Contextual Gamification of Social Interaction – Towards Increasing Motivation in Social E-Learning

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Abstract. In current e-learning studies, one of the main challenges is to keep learners motivated in performing desirable learning behaviours and achieving learning goals. Towards tackling this challenge, social e-learning contributes favourably, but it requires solutions that can reduce side effects, such as abusing social interaction tools for 'chitchat', and further enhance learner motivation. In this paper, we propose a set of *contextual gamification strategies*, which apply *flow* and *self-determination theory* for *increasing intrinsic motivation in social e-learning environments*. This paper also presents a social e-learning environment that applies these strategies, followed by a user case study, which indicates increased learners' perceived intrinsic motivation.

1 Introduction

Social e-learning is a process in which learners achieve learning goals via social interaction within learning communities [15]. In such an environment, connectedness and interactivity try to satisfy learners' basic innate needs such as autonomy, competence and relatedness [12], and thus lead to an increase of motivation [1]. However, the flourish of social features may also result in, e.g., abusing them for 'chitchat' purposes [17]. *Gamification* is "the use of gameplay mechanics for non-game applications" [11], and presents a solution to engage users and motivate their activities thus promoting learning [8]. It has been incorporated into numerous domains, as a way of creating strong connections between users and environments.

Recently, theories and practices of gamification in social e-learning have been explored, showing positive emotional and social impacts [18]. However, evidence also shows that many systems are not motivating students enough, and in some cases they are even discouraging [4]. To alleviate these issues, we believe that the social gamification approach to e-learning needs to be firmly rooted in motivation theories. Thus, in this paper, following-up our prior study [17] that proposed *light gamification mechanisms* to symbiotically build upon social interaction features without replacing the existent social learning communities, we present *specific contextual gamification strategies that apply motivation theories for reducing the side effects and further increasing learner motivation*.

2 Motivation Theories

Motivation is an inner drive. It corresponds to physiological processes that influence directions and persistence of behaviours [9]. Among motivation theories applied in learning, *self-determination theory* (SDT) is an empirical one that focuses on the degree to which individual behaviours are self-determined and self-motivated [12]. Social e-learning that applies SDT is expected to sustainably increase learners' intrinsic motivation, leading to an efficient self-determined learning experience [5, 19]. Hence, in this study, SDT guides the design of the contextual gamification strategies.

Studies show that motivation levels need to be strengthened, so as to keep learners inside an area of optimal performance or *flow* [3]. Flow is a consciousness state experienced by individuals when their activities are fully immersed in a feeling of energized focus and deep involvement and enjoyment [2]. Studies [4, 18] also show that flow has positive influences on learning behaviours and performances. For these reasons, our contextual gamification strategies are informed by the flow theory.

Gamification has been criticised for its overjustification effect, which occurs when an expected external incentive de-motivates learners with already existing high intrinsic motivation [7]. It is believed that people pay more attention to external rewards than internal enjoyment and pleasure obtained from the activity itself [10]. Evidence has shown increased extrinsic motivation reduces learning performance [6]. Therefore, we adopt a *contextual* gamification approach that applies motivation theories to promote intrinsic motivation in existing social e-learning environments, rather than a full-fledged gamification approach that may "over-gamify" the existing mechanics.

3 Contextual Gamification Strategies for Social E-Learning

Self-determination theory (SDT) proposes three basic needs [12] to be satisfied:
1.*Autonomy*: a sense of internal assent of one's own behaviours;
2.*Competence*: a sense of controlling the outcome and experience mastery;
3.*Relatedness*: a sense of connection and interaction with others within a community.

Flow theory postulates three conditions to meet for achieving a flow state [2]:

- Being involved in activities with clear and structured goals and progress;
- Performing tasks with articulate and immediate feedbacks;
- Having a good balance between the perceived challenge level and skill level.

SDT and flow theory have some overlaps, but there are also differences: SDT is a "larger" theory, alike to intrinsic motivation in general, that associates with all the three innate needs, but flow is "smaller" and often related to only two of the innate needs, i.e., autonomy and competence. Our proposed strategies address each innate need defined by SDT, whilst flow is referred when appropriate.

Towards Satisfying the Need of Autonomy. To satisfy the need of autonomy, we suggest to provide learners with meaningful and flexible choices to continuously balance their curiosity, skills and goals against a finite pool of resources, so that learners feel their behaviours are based on their own intentions. To reduce

overjustification effects and maintain intrinsic motivation, we suggest to provide intrinsic choices of voluntary behaviours [7]. To achieve a flow state [2], we suggest to provide goals and progress markers with clear description, tasks at hand with clear and immediate feedback, and customisable learning context. The suggestions on satisfying the autonomy need are summarised as below:

A1. *A set of learning goals with clear description and multiple paths to achieve;*
A2. *Various interaction tools to complete a task;*
A3. *Clear and immediate feedback for learning activities;*
A4. *Meaningful options with consequences;*
A5. *Customisable learning context that can be adjusted by learners themselves.*

Towards Satisfying the Need of Competence. To satisfy the need of competence, we suggest to support the perceived extend of learners' own behaviours as the cause of desired consequences, multiple choices of learning paths, and customised interaction tools, so that learners can build their own competence. To enhance competence feelings, it is essential to provide unexpected, direct and positive feedback, optimal challenges and freedom of demeaning evaluations [12]. Furthermore, when experiencing enjoyment and fun, learners can become intrinsically motivated [14]. Hence, it is important to offer interesting challenges, by combining well-defined rules and goals [7]. To achieve a flow state [2], we suggest to break a learning goal into small and achievable pieces and increase the difficulties during the learning process. The suggestions are summarised as below:

C1. *Reasonable small chunks of learning goals with increasing difficulties;*
C2. *Tasks with unexpected positive feedback;*
C3. *Multiple choices to go along and retrace the learning paths;*
C4. *Learner in control of the learning process moving forward;*
C5. *Enjoyable and fun learning activities.*

Towards Satisfying the Need of Relatedness. Experiencing relatedness means feeling connected to peers, belonging to communities, and contributing to things "bigger" than oneself. Relatedness can be supported by various social interactions such as tagging, rating, commenting, and the visualisation of social status and reputation, such as levels, badges and leaderboard that connect learners to a community with the same interests [13]. Therefore, the suggestions on satisfying the relatedness need are to provide:

R1. *Opportunities to discover and join learning communities;*
R2. *Connections of interest and goals between learners and communities;*
R3. *Various tools for interaction, collaboration, discussion and mutual assistance;*
R4. *Visualisations of social status, reputation and contribution;*
R5. *Promotions to show appreciation to others (such as "like").*

4 Applying the Contextual Gamification Strategies

This section presents the new gamification features introduced into the second version of Topolor [16], a social e-learning environment, guided by the proposed strategies.

Structured and Chunked Goals with Increasing Challenges. In Topolor, a *course* is composed of structured *topics*. Learners have various "layers" of goals: a *long-term*

goal to complete the *course*, a *medium-term goal* to finish each *topic*, and a *short-term goal* to achieve each *objective*. They cannot jump goal "layers", but they can decide which unlocked topic to learn next (Fig. 1). A higher-level goal is usually more difficult and complicated, so that learners incrementally master new skills, and thus enhance the experience of a flow state. These features were designed based on the suggestion A1, A5, C1 and C3 from the strategies.

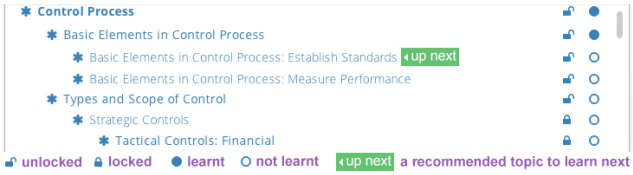

Fig. 1. Visualised course structure (learning path for a course).

Immediate and Positive Feedback with Guidance on the Next Step. Topolor provides immediate and positive feedback for learning activities to satisfy learners' needs of autonomy and competence. For instance, after finishing the pre-test of a course, Topolor shows "congratulations" and encourages learners to start the course. After submitting a test, Topolor immediately shows the result and recommends which topics the learner may need to review (in Fig. 2, 'Control Process' is recommended). These features were designed based on suggestion A3, A4, C2, C4 and R1.

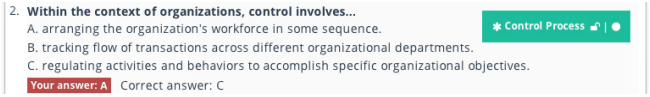

Fig. 2. Immediate feedback when taking a quiz

Visualisation of Social Status, Comparisons and Learning Progress. Topolor's support for the sense of competence and relatedness include the comparison of learner performance and contribution, based on suggestion A3, C5, R2, R3 and R4 (Fig. 3).

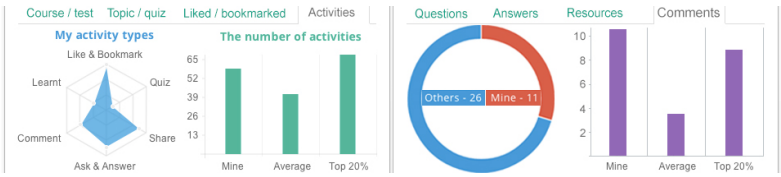

Fig. 3. Pop-up view – comparison: performance (left), contribution (right)

Other gamification features of Topolor are as follows: **storytelling**: tours for guiding 'newbie' learners to use various features (A3, A4 and C4); **profile** pages: publishing learning activities, learning status statistics, visualisations of performance and contribution (C5, R3 and R4); **leaderboard** (R4); **team building**: discussing and commenting on learning contents (R3); **peer reviewing**: rating peers' posts and comments (R5).

5 Case Study

A case study was conducted to evaluate the SDT and flow-motivated gamification features. Both qualitative and quantitative data were collected and analysed. The main research question of the case study is: *can Topolor's newly introduced gamification features increase the learners' perceived intrinsic motivation?*

The experiment was conducted at the Department of Economics, Sarajevo School of Science and Technology, Bosnia and Herzegovina, in December 2013. 20 students, 2 observers and 1 course instructor participated in the 1.5 hours online learning session - using Topolor to learn a course on 'Control'. After the initial online session, students were encouraged to further use Topolor to revise the covered materials, for two weeks. After that, students were asked to complete an optional online survey. Meanwhile, a logging mechanism in Topolor kept track of each student action. Out of the 20 students who participated in the online course, 15 completed the online survey. The survey responses (see Table 1) show three main results, including perceived satisfaction of *autonomy needs* (questions 1-4), *competence needs* (questions 5-8) and *relatedness needs* (questions 9-12). The means rank between 3.60 and 4.33, and their standard deviations range between 0.49 and 0.70. All the means are greater than 3 (the neutral response), suggesting the students were intrinsically motivated.

Table 1. Survey Results of SDT-based Contextual Gamification Features.

	Likert statement (1: strongly disagree – 5: strongly agree)	Mean	SD	SDT need
1	I felt in control of my learning process.	3.67	.488	Autonomy
2	I was interested in using Topolor.	3.73	.594	Autonomy
3	I felt confident to use Topolor.	3.93	.704	Autonomy
4	I felt my learning experience was personalised.	3.80	.676	Autonomy
5	I enjoyed and had fun using Topolor.	3.73	.704	Competence
6	I felt I only needed a few steps to complete tasks.	3.60	.632	Competence
7	I felt it was easy to understand why I received recommendations.	4.33	.488	Competence
8	I felt it was easy to find the content I need.	4.13	.516	Competence
9	I felt it was easy to share content with peers.	3.60	.507	Relatedness
10	I felt it was easy to access the shared resources from peers.	3.73	.594	Relatedness
11	I felt it was easy to tell peers what I like/dislike.	3.60	.632	Relatedness
12	I felt it was easy to discuss with peers.	3.80	.561	Relatedness

6 Discussion and Conclusion

Qualitative feedback was also received from the course instructor, the observers and the students. The general feedback was consistent with the questionnaire results, and a number of participants expressed interest in using Topolor in the future. Besides, the activity records show that the students performed a wide variety of action types, indicating the students were motivated in trying interaction features in Topolor.

The main limitation of this study is the low number of participants. However, the new Topolor with gamification features has been opened to public (topolor.com), thus a larger cohort of users is expected in the near future. Another limitation is that more

detailed evaluations are needed to examine each gamification features' influence. For future work, we will conduct deeper evaluations based on a larger data collection.

To conclude, motivation plays a crucial role in the success of the learning process, and gamification has the potential to increase learners' intrinsic motivation. To keep learners motivated in performing desirable learning behaviours and achieving learning goals, we proposed *contextual gamification strategies* rooted in self-determination and flow theories. The case study results indicated that our approach was promising.

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