engages the user's motivation.

1. Gamification

Gamification, introduced by Deterding, Dixon, Khaled and Nacke [1, p. 1], generally means the use of game mechanics non-gaming contexts. This concept differs from Serious Games in the way that gamified environments are not fully-qualified games. They use game mechanics only for certain aspects of user interaction. The overall goal of this technique is to engage users' motivation: "The use of game thinking and game mechanics to engage users and solve problems" [2]. Gamification tries to achieve this by adopting game elements and game patterns that address certain psychological aspects: mastery [3], self-efficacy [4], self-determination [3], challenge [5], social development [3] and fun [6].

Another big aspect of gamification is to rather reward users for their achievements than to punish them for unachieved duties. This perspective is the direct opposite of what most school systems and eLearning systems are currently built on. It allows users—or in this case gamers—to get away from their current physical situation and dive into virtual realities in which they can bravely take risks that even endanger their virtual Character. This freedom enables users to try different, more creative solutions and scenarios to solve tasks they normally would not be able to try without fearing penalties in the real world.

But all these benefits can only be achieved if the system is able to create a flow experience described by Csikszentmihalyi [6]. In order to achieve this flow the difficulty of the tasks the user has to solve has to match the user's expertise. On the one hand the goal is to avoid any boredom caused by tasks that are too easy for the user. On the other hand the user should not be challenged in a way that exceeds his or her abilities. The level of difficulty of tasks should resonate with the user's current level of knowledge and experience.

If a system that tries to motivate its users due to mentioned techniques, several elements have to be implemented simultaneously. On the one hand there are elements in games which are ever-present, forming the atmosphere of the game environment and represent a visual stimulus to act (affordance). These elements are deeply integrated in the user interface and its design to support specific game mechanics and game structures [1, p. 12]. The interaction of these elements between each other boosts gameplay, motivation and its preservation [7, pp. 26–50], [8, pp. 20–34]. In learning environments points, levels, badges, avatars, leader boards and narrative elements are often added as visual game elements [1], [9]–[11]. On the other hand there are game patterns that motivate user actions more indirectly. These patterns are crucial elements, but less explicit than those directly expressed via the user interface [1]. Their motivational impact is most effective, when combined and set in an interactive context with different visual game elements. Therefore, it is not enough to use only one or two game elements in a learning environment. A comprehensive variety of game elements and patterns has to be implemented [7, p. 26]. One of these patterns is the conjunction between the goals of the user and of the application, which results in an ideal embedment of the non-gaming context into the gamified environment [5], [8, p. 21], [12, p. 120]. Another pattern is the self-determined practice to preserve the user's autonomy (e. g. self-determined time management) [3], [13], [14]. Furthermore, the user's striving for personal development and feeling of competence are fundamental needs of the human being that have to be considered in a gamified application [15]. The efforts of the learning user "need to result in mastery of content, context and application" [14], which creates

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fun, captivates the user and increases feelings of self-efficacy [8, p. 28].

However, this is not only achieved by using visual game elements like points, levels or achievements, as they are only expressions of the user's progress. The real pleasure in digital games comes from the step-by-step process of mastery, learning and personal progress [8, pp. 28–33], [16, p. 40]. Applications should therefore not only visualize but more so facilitate personal progress to support the users in reaching their goals [11, p. 29], [17, p. 35]. Whenever a user is confronted with solving a task or reaching a specific goal, feedback should be provided to increase motivation [3], enlarge the aspect of playing [18] and support the user in reaching the goal. Feedback can be expressed via various visual elements like points, achievements or progress bars, but also in form of hints or scaffolding support. These elements do not only express the user's activity but can also give a hint towards the next goals, which facilitates mastery and illustrates a constant upward movement of progress [7, p. 36], [8, p. 21], [19, p. 19].

Further game patterns that should be taken into account are collaboration and competition. The integration and inclusion of the user's fellow players are able to create social integration and hence an appealing game environment [7, p. 32], [19, p. 65]. Competitive structures are essential to maintain the commitment: "[I]f the player always and inevitably wins, the resulting lack of challenge could result in a critical loss of engagement" [20, p. 7]. The dimension of conflicts therefore has to be in balance with the users' skills. Besides competing against each other, the notion of collaboration and team-play is equally important [8, p. 268]. Any user is able to contribute his or her skills to improve the overall success of the team, which results in a growing social engagement [20, p. 4]. Additionally, any cooperating user assigns a feeling of importance to his or her fellows, as he or she appreciates their efforts in contributing to the success of the group [8, p. 269], [21].

The reward system is a game pattern that gives feedback about the current state of progress and mastery and furthermore increases a user's motivation. It includes a combination of different elements (e. g. points achievements, rankings) that create a versatile gaming experience [12, p. 135]. Nevertheless, rewards should rather be used to acknowledge a user's skills than to create a feeling of being controlled [22], which would have negative effects on motivation [23] [24, p. 299].

Providing this comprehensive variety of game elements and patterns is a key to create a successful gamified system (see [7]).

2. Motivation

Due to the digitalization of more and more areas of life, current generations have been growing up with new media like smartphones, mobile internet, computer games and a wide range of digital technologies. Therefore, Digital Natives [25] experience many motivating elements in their daily life, which makes it a reasonable step to use these elements also in learning environments in order to improve learning process and knowledge transfer.

The use of game elements and patterns that are responsible for engaging the user's motivation must be adapted to the specific learning context. Along with the actual tasks, these mechanics include characters and avatars, points, levels or achievements. Zichermann [2] describes this concept as "What games do well is expose complex, learnable systems that users can engage with to achieve personal mastery — and thus accomplish something aspirational".

The problem with many currently available eLearning systems is that these systems do not use many game elements and patterns or none at all. Even if they use any, these elements and patterns are not tied together. Most systems offer the allocation of points for solved tasks but these points are only used to score single tasks and are not part of a greater context. This *pointsification* misses other important game elements and patterns. Robertson points out that "It's crucial that we stop conflating points and games" [26].

Due to the missing combination of these elements, there is no flow experience and the user's motivation is not addressed. In order to successfully implement a system that achieves to engage the user's motivation it is very important to have all mentioned concepts in mind throughout the whole planning and process of development (see [11]).

3. Goals

The goal of this project is to develop an eLearning system that offers a variety of game elements (like XP, level etc.) and game patterns (like feedback mechanisms, time management etc.) to highly increase the user's motivation for any kind of learning material. This can be seen as an alternative to classic methods and should give teachers of any kind of subject and any kind of student the possibility to present and experience learning material in an interactive way. The presented system can be regarded as an extension to a course or a tool and resource supporting a course.

The technical focus is to create a highly flexible system, which should not be limited to only one kind of learning context but should provide a universal

environment for any kind of material. For this purpose, a modular structure was used to ensure that the system is easy to maintain as well as further development can be smoothly applied. Future projects should not only have the possibility to improve the system, but also to add more game elements and patterns.

4. Project: Questlab

The project was started in 2013 under the title "The Legend of Zyren". Its primary goal was to gamify the learning content of the seminar "Knowledge Representation" at the Heinrich-Heine-University of Düsseldorf. In order to make the system and its concepts available to other courses and institutions we started to develop a web-based framework called Questlab in 2014. This platform allows any kind of teacher to easily install a game-based system containing their learning content enriched with game elements and game patterns and embedded in a narrative context. Unlike other eLearning systems the focus of Questlab is to provide a rich variety of game elements and patterns to achieve an increase of motivation. Especially in IT instruction, it is of high importance to provide constant scaffolding support to improve and maintain learning success.

After the planning phase and a short period of implementation, the system was already used as an extension to the mentioned seminar, replacing the prototype previously used.

4.1. Technique

In order to introduce a gamified system to enhance a university seminar it is crucial that any student will be able to access and use the system. Therefore we decided to implement this system as a web-based platform that anybody can access from mostly any device only requiring an internet connection and a web-browser.

As already mentioned, one focus of the development was to make the system as modular as possible to keep maintenance efforts low and to allow further development of features independently. Based on these assumptions we decided to use a Presentation-Abstraction-View-based (PAC) architecture. PAC can be seen as a variant of the very popular Model-View-Controller model (MVC) whereas every part of the application is wrapped into agents. The agents themselves consist of independent MVC modules. This structure allows every agent to be developed, reused and maintained separately.

The application has been implemented in the script-language PHP[1], all content is stored in a relational database, which had to match the modular architecture as well. Therefore, it had to conform to conventions and normal forms but also be easily extendable in the future without interfering with already existing tables. To ensure data integrity, foreign keys had to be used for any kind of relation inside the data structure.

4.2. Platform structure

The primary goal was to create a framework that can be used in a wide range of subject areas, even though the project was initially designed to gamify only one subject. The first prototype introduced in 2013 covered only one course on "Knowledge Representation" and had to be copied and modified to be used for other courses or seminars. When we started creating the framework concept, we first added a layer of abstraction to cover several courses in one instance. The platform can therefore be seen as a kind of meta-system that can include several seminars that can be different to one another in any kind of aspect.
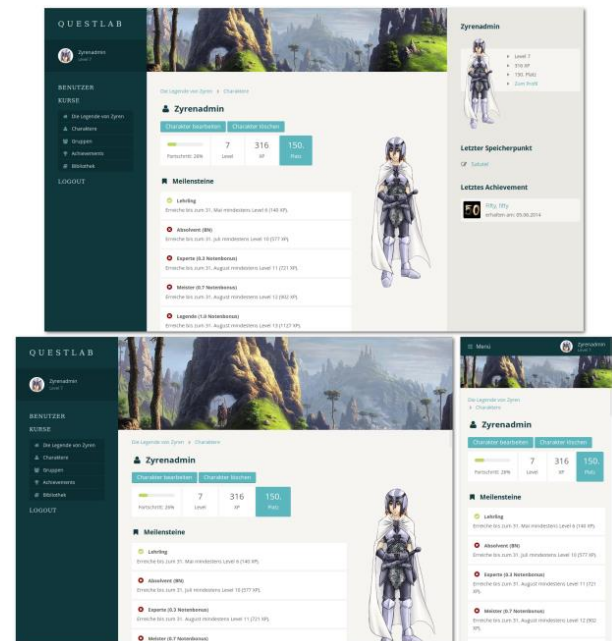

Figure 1. Questlab's Responsive Design showing visible elements at different screen sizes

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[1] http://www.php.net

4.3. User interface

As the web-based user interface was designed to be used on any device, the interface had to be clean, easy to use and composed according to the rules of Responsive Design (figure 1).

The interface consists of four elements: An area for the main content, a menu, a mood picture and a sidebar. On small screens the menu is displayed as a drop-down menu at the top of the site. If the screen-width extends, the menu will be placed on the left showing all entries at once. The mood picture is an image displayed at the top of the site, which is replaced dynamically depending on the content. Each site can specify its own picture to support the atmosphere of the narrative of the currently displayed content. If the screen size is big enough and the currently displayed page shows the content of a seminar, a sidebar will be displayed on the right to provide additional information about the character and its current progress.

4.4. Seminars

The area of "Seminars" is the entry point for a user after he got access to the platform. A seminar wraps up all following features, is completely independent from other courses and can provide any kind of learning content. Therefore it can be used to represent a wide range of courses e. g. a class at school, a course at a university or any other learning content. It is also possible to use a seminar repetitively by creating a copy and applying some changes.

4.5. Characters

To attend a seminar the users has to create a personal figure which is called "character". This character will become their virtual representation and is bound to the context of the course. In terms of gamification the character accomplishes all actions, gets points, will be listed in rankings and so on. All information about a character is displayed on a profile page.

As explained later in this paper the user can choose between different character types which are defined by the seminar managers. Based on this type, an avatar will be created to visually represent the character.

To avoid interference with the virtual identity of the character, any personal information like the real name or the e-mail address are stripped from the character's profile. This feature is important to give the users the possibility to identify themselves with their virtual representation inside the system. It is an abstraction of the real world that allows the user to do critical, virtually dangerous actions without fearing any real punishment or physical injury, as pointed out by Riegle & Matejka [27].

Another effect the concept of a character implies is the bond between the user and the system, as illustrated by Castronova [28]. The user identifies with character which gets points, evolves, will be compared to and compete with other characters and is therefore drawn to the game.

4.6. Character groups

Many game types also use groups of characters to add collaboration between group members and competition between different groups [8]. Depending on the type of game these groups can be any kind of coalition. Common examples would be guilds or clans that stick together during the complete game, but also pick-up-groups or any kind of randomly joined groups can be found in gamified settings.

This concept has been implemented in Questlab as well.

4.7. Character group quests

Furthermore, it is possible to create quests for character groups. They are meant to reflect quests that do not take place on the platform itself but in real-life classes. The character group quests therefore currently contain only static data: a description, some rules for the quest and a text for groups who have won the quest and those who have lost it.

Additionally a number of experience points (XP) can be specified as the maximum amount of points a group can obtain. If seminar moderators enter which groups have attended the quest, they can assign how many XP of the maximum possible value each group has earned. These XP are then added to the XP of each character that belongs to the group.

4.8. Quests

After creating a character, the user is able to accomplish quests of a seminar. Quests can be tasks like the ones that can be found in role-playing games or simple exercises like multiple choices items. They contain the learning content and are therefore the key element of a gamified system.

Each quest is assigned to a specific quest type and is part of a quest group. It is possible to create different branches by specifying multiple succeeding quests, which offers the possibility of decision points and parallel quest sequences for instance. An entry text is assigned to each quest that will be displayed as a label

for these decision points. The branches are a great way to create non-linear narrative paths and give the user more control over the story. Regarding to Knautz, Göretz & Wintermeyer [21, p. 2] this is a key element of gamification.

Another very important aspect of games is storytelling. Plot and narrative create a context for a quest, connect them with one another and serve as an atmospheric element. For this purpose, every quest can have a prologue and an epilogue. The prologue can be viewed straight after entering the quest, guides the user towards the task and creates the appropriate context that is needed to understand and successfully solve the task. The epilogue will not be displayed until the task has been solved successfully.

The look and structure of a task is determined by the task type stated below. After the user has submitted a solution for a task, his submission is evaluated and feedback will be given. If the answer is wrong, the task has to be redone. If the user has given a right answer, positive feedback will be displayed along with the title and a link to the next quest or quest group, which provides a continuous game flow. If the task has been solved successfully, the (correct) answer will not be displayed when the user enters the quest again, unless a button is clicked. This ensures that the user can redo a task for learning purposes without immediately displaying the answer.

Additionally, the sidebar gives a link to the quest last entered by the user, to ensure that the user can enter at the right point of the game after leaving the platform.

4.9. Quest types

The task of a quest is determined by its quest type. This type defines how the task content is displayed and how it has to be solved. In order to ensure the game to be interesting and maintain the game flow, it is of great importance to provide a wide range of different quest types.

Questlab currently provides eight quest types. The "text entry" type provides input fields the user has to fill out. The contents are evaluated against a regular expression that is attached to each input field and can be placed anywhere inside a text. The second type, "choice input", is very similar to the first one but provides drop-down lists instead of input fields. Multiple values can be deposited for each list from which the user has to select. The third quest type is a common "multiple choice" item. For this type multiple questions with multiple answers are created. Additionally, there are tasks of the type "submit". This type only consists of an instruction and can be solved by submitting a PDF-document. This text then has to

be evaluated by seminar moderators. If the moderators agree to the solution they can mark it as solved and unlock the user for the next quest. If they mark it as "incorrect", they attach a comment and give the user the possibility to rework his or her answer and re-submit it. This can be done several times without technical limitation.
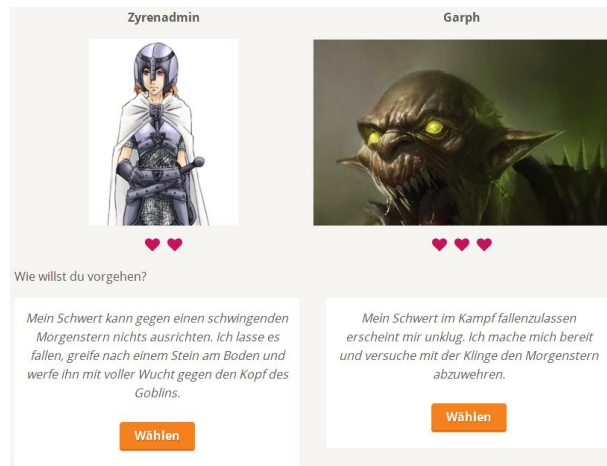

Figure 2. Example task of the quest type "bossfight"

The fifth type is called "crossword" and provides a crossword puzzle the user has to solve. In contrast to the quest types explained so far, less text input is needed for the quest type "drag&drop". To solve a drag&drop task the user has to drag graphical fields and drop them in the right area inside the graphic. A very different type of task is represented by the type "bossfight" (figure 2). For this type the user is confronted with a virtual opponent against whom he or she has to fight. In this scenario both rivals start with a certain amount of points. While answering questions by choosing one of multiple possible fight options, the user can reduce the boss' amount of points, by choosing the right option, whereas choosing a wrong option will reduce the user's points. The last quest type does not really offer a task containing actual learning content, but provides the possibility to maintain the game flow.

To keep the system flexible and extensible, all types are organized in separate folders. Additionally, each quest type uses separate database tables prefixed by its name, which allows an independent development and gives each type a very flexible design without forcing a specific data structure.

4.10. Quest groups

Quests usually represent small objectives so that the user can directly experience personal progress.

However, any quest is always related to a greater structure by being part of a quest group. Quest groups are primarily organized hierarchically and can be used for different purposes. One way is to create a group related to a certain levels, with each quest inside this group representing a specific level, or to create a much more complex structures similar to those that can be found in role-playing games. A typical structure in these games would have acts at the top level, quest lines as second level and quests as a third level.

Another way to organize quest groups is not to attach them to the hierarchy but to attach them to a quest of another quest group, which makes them optional to pass. These optional quest groups are linked inside the prologue or epilogue of a quest of another quest group and can only be found by reading through the text. The user can continue to play even without solving the quests inside these quest groups. The reason behind this concept is to engage the user to solve tasks they don't have to solve and to let the game appeal more interesting by not only providing a linear structure, but also explorable content. It is also a good way to provide additional learning material for users that are very interested in certain topics.

Since the quests are not meant to be done only once in order to merely completing the game, but rather to provide the option to study and repeat certain contents, topics can be assigned to each quest. Via a library the user can easily access quests already done and repeat the syllabus. The user receives feedback of how many quests have currently been solved for a topic via a progress bar. This will also tell the user how many quests are still to be discovered.

4.11. Game elements

A central aspect of games and gamified systems is to provide a feedback of the user's current progress. The progress is calculated based on points that can be earned at several opportunities stated below.

Experience Points (XP). By solving quests the user earns experience points (XP). Since quests are organized in quest groups, the current progress is calculated and visualized with the help of a progress bar. The total amount of XP of a quest group is measured by its child quest groups, the quests attached to it and also the optional quest groups assigned to these quests.

Additionally to the XP collected from quests, the user can achieve XP via character group quests (guild quests). These points are cumulated to the total amount of the user's XP. Since the XP are a very important game element, they are permanently displayed in the sidebar in addition to other character information.

Levels. Based on the amount of XP a seminar manager can define levels that mirror the actual experience of a character. Levels are implemented to engage the user to collect more XP, for instance by solving quests of optional quest lines, or to create avatars which are explained below.

Ranking. A ranking of all characters of a seminar is created and visualized on the platform based upon the amount of earned XP. On a character's profile page a user can view his or her current position in the ranking. The ranking is designed in a context-sensitive way and does not display more than two players with a higher status in the ranking avoid discrimination of lower ranked characters.

This game element does not only give an overview of the current progress but also motivates the user to continue the game and look for optional content to reach higher positions in the ranking.

Avatars. The term "avatar" is used differently across various contexts. In Questlab it does not refer to the user's character but shows a visual representation of their character and its progress, based on the experience level and the character type. The avatar evolves with the level of a character, creating an additional, visual feedback (figure 3). The avatar can also be seen as reward: If the user earns XP and reaches higher levels, their avatar evolves and improves visually. The avatar is therefore also an additional way of comparing characters which promotes competition among the users of a seminar.

Figure 3. Overview of the development of an avatar

Achievements. By solving quests, doing certain actions or triggering certain events on the platform, the user can obtain achievements, which are extra trophies besides regular experience points.

There are two types of achievements: On the one hand, there are achievements that are visible to the user. Their description is visible and the user will be informed how to obtain them. On the other hand, there are trophies that are listed with invisible names and descriptions that cannot be seen before achieving them, which motivates the user to look for optional content to explore.

Additionally, some achievements are unique, which means that they can only be achieved once by one character exclusively. These trophies therefore express very valuable rewards.

Furthermore, there is the possibility to assign a date to an achievement which turns it into a milestone. This

date acts as a deadline so that the milestone can only be obtained before this date.
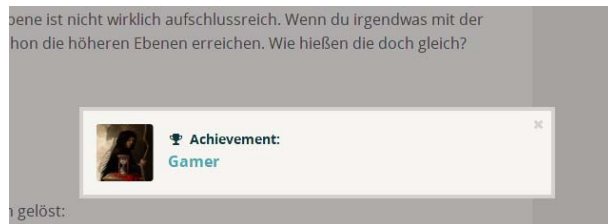

Figure 4. Notification that pops up when the user obtained a new achievement

Achievements are created by assigning multiple conditions out of four condition types: First, a date and time can be set. The achievement will be awarded if the specified date and time apply. The second condition type is based on character properties. The creator can select a property from a drop-down list and can then assign a value that the property has to match. This can be used to award achievements for collected XP or for reaching a certain level. The third condition type specifies quest values. These values can be used to compare them to the current status of a character. It is also possible to aggregate quest values. A common example for an aggregation would be the amount of solved quests. The last type is the meta-achievement. This type is based on values of other achievements e. g. the total amount of already obtained achievements by a character.

If a user performs an action that fullfill all conditions of an achievement, they will be rewarded by obtaining this trophy. This will be communicated by displaying a notification at the bottom of the screen (figure 4). The most recently obtained achievement will also be displayed in the sidebar.

5. First results

5.1. The Legend of Zyren

The Legend of Zyren was the first seminar the platform was used for. The platform and the usage of the first seminar have been tested by 96 students. The evaluation covered 108 questions with overall very positive results that confirmed the useful role of the platform and the motivational effect of the used game elements and the game patterns.

Since this paper focuses on the meta-system and not on the specific seminar it was originally used for, only the first results regarding the technical aspects will be described. More evaluation results can be found in [29].

5.2. Questlab

The technical results of the evaluation in relation to the application are as follows:

Concerning the visual appearance of the website 90% of the participants enjoyed its high aesthetic value. In terms of usability 97% confirmed that the font sizes and types were chosen appropriately, and even 42% 'strongly agreed' (figure 5). The results of the following questions which were designed to measure the effects of visual appearance turned out to be equally positive. 86% of the participants confirmed that the navigation is easy to use and structured in a comprehensible way (SF1-S2(b)) and 94% also think that links and buttons are clearly visible.

Concerning the features and functions, similar affirmative results could be attained (figures 6 and 7). 91% of the participants claimed that the images and graphics support the atmosphere on the platform in an adequate way (SF2-M6/M5). 95% also affirmed that the personal progress is clearly visible and comprehensible at all times (SF2-S2(a)). 92% rated the library as a very useful tool to get an overview of the topics (SF2-S1(a)). 88% also confirmed that the library was useful in terms of exam preparation (SF-L2/S1(c)). Another 88% stated that the scroll-boxes support the usability (SF2-S2(b)) and 92% had the opinion that the right sidebar is very useful because it contains all relevant information (SF2-S1(b)).

Since a Responsive Design (SF3) focuses on the usage of the website on all variants of mobile devices and desktop PCs, it offers—in addition to the standard 6-scale—the option to distinguish between certain device and reveals how often they were used (option 7). 91% of the participants confirmed that the use of the platform via a desktop PC is possible without any problems (SF3-S2(b); 4% did not use the desktop PC). 62% also confirmed that the use of the platform via smartphone works well (SF3-S2(a); 15% did not use the smartphone). 29% of the participants had no problems using the platform via the tablet. This value is rather low because 53% did not use a tablet at all (SF3-S2(c)).

Concluding, 88% confirmed that it is very useful to be able to use the platform via any technical device (SF3-S1; 5% did not use every technical device).

Regarding the system capabilities, all statements were constructed to measure the effect on trust (figure 8). 83% of the participants are of the opinion that the automatic evaluation of quests by the system is reliable (SF4-S3(a)) and 88% also confirmed that the availability of the platform was reliable (SF4-S3(b)). 93% additionally felt that their data is stored safely (SF4-S3-(c)).
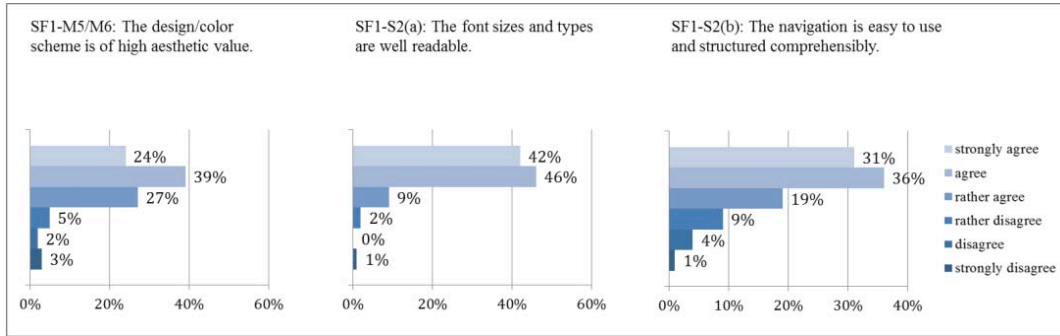
SF1-M5/M6: The design/color scheme is of high aesthetic value.

SF1-S2(a): The font sizes and types are well readable.

SF1-S2(b): The navigation is easy to use and structured comprehensibly.

legend:
- strongly agree
- agree
- rather agree
- rather disagree
- disagree
- strongly disagree

SF1-M5/M6: 24%, 39%, 27%, 5%, 2%, 3%

SF1-S2(a): 42%, 46%, 9%, 2%, 0%, 1%

SF1-S2(b): 31%, 36%, 19%, 9%, 4%, 1%

Figure 5. Evaluation results of Display (n=96)

SF2-M5/M6: Images and graphics supported the atmosphere on the platform.

SF2-L2/S1(a): The library enables me to prepare the final exam in a topic-focused way.

SF2-S1(b): The library offers a useful overview of the topics.

legend:
- strongly agree
- agree
- rather agree
- rather disagree
- disagree
- strongly disagree

SF2-M5/M6: 28%, 38%, 25%, 3%, 3%, 3%

SF2-L2/S1(a): 25%, 40%, 23%, 6%, 2%, 4%

SF2-S1(b): 28%, 38%, 26%, 1%, 6%, 1%

Figure 6. Evaluation results of Features and Functions (n=96) – part 1

SF2-S1(c): The right sidebar that included information about the character, saving points and guild members is useful.

SF2-S2(a): The personal progress is visibly and comprehensibly displayed on the platform at all times.

SF2-S2(b): Scroll boxes that contained the text of the story prevent an overloading of the page.

legend:
- strongly agree
- agree
- rather agree
- rather disagree
- disagree
- strongly disagree

SF2-S1(c): 36%, 40%, 16%, 6%, 1%, 1%

SF2-S2(a): 42%, 38%, 15%, 4%, 0%, 1%

SF2-S2(b): 36%, 32%, 20%, 5%, 5%, 2%

Figure 7. Evaluation results of Features and Functions (n=96) – part 2

SF4-S3(a): I could rely on the automatic evaluation of quests by the system.

SF4-S3(b): I could rely on the permanent availability of the platform.

SF4-S3(c): I had the impression that my data (personal data and hand in exercises) was save on the platform.

legend:
- strongly agree
- agree
- rather agree
- rather disagree
- disagree
- strongly disagree

SF4-S3(a): 23%, 39%, 21%, 7%, 6%, 4%

SF4-S3(b): 31%, 40%, 17%, 7%, 4%, 1%
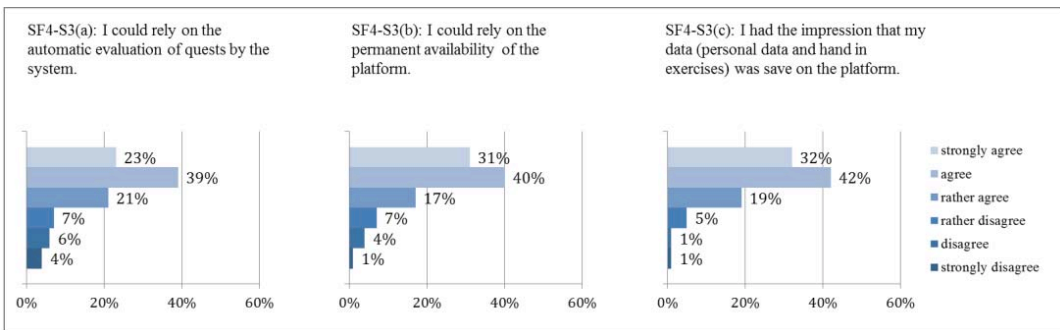
SF4-S3(c): 32%, 42%, 19%, 5%, 1%, 1%

Figure 8. Evaluation results of System Capabilities (n=96)

6. Conclusion & further development

The system presented in this paper features a complex structure and various concepts and game elements and patterns. There are a couple of features and improvements on the conceptual as well as on the technical side that we would like to address in the near future. Even though results of the evaluation of the general concept, the user interface, its design and provided features, shown in chapter 5, have been given a very positive feedback, the system holds some limitations that have to be addressed in the ongoing development.

Since most actions take place inside quests of a seminar it is necessary to add further quest types, as the use of modern web technologies would allow creating types that are more interactive. This would also apply to character groups quests that currently only offer static information. These more dynamic elements could serve to even further increase a user's motivation. An interesting approach would be to integrate real-time applications that monitor the current state of character group quests, such as a geo-location service.

The platform would also benefit from more versatile media like audio and video, which would enrich the user experience. To give seminar moderators a direct feedback, it would be reasonable to provide some site statistics about the usage of the platform and the seminar.

In order to store the hierarchical data of quest groups and quest paths, the use of a more mature data structure would simplify the complexity. Nested sets could be a probable solution for this structural problem.

Although the application uses a modular architecture, extension still requires some workload. If the application would offer Application Programming Interfaces (APIs) to the most commonly used tasks, this workload could be reduced and additional features could be implemented more easily. Additionally there is currently no well-defined and well-documented installation and update procedure which makes it hard to deploy the application and to let existing installations take advantage of the ongoing development.

Furthermore, as the system and its implementation is quite a young project, extensive testing is needed to evaluate the underlying concepts and their implementation.

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